Making the Modern Person: The Tyler Rationale, Curriculum Studies, and Cybernetic Systems

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Table of Contents

ABSTRACT

This research examines the role of cybernetics in mid-20th century American education and social reform. It places the widely-influential Tyler Rationale (*Basic Principles of Curriculum and Instruction*, 1949) alongside Norbert Wiener's *Cybernetics* (1948) and Shannon's information theory (1949) to explore the influence of the science of cybernetics and information theory in the field of curriculum. The Tyler Rationale has been discussed in curriculum both as a model for curriculum designers to follow and historically as a particular management style introduced into the planning of schooling. The analysis examines historically the system of reason that gave intelligibility to the Tyler Rationale by focusing on its role in a larger enterprise in which the authority of a new science of cybernetics helped to diagnose the American nation's potential within a new "modern" stage of development. This, in turn, suggested cybernetics as the key social technology to close any "cultural lag" between the nation's promise as a system society and any ossifying features of its outdated traditional social order. Cybernetic technology became a way of seeing and organizing the reform of American social structures by remaking higher and public education and introducing algorithmic strategies. The technology, as embodied in the Tyler Rationale, was concerned with making up new kinds of people amenable to the production, consumption, and exchange of new forms of communications as a modernization project that democratized and reformed the individual to remake society. The dissertation argues that systems-based educational research, programming, and policies embody cybernetic principles as a form of governance and control in schooling.

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INTRODUCTION

The "Tyler Rationale," or more simply "the Rationale," was published originally as *Basic Principles of Curriculum and Instruction* (1949).[1] From pre-school to law school, the Rationale's curriculum-forming model centers on four steps of purpose, planning, organization, and evaluation, and operates internationally as the singular litmus test for what many consider effective instructional design. It has been translated into at least seven languages and published in 22 editions. In 1981, the Rationale earned first place—alongside the work of John Dewey—as the most influential text in curriculum.[2] "If any single volume deserves to be called the bible of curriculum making," weighed one observer, "it is certainly Ralph Tyler's *Basic Principles of Curriculum and Instruction*. [...] A more influential text within the field of curriculum would be hard to name."[3]

The four-step design of the Rationale demonstrates how its popularity stems mostly from its effective, yet 'basic' process. Presented as a series of four questions or steps, the first question of the Rationale seeks to establish the educational objective, goal, or *purpose* of curriculum. It asks, "What educational purposes should the school seek to attain?" compelling educators to consider educational purpose in advance of selecting educational objectives. To determine that purpose, Step One locates three sources of data (studies of students, specialists, and society), but since an excess of curriculum objectives might flood in from three different sources and overwhelm educators, it includes two filters: a philosophical and psychological "screen." Together, the three sources of data and two screens narrow the possible number of objectives in the first step.

Step Two probes different plans for configuring educational *experiences* for students to meet that determined purpose. It asks, "What educational experiences can be provided that are likely to attain these purposes?" Step Three asks "How can these educational experiences be effectively organized?" to effectively implement those educational experiences, and Step Four explores how to *evaluate* the combined effects against Step

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[1] *Basic Principles of Curriculum and Instruction* (Chicago, IL: University of Chicago Press, 1949).

[2] Harold G. Shane, "Significant Writings That Have Influenced the Curriculum: 1906-81," *The Phi Delta Kappan* 62, no. 5 (January 1, 1981): 311–14.

[3] Phillip Jackson, as quoted in William F. Pinar, "Curriculum Theory Since 1950: Crisis, Reconceptualization, Internationalization," in *The SAGE Handbook of Curriculum and Instruction* (Thousand Oaks, CA: SAGE Publications, Inc., 2008), 491.

One's initial purpose by asking "How can we determine whether these purposes are being attained?" Simple. Direct. Powerful.

This dissertation aims in part to explore what makes the Rationale "real," that is, the inscribed principles that give it intelligibility. Most interpretations of the Rationale—either to laud or to malign—examine primarily its contents and individual components. Little ground has explored the principles and preconditions needed to organize its organizing schema. This dissertation historicizes the Rationale to explore how the Rationale orders thought and creates objects of reflection and action in the curriculum. It first explores the principles that order interpretations of the Rationale. How are the interpretations assembled and organized? How do these explorations hang together to represent the Rationale a certain way? What are the limitations of these interpretations?

The first section of this chapter addresses these questions. It reviews how a set of scholarship in curriculum studies has interpreted the Rationale. The second section explores a different set of concepts from which to approach the Rationale. The third and final section provides more detail on how a project might approach the Rationale differently, through those concepts and a different set of methods.

Before beginning, however, a qualifier about the version of curriculum studies under consideration below. Scholars, such as those in the "new" curriculum history, articulate different interpretive methods to generate different conclusions about curriculum.[4] With this push toward other approaches to interpreting events in curriculum studies, the analysis below is restricted to the set of scholarship related to the Rationale and its interlocutors, not the entire field. Understanding how a particular set of scholarship typically interprets the Rationale opens up space for considering a different approach to the text.

Interpreting the Interpretations

This first section of this chapter considers how the Rationale has been interpreted. I focus on a select group in curriculum studies that have interrogated the Rationale, a group of scholars that spans sympathetic interpretations (William Schubert, Peter Hlebowitsh, Daniel and Laura Tanner) to ones more critical of the Rationale (William Doll, Herbert Kliebard, William Pinar). I begin first by introducing Ian Hacking's concept of "styles of reason" to

[4] Bernadette Baker, *New Curriculum History* (Sense Publishers, 2009); Petra Hendry, *Engendering Curriculum History* (Taylor & Francis, 2011); T. Popkewitz, ed., *Inventing the Modern Self and John Dewey: Modernities and the Traveling of Pragmatism in Education* (Springer, 2005); Thomas Popkewitz, Barry M. Franklin, and Miguel Pereyra, *Cultural History and Education: Critical Essays on Knowledge and Schooling* (New York: Routledge, 2001).

explore the prevailing "style" used when interpreting the Rationale. It then turns to explore a series of representations in the "givens" assumed into this style that are then written into the interpretations of the Rationale. The third part explores how the interpretations of the Rationale reaffirm cultural theses, cultural ways of knowing that implicate notions of emancipation and freedom, or democracy and progress. These three parts provide background into the limitations of how others see and think about the Rationale to stage new ways to apprehend the Rationale, which are taken up later in the second and third sections of this chapter.

To begin, Hacking's "styles" of (scientific) reason helps tease out a set of assumptions and givens embedded within the interpretations of the Rationale. According to Hacking, reasoning through a particular methodological style establishes the criteria and conditions of possibility for what later counts as true or false.[5] Creating preconditions inaugurates a series of subsequent self-authenticating principles and rules that together frame what Popkewitz calls a "system of reason,"[6] which considers how things hold together and gain intelligibility and is not the same "system" discussed later in terms of a particular theory of social relations, communications, and outcomes discussed in terms of the Rationale. Axiomatization, measurement, taxonomy, comparison, analogy—these cultural practices are organizational processes that formulate rules, distinctions, regulations, and categories to assemble an overall system of reasoning that structures how to "see" the world. In this, interpretive styles orient, order, organize, and regulate perceptions, which leads to commonsense views, indicating how scientific styles can operate simultaneously as political acts.

Moreover, using the "styles" approach generates a few benefits for this project. First, since the starting point of any process prefigures its later content, understanding an interpretive style helps to apprehend how a method prefigures interpretations which prefigures conclusions. Second, understanding styles helps to understand why and how scholars reason about the Rationale, which, third, then affords considering other ways to explore changing conditions of the curriculum. Finally, a way of reasoning orders thought and action, which suggests curriculum as an organizational process for how to think and know the world, including who "we" are. The next part

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[5] Ian Hacking, "Language, Truth and Reason," in *Rationality and Relativism*, edited by Martin Hollis and Steven Lukes (Boston: MIT Press, 1982): 48–66; and "'Style'". Also, see "Styles of Thinking: The Special Issue," in *Studies in History and Philosophy of Science Part A*, Part Special Issue: Styles of Thinking, 43, no. 4 (December 2012). For a critique of Hacking's relativism (but not the idea of "styles"), see Martin Kusch, "Hacking's Historical Epistemology: A Critique of Styles of Reasoning," *Studies in History and Philosophy of Science Part A* 41, no. 2 (June 2010): 158–73.

[6] Thomas Popkewitz, "The Production of Reason and Power: Curriculum History and Intellectual Traditions," *Journal of Curriculum Studies* 29, no. 2 (March 1997): 131–64.

turns to explore more general (social) epistemological principles and rules involved in the interpretative "style" used when engaging the Rationale.

Principles of Interpretation

This part explores the style of how curriculum scholars have interpreted the Rationale and the limitations of those interpretations. The interpretations generate and reproduce knowledge that give intelligibility to the Rationale and the interpretations across different schools of thought in curriculum studies use a series of principles and rules to embed the existence, order, and classification of a series of assumed objects of reflection. These "givens" in curriculum studies inscribe a way of making visible just who and what is acted on. In short, the principles and rules generate knowledge that reinserts human bodies into a framework for intervention and is used to regulate social life.

To begin, the interpretations in curriculum studies indeed aspire to description. "[T]he proper study of [curriculum] policy," curriculum studies scholar William Schubert argued, "should be an attempt to glean the central principles upon which practice is based. These are best discovered by careful observation of practice." According to Schubert's account, the study and understanding of curriculum should thus be "concerned with the reality that affects the lives of students and teachers."[7] A concern with reality entails gathering evidence to describe the "real" processes observed at work both in the Rationale and curriculum studies. For example, curriculum historian Herbert Kliebard gathered evidence, documents, and "Artifacts of a period" to pen a classic text on American curriculum.[8] From that assembled primary evidence he could then "reconstruct what was actually happening" in curriculum to then represent "four interest groups" who struggled over controlling the curriculum and who were represented as "political in the sense that they were united for the purpose of exercising power." [9]

And yet, Kliebard's four interest groups were not represented as political in the sense that they were already united for a purpose by an earlier exercise of power. By glossing over earlier effects of power, descriptions of curriculum and the Rationale gathered evidence always already narrated from an *a priori* form of knowledge, descriptions which then embedded that form of knowledge in the reconstruction of "what was actually happening."

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[7] William H. Schubert, *Curriculum: Perspective, Paradigm, and Possibility* (New York: Allyn & Bacon, 1985), 150.

[8] Herbert Kliebard, *The Struggle for the American Curriculum, 1893-1958*, 2nd ed. (New York: Routledge, 2004), xiv.

[9] Ibid., 250.

Consequently, descriptions, as Schubert argued, "concerned with the reality that affects the lives of students and teachers" result in representations of objects and things already restricted to an already constructed reality and not how those objects and things come into being, suggesting that the interpretations of the Rationale embody a style of reasoning. The next part explores such limitations in more detail.

Givens and objects circulate

This part explores examples of such knowledge reproduction in the scholarship of those who interpret the Rationale. It explores how the scholarship across schools of thought use the same style of reason to represent three objects or "givens." The first object is the individual, the second is a notion of the social, and the third is the curriculum. These three objects and their representations are first explored separately, after which they are then reassembled to show how they are used in the interpretations of the Rationale, which then generates a series of cultural theses.

First, interpretations across different schools in curriculum studies represent the individual in particular ways. The individual is given an independent space, represented as a stable, autonomous, rational, and reflexive humanistic actor empowered with agency. Interpretations in curriculum studies stabilize this subject as the *a priori* center, where an actor/agent must be taught to effect individual and social change characterized by a particular definition of individual agency.

Different schools of thought in curriculum studies compose this individual subject and its sense of agency. For example, curriculum historians Daniel and Laurel Tanner from a "traditional" school of thought argued for helping "children develop the competencies [...] to learn problem-solving strategies that could serve them in everyday situations if they were to deal with their own social problems: drug addiction, health, sex, career, and dropping out of school are examples and, hopefully, the strategies would serve them well as adults."[10] In this example, a child or group of children are represented as equipped with a sense of agency ("competencies," "to deal with") that requires intervention to develop, from which they can be held accountable ("their own social problems," not someone else's) as they confront a series of social pathologies (drug addition, sex, dropping out of school). In another example from a critical theory stance in the "Reconceptualist" school of curriculum, William Pinar links the

[10] Daniel Tanner, and Laurel Tanner, *History of the School Curriculum* (New York: Macmillan Pub Co, 1990), 179.

agential subject to the formation of a stable, solid self: a "distorted self [is] a repressed self, [one] exhibiting a partial, fictionalized identity. Such a self lacks open access to itself and to the world," a "prerequisite to agency," without which all are "no longer fully human."[11] Pinar's representation requires intervention to restore commitments of "professional authority and ethical responsibility," where curriculum and "Information must be tempered with intellectual judgment, critical thinking, ethics, and self-reflexivity."[12] According to traditionalist curriculum scholar Schubert, "[T]eacher-student dialogue and reflection" is what drives "curriculum policy" and that policy should honor the role of the agential reflexive student.[13] Curriculum theorist William Doll's *Post-Modern Perspective on Curriculum* narrates how "the art of curriculum construction is that of helping students develop their own creative and organizing powers." Alongside "Such organization and transformation," Doll argues that students can act on themselves to change themselves "by our reflection on what we have done [...] a key tool for our own transformation."[14] Curriculum scholar Peter Hlebowitsh defended how the Rationale's processes stress "the importance of active learning and student interest in learning" and emphasize "the concept of the learner as active and purposeful [...] which suggest[s] ideas, values and modes of thinking appropriate for civic virtue" that must be introduced into any student's agential role to effect change as "the citizen."[15] This subject-centered view of agency also extends to the "use of interest groups as a framework" discussed earlier in Kliebard's classic treatise on the American curriculum, which situated institutional development in education as an expression of individual agency and included the "ways local actors and circumstances influenced [curriculum] reforms." There "leaders of the various interest groups" struggled over curriculum control to effect social change.[16] In sum, the different schools of thought across curriculum studies offer a common representation that stabilizes, structures, regulates, and imbues an *a priori* subject with particular agential capacity amendable for intervention to restore cultural commitments and to

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[11] Pinar, "'Dreamt into Existence by Others': Curriculum Theory and School Reform," *Theory into Practice* 31, no. 3 (July 1, 1992): 232; William Pinar, ed., *Curriculum Theorizing: The Reconceptualists* (McCutchan Publishing Corporation, 1975), 367, 363.

[12] William Pinar, *What Is Curriculum Theory?* (Mahwah, N.J.: Lawrence Erlbaum, 2004), 3, 8.

[13] Schubert, *Paradigm*, 160.

[14] William Doll, *A Post-Modern Perspective on Curriculum* (New York: Teachers College Press, 1993), 117-118.

[15] Peter Hlebowitsh, "Amid Behavioural and Behaviouristic Objectives: Reappraising Appraisals of the Tyler Rationale." *Journal of Curriculum Studies* 24, no. 6 (1992): 540.

[16] Kliebard, *Struggle*, 248, 247, xv.

steer a subjectivity into a framework that encloses possibilities for change.

A second given circulating in this set of scholarship is the notion of society. The representation of society is given an independent space, a location as a site of collective belonging with its own set of abstract relations. The interpretations typically excavate facts determined from the "reality" of social life embedded in that independent space, facts which are then used to intervene and improve another object, one filled with social content: the individual. The approach in these interpretations typically helps to organize and maintain an idea of society around a predetermined conception of a harmonious social order.

This representation of society repeatedly surfaces across curriculum studies. The social "given" frequently entangles with the above representation of the individual and also the next object of reflection, the curriculum, where in both an abstract notion of "the social" emerges as a central reference point. For example, in 1923, curriculum scholar W.W. Charters (with whom Tyler studied) offered an observation: "The school curriculum is the latest great social agency to feel the effects of the theory of evolution,"[17] an observation which references curriculum through its "social agency." That social reference point still organizes curriculum thought today. William Pinar's "method of *currere*" entangles "subjective risk and *social reconstruction*, the achievement of selfhood and society in the age to come."[18] Doll argues "[A] role classrooms could adopt, I'd argue should adopt [is a] focus [...] on a community dedicated to helping each individual, through critique and dialogue, to develop intellectual and social powers."[19] Schubert argued "Curriculum development involves the broad consideration of curriculum vis-a-vis social issues, [...] the nature of subjects or disciplines, human relations [...] and personnel issues as well as design."[20] The Tanners narrate that improving curriculum brings "each rising generation [...] the social power and insight necessary for intelligently attacking the problems of a common humanity."[21] Likewise, Rationale proponent Hlebowitsh integrates a notion of the social by challenging how interpretations critical of the Rationale have viewed

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[17] Werrett Wallace Charters, *Curriculum Construction*, (New York: Macmillan, 1923), vii.

[18] Pinar, *Curriculum Theory*, 4 (emphasis added).

[19] Doll, *Postmodern*, 170.

[20] Schubert, *Paradigm*, 189.

[21] Daniel Tanner and Laurel Tanner, *Curriculum Development: Theory into Practice*, 3rd ed. (Prentice Hall, 1995), xv, xvii.

"curriculum for purposes of social cohesion and ordered direction [...] as acts of repression and social control." Hlebowitsh holds instead that "Schools [...] can cultivate intrinsic controls [in students] that are intellectual and emotional in nature, and that are cast in the interests of the common welfare."[22]

A notion of society is assumed into these interpretations of curriculum studies. These views represented the notion of society differently. First, as an organism, such as in Charter's representation of how society connected to evolutionary theory, or second, to Tyler's emerging view of society as a social system, or third, Doll's view of postmodern society as a social network (networks are "flatter" than systems). Despite these different renderings of the notion of "the social," the accepted idea implicates the notion of the social as an object of thought to serve as a point around which the other givens are organized, circulate, and pass through.

The third and final given is the curriculum. Curriculum scholars debate how different configurations of knowledge can inform a contemporary curricular milieu to intervene and transform the other two givens, the individual subjectivity or society or both. Under this representation, curriculum provides that which is needed to ply interior changes necessary for individual improvement, to embody cultural ideals, or reaffirm social values. This principle, for example, was expressed earlier when the Tanners held that improving curriculum brings "each rising generation [...] social power and insight," or Hlebowitsh's idea that curriculum "cultivate[s] intrinsic controls [...] cast in the interests of the common welfare," or Kliebard's point that "interest groups" controlled curriculum to effect social change, or Pinar's view that "we can regain (relative) control of the curriculum" by "connecting academic knowledge to our students' (and our own) subjectivities, to society, and to the historical moment."[23] Curriculum is represented as filling a void.

What emerges as a common theme in this style of reason is a particular accepted and "commonsense" representation of the curriculum. Curriculum holds a functional role between other objects and symbols in a larger style of reasoning. Such representations of curriculum narrate a framework for different methods of intervention, where curriculum's quality or its value often entwines with the human sciences in terms of regulating efficiency in rates of learning, or through improved instruction to regulate the motion and direction of the individual and the social toward a pre-determined future goal state. Under this view, curriculum bonds the individual and the social

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[22] Hlebowitsh, "Amid," 542-543.

[23] Pinar, *Curriculum Theory*, xiv.

givens as expressions *of* power, despite the stated impulse to *em*power, which presumes a representation of who the learner and society are and should be, suggesting again a limitation of the approaches under consideration here.

Principles assembled into a story

Bringing this third principle, the curriculum, into conversation with the other two principles of the individual and society aims to show how all three interact as part of a greater discussion of a "formula" in the interpretations in curriculum studies. The curriculum (one given) fills the individual agent/actor (another given) to orient, coordinate, and position the social body (a third) toward presumed greater goals. An example of this "formula" can highlight how these three given elements comingle in curriculum studies as to what is hoped for, seen, and acted on to generate a framework for intervention in the lives of humans. Noted University of Chicago curriculum theorist Hilda Taba (and close associate of Tyler) explained such a formula in 1945: "The educational process takes place in a three-way relationship, and, therefore, a three-way orientation is needed [...] First, education takes place in a *society*. [...] Secondly, we educate people by changing them as *individuals*. [...] Finally, all learning experiences take place through some *content or subject matter*."[24] Taba's formulaic description orders the three givens under a tripartite configuration: one element, a social concern, serves as the reference point for changing a second, the individual, through a third, academic content or curriculum (knowledge), the conduit that binds. The formula reflects Charters' "social agency" view of curriculum discussed above in how regulating curriculum regulates the individual and society, which connects all three to cultural theses taken up shortly.

Interpretations that engage the Rationale reproduce this three-way formulaic orientation. A brief set of examples from different schools of thought show a striking similarity with Taba's formulation of the tripartite configuration. By the end of these examples, a typical narrative about the Rationale will emerge: that *society* and the *individual* connect through a functional view of *knowledge* (curriculum), the same three elements in Taba's 1945 formula. I emphasize each element in the following examples.

- Kliebard's "critical" historical analysis agreed with the Rationale's thesis that academic *knowledge* ("subject matter") needed to be deployed for "meeting an obvious *individual* or *social* need." Otherwise "how can one

[24] Hilda Taba, "General Techniques of Curriculum Planning," in *American Education in the Postwar Period: Part I, Curriculum Reconstruction* (National Society for the Study of Education. Committee on Curriculum Reconstruction: University of Chicago Press, 1945), 82-83 (emphasis added).

justify [the curriculum's] existence"? Kliebard, however, skewered the Rationale's coalition-building attempt to balance the opposing "doctrinaire" visions necessary for creating that kind of need-fulfilling curriculum.[25]

- Hlebowitsh (who penned the "Introduction" to the recently re-issued Rationale) defended the Rationale against Kliebard's criticism. Hlebowitsh has noted how "Tyler underscored that schools perform a socio-political function," and concluded that the Rationale appropriately balanced competing doctrinaire curriculum visions by "rais[ing] continuous questions [...] regarding [what] the *learner*, the *society* and the *subject-matter*" needed.[26]
- Schubert lauded the Rationale as "The perennial paradigm [...] for the last twenty-five years." Historically, however, the "original emphasis" behind the Rationale's steps was not intended as a linear process, as critics like Kliebard had suggested (and a point I take up in the next chapter). Instead, its emphasis rested on the dynamic "nature of *knowledge, society* and *learners*." The natural intersection of all three raised essential questions, "among the most profound that human beings can address."[27]
- Doll sees the Rationale through the lens of "industrial and capitalist *society*," and "Given this orientation it is only natural Tyler and his followers focused on job analysis as the source for *curriculum* inspiration, for the skills, *knowledges*, [and] attitudes *students* should acquire."[28]
- The Tanner's also defended the Rationale and its appeal to John Dewey's "use of philosophy" to build and construct academic "*knowledge* [...] to serve educational purposes" which helped satisfy intrinsic needs to "define the nature of a *good life* [for an individual] and a good *society*."[29]
- Pinar criticizes the Rationale "as the quintessential instance of the traditional field's interest in procedure."[30] In Pinar's view, "procedure" hardly conveys "a theoretical understanding of curriculum." Pinar prefers instead a

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[25] Herbert Kliebard, "The Tyler Rationale," in *Curriculum and Evaluation*, ed. Arno A. Bellack and Herbert M. Kliebard (Berkeley, CA: McCutchan Pub. Corp., 1977), 59, 65.

[26] Hlebowitsh, "Amid," 542, 543, 541.

[27] *Curriculum*, 195.

[28] *Postmodern*, 54.

[29] *Development*, 236.

[30] William Pinar and William Reynolds, eds., *Understanding Curriculum as Phenomenological and Deconstructed Text* (New York: Teachers College Press, 1992), 20.

> more authentic theoretical construct that involves deploying "academic *knowledge* [that] might contribute to the restructuring of *students'* individual subjectivities for the sake of *social* reconstruction."[31]

Despite the assumed differences within these various schools of interpretation, each structures a similar conclusion because each confronts the same *problematic* under the same interpretative style using the same givens. Consequently, and in relation to evaluating the Rationale, scholars debate the degree to which contemporary curriculum fills a void to transform an individual subject or society to embody predetermined ideals or "values." Tyler expressed this same idea the year the Rationale was published: that a "general agreement" (consensus) already existed in which "*society*, man's accumulated *knowledge* and the *individual* must be considered"[32] when reforming curriculum around "the high ideals of a good society" and to "develop social rather than selfish attitudes"[33] in the student. That general agreement persists today in curriculum studies when different schools of thought share the same interpretive "style" and thus continue to recommit interpretations of the Rationale into the same formulaic framework for intervention that it already holds.

Viewing these interpretations through a different style of reasoning helps makes visible how the "commonsense" style of reasoning used to interpret the Rationale reproduces the same kind of knowledge. What is taken as the accepted object of reason and reflection can be problematized by making visible how such interpretations and representations are expressions of power that exercise control to regulate human bodies by organizing knowledge for how humans are to see, think, and act.

To review, the "style" explored above generates epistemological principles that compose these three givens and their representations, which generates a common feature throughout the interpretations of the Rationale: a framework that naturalizes how to make bodies amenable to change. The series of representations embedded in the interpretations of the Rationale allow each given to be regulated and managed, since the representation of the learner (the individual) arrives as either more liberated or oppressed, altered by adjusting the conditions under which knowledge (curriculum) is presented, taking for granted the representation of populations of human bodies and their

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[31] William Pinar, *The Synoptic Text Today and Other Essays: Curriculum Development after the Reconceptualization* (New York: Peter Lang, 2006), 3.

[32] Virgil Herrick, and Ralph Tyler, "Looking Ahead: Next Steps in the Development of a More Adequate Curriculum Theory," in *Toward Improved Curriculum Theory*, edited by Virgil Herrick and Ralph W Tyler (Chicago: University of Chicago Press, 1950): 121-122 (emphasis added).

[33] Tyler, *Basic Principles*, 35, 48.

worlds (society). These given elements together appear within an *a priori* structure, configuring the relations between each part within a "place" to organize a future state from within the present state, and when taken together, these interpretations reflect a cultural mode of the production of knowledge. The method of interpretation explored here organizes a future of how and what democracy or an emancipatory state will look like, both culturally constructed ideals. These features suggest the interpretations of the Rationale implicate not a natural, neutral, nor objective approach, but a cultural practice. These cultural practices in curriculum studies implicate cultural theses, taken up next.

Cultural Theses

Cultural theses are the principles generated about who people are and should be based on the reasoning methodological style of reasoning. They are generated and made plain by how the interpretations order, classify, and represent qualities embodied in the assumed givens outlined above, particularly when some variation of a "social" notion remains as a reference point around which the other givens are organized. For example, when Taba in 1945 called for "new objectives" in curriculum to "reorient[ ] people to a peacetime world,"[34] those objectives were organized around cultural theses expressed as emancipation and freedom, democracy and progress, salvation and improvement, which all serve to fill a void by reducing social inequality and exclusion, or promoting democracy and progress, or salvation and improvement. Below I highlight three cultural theses—emancipation, progress, and salvation—and then explore how those theses relate to interpretations of the Rationale.

A first cultural thesis affirms emancipation and freedom as transcendental concepts. According to Pinar, curriculum studies must "originate in an emancipatory intention [...and] we must [...] dwell on the notion of emancipation. Not until we are in emancipatory relation to our work will we devise theory and formulate strategic action which will [...] 'improve' the nation's schools."[35] The more traditional Tanners held that studying curriculum history also holds an emancipatory element by "contribut[ing] insights into problems of present concern to educators," including the present-day concerns for future social and individual freedoms: "educational opportunity,

[34] Taba, "General Techniques," 81.

[35] William Pinar, "Notes on the Curriculum Field 1978," *Educational Researcher* 7, no. 8 (September 1, 1978): 11.

social justice, and economic equity."[36] Hlebowitsh argues that "in curriculum planning, serious attention ha[s] to be given to the interests, activities, problems and concerns of the students in ways that contributed to the progressive ideal of the good person leading a good life."[37] Whether a critical or traditional school of thought, a cultural thesis of emancipation and freedom persists in the attempt to configure a proper set of relations between the triad of givens to escape oppressive conditions in the present for a changed future.

This emancipation thesis relates to a second cultural thesis: a sense of progress. Liberating students from the confines of present oppressive conditions implicates notions of a future end-stage. Different schools of thought weigh the three givens differently to propose a future corrective to any past or present oppressive circumstances, as though a Promised Land of equality and democracy rests over the horizon. Pinar seeks to turn "attention from the past [...] to look to the present and to the future" to insist in a more open curriculum practice.[38] Doll sees the postmodern world as exhibiting a progressive, "new stage of intellectual, political, social development."[39] Hlebowitsh finds the Rationale an emancipatory mechanism, for it "supplies guiding questions and sources not for the purpose of suffocating artful initiative, but to lend a fundamental vision of growth and movement toward an ideal."[40] William Schubert recounts how his "adolescent rebellion" left him lacking "meaning and direction" in the past. "School seemed to be about things—information detached from the meaning of life." Later he was "re-awakened by literature and the arts [and] began to conclude that what I had just done for myself—creating the course of my study, a curriculum—was so rewarding" that Schubert felt "ready to help [someone else] develop a journey of learning, a curriculum, that might give greater meaning and purpose to [their] lives."[41] A cultural theses of progress emerges by clearing away obstacles from the past or present to help make a subject whole by creating future conditions for greater achievement.

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[36] Tanner and Tanner, *History*, xiii.

[37] Hlebowitsh, "Amid," 540.

[38] Pinar, *Notes*, 11.

[39] Doll, *Postmodern*, 11.

[40] Hlebowitsh, "Amid," 543.

[41] Schubert, *Paradigm*, viii.

Connected to emancipation and progress is a third cultural thesis: salvation and improvement. Applying content knowledge to the individual to enact social progress reaffirms the individual's agential capacity. But to receive the demands of progress, any such narrative re-affirms what historian Odd Arne Westad calls America's cultural mission "of *guidance*, and its object, the *ward*." This cultural mission suggests that the ward is "in need of guidance"[42] to improve and fulfill what she or he lacks to fill a void. For example, the Tanners believed what had been lacking is "a holistic conception of curriculum [...] an aggregate rather than a segmental model of curriculum" that would bring relief to oppressive conditions. The Tanners bristled "in recent years" at how observers argued "against education as a means of improving the human condition."[43] or again, Hlebowitsh's conclusion that curriculum planning must attend to the progressive idea of guiding a good person to lead the good life, or how Pinar's "autobiographical sequence of ourselves as individuals and as educators might enable us to awaken" to fill a void: a lack of awareness for overcoming "the nightmare we are living in the present."[44] According to curriculum historian Schubert, the objective or purpose that undergirds studying curriculum is as "profound and serious an issue as human kind can address" and what it "means to turn [the fate of our children and youth] towards greater growth, goodness, and enlightenment."[45] This third cultural thesis of salvation and improvement, alongside the other two, are assembled as part of the tripartite configuration embedded in a framework to generate intervention, again, not as a way in which objects express power, but in a way that situates them as amendable for change, as an expression of power that limits possibilities for interpretations.

These transcendental cultural concepts are represented as universal and essentialized. Moreover, these concepts are not merely present as an effect of curriculum, but instead their presence comes to the fore because they are embodied in the style of reason that is used, allowing the concepts to gain status as effects of power, organizing in various ways what is said, done, and acted on in the interpretations surrounding the Rationale.

Finally, consider how these cultural theses are invoked in interpretations of the Rationale When the

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[42] Odd Arne Westad, *The Global Cold War: Third World Interventions and the Making of Our Times* (Cambridge University Press, 2005), 22 (original emphasis).

[43] Tanner and Tanner, *Development*, xv, xvii.

[44] Pinar, *Curriculum Theory*, 5.

[45] *Curriculum*, 8.

characteristic content-based interpretations finally do examine processes in the Rationale, they wrangle over two qualities: that of linearity and behaviorism. For example, critics diagnose in the Rationale a problematic "rigid sequence," if not an "excessive rigidity," which generates a *linear* quality, where "the starting point for virtually any educational activity is a clearly stated objective" and then "proceeding stepwise from there"[46] merely and simply "match[ed] objectives with outcomes." Second, the Rationale is then also diagnosed with a *behavioristic* quality with "Pavlovian overtones" because those linear curriculum-forming steps "evoked the kind of behavior desired" in students in a way that can be linked historically to an industrial "kind of product control [as] set forth by [curriculum theorist Franklin] Bobbitt as early as 1922."[47] Such interpretations, moreover, frequently assume that 'the *content* of systems procedures [are] empty."[48]

Conclusions about the empty content of these curriculum-forming process are then fit back into reaffirming a cultural thesis framework. These two qualities today anchor the claims and counterclaims made by critics and defenders alike.[49] Housed within such diagnoses of linearity and behaviorism in the Rationale, however, is a consideration of which psychological order does and does not apply (e.g., behaviorism or otherwise) by considering a more correct way (linear or not) for how curriculum (and curriculum formation) can more properly move an individual from one state to another based on psychological knowledge of who one is and should be. This psychological perspective articulates a cultural thesis: that an unstated and predetermined emancipatory future state

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[46] Herbert Kliebard, "The Tyler Rationale Revisited," *Journal of Curriculum Studies* 27, no. 1 (1995): 82-83.

[47] Kliebard, "Tyler Rationale," 65, 63.

[48] Michael Apple, *Ideology and Curriculum*, 2nd ed. (London: Routledge, 1990), 115 (original emphasis).

[49] For criticisms, consider Michael Apple, *Ideology and Curriculum*, 2nd ed (London: Routledge, 1990), Ch. 6; Herbert Kliebard, "The Tyler Rationale," in *Curriculum and Evaluation*, edited by Arno A. Bellack and Herbert M. Kliebard (Berkeley, CA: McCutchan Pub. Corp., 1977), 56–67, and "The Tyler Rationale Revisited," *Journal of Curriculum Studies* 27, no. 1 (1995): 81–88; William Doll, *Pragmatism, Post-Modernism, and Complexity Theory*, ed. by Donna Trueit (New York, NY: Routledge, 2012), especially p. 24; and *A Post-Modern Perspective on Curriculum* (New York: Teachers College Press, 1993), Ch. 2; Cleo Cherryholmes, *Power and Criticism: Poststructural Investigations in Education* (New York: Teachers College Pr, 1988), Ch. 1. For endorsement, consider Peter Hlebowitsh, "Amid Behavioural and Behaviouristic Objectives: Reappraising Appraisals of the Tyler Rationale." *Journal of Curriculum Studies* 24, no. 6 (1992): 533–47) and "Interpretations of the Tyler Rationale: Reply to Kliebard," *Journal of Curriculum Studies* 27, no. 1 (1995): 89–94; Schubert, *Paradigm*, Ch. 8; Angela Stanley, "The Tyler Rationale and the Ralph Tyler Project." Dissertation, December 2009; Tanner and Tanner, *Curriculum Development*, 241-242; William G. Wraga, "'Extracting Sun-Beams out of Cucumbers': The Retreat from Practice in Reconceptualized Curriculum Studies," *Educational Researcher* 28, no. 1 (1999): 4–13; William G. Wraga, "Understanding the Tyler Rationale: Basic Principles of Curriculum and Instruction in Historical Context," *Espacio, Tiempo Y Educación* 4, no. 2 (July 1, 2017): 227–52.

can be reached either through curriculum content or curriculum formation, which again presumes the tripartite configuration discussed above: that curriculum and curriculum formation shape the individual and society to bring the emancipatory qualities each lacks.

To close out this first section, any differences between the schools of curriculum studies now appear to be limited to using the same "style" to interrogate the Rationale. A different approach to explore the Rationale would consider what contributes both to the formation of the content of the Rationale (such as the three givens explored earlier) and the formation of that which "houses" that content: to consider how the Rationale itself comes into being as an assembled whole. Another "style" considers the Rationale not through an approach like those explored above but considers the Rationale and curriculum studies through a cultural approach. The next section takes up some of the concepts and trajectories to develop such a cultural interpretation to approach the Rationale.

Curriculum Studies as a Cultural Studies

As we just saw, the interpretive approach in curriculum limits how one understands the requirements of contemporary schooling, and also how one can understand how the "problems" upon which schools in the United States are christened. W.W. Charters' earlier 1923 observation shows the longstanding belief that curriculum itself holds agency of a social nature, and that a set of transformative qualities already permeate ideas about the category of curriculum. Upon this reckoning, Tyler, his simple model, and its interlocutors are implicated within the same epistemological view.

The set of questions I asked to get around these limits to that typical approach to the Rationale are as follows. I asked what cultural narratives are embodied in the Rationale's coordination of instructional programming? How did it come to be that cultural theses surround the Rationale and how are they related to changes in the social sciences? How are principles of sameness/difference and inclusion/exclusion embodied in the principles that order and classify the curriculum? These questions allow me in the remaining part of this chapter to outline an alternate vision for interpreting the Rationale. Rather than replicate the same variation-on-a-common-theme observed within the curriculum interpretations analyzed above, below I present an alternate set of concepts that are offered in no particular order, but that differ from the principles typically employed within the discipline discussed earlier. These concepts help organize a different approach to conduct a cultural history of the Rationale.

Thinking About the History of Curriculum History: An Alternative

I lay out in this section a separate set of methodological concepts to prepare the grounds for a different historical approach. Some concepts relate to methods in history, like *genealogy*, or *monumental history*. Others stem from political or philosophical domains, such as *governmentality*, a *system of reason*, a *grid of intelligibility* or the *conceptual persona*. Others are taken from literary criticism, such as the *author function*. Regardless of their typical use, I introduce these concepts to inaugurate a different approach to engage the Rationale.

Before I get to these concepts, first allow me to discuss the role of agency. The analysis of the earlier curriculum interpretations aimed at engaging in a shift to refocus attention away from a stable, autonomous, rational, and reflexive humanistic agent or actor as the "cause" or "agent" of change. My approach instead places reason itself at the foreground of analysis, where reason gains status as an actor or agent particularly during an era that witnessed the growth of different technologies of social organization observed in systems thinking. The object of inquiry in the approach here situates attention upon the different, culturally-based "intellectual technologies" like reason, rationality, and systems, and follows what intellectual historian Hunter Heyck has illustrated: that an analytical focus at the time of the Rationale rested on "the choice, not the chooser."[50] Just as with Heyck's analysis, and just as with the systems thinking of the time of the Rationale, the unit of analysis rests on how such socio-cultural technologies organized and coordinated effective spaces and managed relationships between the human bodies in which to situate them. Reason and rationality are actors involved in the production of knowledge like curriculum formation, and, by extension, curriculum-forming models like the Rationale.

A different encounter with human agency is taken here. The sense of agency that elevates the human subject are undermined by the "Subjectless Processes"[51] of and within systems that redistribute action outside the domain of human activity. Exploring human agency under a different encounter suggests power is not wielded and concentrated in the hands of humans. Indeed, a pre-existing power dynamics, courtesy of the technology within the structural arrangements discussed in later chapters, decenters the (human) subject.

Moreover, the view of such structures taken up later is not held in terms of a pre-existing base-

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[50] Hunter Heyck, "Producing Reason," in *Cold War Social Science: Knowledge Production, Liberal Democracy, and Human Nature*, ed. Mark Solovey and Hamilton Cravens (New York: Palgrave Macmillan, 2012), 100.

[51] Jean-Pierre Dupuy, *On the Origins of Cognitive Science: The Mechanization of the Mind* (Princeton, N.J: MIT Press, 2009), 155 (and 107).

superstructure materialist view. Those "old" accounts of materialism and material dimensions represent an analytical, empirical, and positivist model of physical matter. "According to this model, material objects are identifiably discrete; they move only upon an encounter with an external force or agent, and they do so according to a linear logic of cause and effect" from within a Newtonian worldview. According to this "old" materialist doctrine, physical matter is detached, inert, and non-agential, which contrasts with a "new" materialism view, a view that considers the "productivity and resilience of matter" in how physical "matter is both self-constituting and invested with—and reconfigured by—intersubjective interventions that have their own quotient of materiality."[52] Under this view, phenomenological language practices interact with dynamic physical matter to create an array of different conditions, from which human actions (human agency) can then produce "things."

This project, then, offers a different sense of agency than the earlier curriculum interpretations expressed. Those earlier interpretations make visible a sense of agency that is either given to human actors (such as with the Tanner's), or from a neo-Marxist or a New Left view that sees agency in the structures of "social interests" (such as with Kliebard's analysis). This sense of agency often imbues the human with "potential" to make decisions, a capacity to enact choices, from which effective change or personal fortunes rise or fall. In this view of agency, the focus rests not on the choice, but on the chooser, and the source of historical change is attributed to human actors, agents, or authors, and not the cultural inscription of categories and subjectivities and the effects of power that precede human bodies. After all, what are the *pre*-determined criteria that make a person a rational chooser? Or a reasonable person?

With this sense of contrast between concepts of agency, one can now see the political effects of different interpretive "styles." One approach, such as Kliebard's "political in the sense that they were united for the purpose of exercising power," gets at "the political" by focusing on a manifestation of power, perhaps located in the state or in socioeconomic ideologies. The approach below, however, interrogates a different way to get at "the political" by focusing on the effects of power within technologies (like those used upon the self that postmodern theorist Doll expressed), or the reasoning and rules that, for example, form political categories of social inclusion and exclusion. Moreover, a view that interrogates the agency of reason and rationality that precedes such "power structures" allows the interrogation of different ways of reasoning about the world that governs the order within it. And I begin with

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[52] Diana Coole and Samantha Frost, "Introducing the New Materialisms," in *New Materialisms: Ontology, Agency, and Politics*, ed. Diana Coole and Samantha Frost (Durham, NC: Duke University Press, 2010), 7.

one of those ways of reasoning: *governmentality*.

A political way of reasoning about the world organizes political life in the discourse of liberal democracy. Within this way of reasoning, the world is partitioned into spheres: the public sphere, the private sphere, the political, economic, or civil sphere, and so on. This partitioning designates that the private sphere of individual rights belongs in the domain of the social (civil) sphere, and the state belongs to the political sphere, and that political sphere, including the state, is not to encroach on the social sphere. As Niklas Rose observes, "'civil society' [...] came to signify [...] a natural realm of freedoms and activities outside the legitimate sphere of politics,"[53] and any encroachment by the state onto civil society signals the illegitimate interference with individual rights and freedoms. Indeed, within classical liberal political discourse, the role of the political sphere is to ensure the sanctity of individual rights contained within the social (civil) sphere by limiting the role of the state. The Bill of Rights in the U.S. Constitution is one such example.

But while the political sphere and the state are not to encroach on the social sphere, the social sphere is not similarly restricted. It can call upon the political sphere for action or it can even call upon itself to reform itself under the mantle of democratic self-governance. To be sure, members of the private sphere often do draw on their political freedoms to demand action and intervention within social affairs and in many ways it may be considered one's civil duty to do so. Self-governance is allowed to circulate freely in the private sphere, allowing the social sphere to be "political" absent any role of the state, providing the social (or civil) sphere well-developed mechanisms for governmental, but not government, intervention.

This larger practice, Foucault alleges, is *governmentality*.[54] Governmentality is a governing rationality and as a political way of reasoning, it helps regulate "the conduct of conduct: that is to say, a form of general activity aiming to shape, guide or affect the conduct of some person or persons."[55] Governmentality allows the human sciences (or even a religion) to administer and "protect" the social sphere and the freedoms contained within it

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[53] Peter Miller, and Niklas Rose, *Governing the Present* (Cambridge, England, UK: Polity Press, 2009), 59. "Liberal government identifies a domain outside 'politics' and seeks to manage without destroying its existence and autonomy (60)."

[54] Michel Foucault, "Governmentality," in *The Foucault Effect: Studies in Governmentality*, edited by Graham Burchell, Colin Gordon, and Peter Miller (Chicago: University of Chicago Press, 1991): 87–104.

[55] Examples of relationships include "private interpersonal relations involving some form of control or guidance, relations within social institutions and communities and, finally, relations concerned with the exercise of political sovereignty." See Colin Gordon, "Governmental Rationality," in *The Foucault Effect*, 2-3.

through prescriptions like self-governance and self-control, both principles of self-limitation that regulate the conduct of the self and others in service to a greater goal.

Such a political way of reasoning about the world was exposed in the earlier curriculum interpretations. Curriculum studies often uses scientific principles to formulate an "argument" about intervening to bring the "lacking" subject or society something that was needed to achieve a greater goal. This way of reasoning, all of which occurs inside the social sphere brings to that lacking "given" subject or society a mode of conduct based on predetermined principles, thereby governing human conduct without state intervention. This entire process consequently preserves larger liberal structures by allowing the human sciences (the focus of this project) to intervene and protect the social domain (by limiting personal conduct) without intervention from the political domain. This larger practice in curriculum studies is a governmental practice.

One way around this sense of governing rationality typical to curriculum interpretations is to probe the Rationale through another concept, a "genealogical" historical mode. *Genealogy* "expos[es] the contingent and 'shameful' origins of cherished ideas and entrenched practices."[56] Synchronically inclined, a genealogical approach "reveals the [...] contestability of ideas and practices" through a history "that denaturaliz[es social] norms and ways of life by suggesting that they actually arose out of contingent historical processes."[57] A genealogical approach radically historicizes both the Rationale, and the structures and discourse within curriculum history.

A genealogical approach recognizes how the Rationale is an effect of entangled assumptions that coalesce. After all, a system organized under a *grid of intelligibility*—an "analytical schema," according to Foucault—is what allows the Rationale to be apprehended.[58] The Rationale comes into being as an object of investigation in the same way as do all objects of our modern Liberal age: at a particular time and in a particular place as coordinates on a grid of time and space.[59] Rethinking the Rationale's emergence on a grid clears a way to rethink how traditional

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[56] Bevir, "Genealogy," 264.

[57] Bevir, "Governmentality," 429.

[58] Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège De France, 1978-1979* (New York: Picador, 2010), 243.

[59] Daston, *Biographies of Scientific Objects*; Martin Heidegger, *What Is a Thing?* Translated by Vera Duetsch and W. B. Barton (South Bend, Ind.: Gateway Editions, 1968).

interpretive practices project certain qualities onto the Rationale, such as how curriculum studies treat it as an already-formed thing, the content of which can then be debated. But without first understanding how it comes into being and materializes on a grid, it will forever remain as a "thing," as a *monument*.

Monumental history, as historian Hayden White points out, "creatively [...] points men toward the future on the basis of respect for past greatness."[60] Monumental history seeks "the manifestly great, the heroic, and holds up [the past] as an example of man's creative power to change the world [...] a hero-serving form."[61] A different method that recognizes the monumental status of the Rationale seeks to recognize the assumptions and practices on which the Rationale's interlocutors (and others) rely. A different method than those typical to curriculum studies appropriates elements of literary theory that acknowledge the role of language in the production of subjectivities (like the Western liberal subject), and reconsiders the object of inquiry as historically contingent, not continuous or self-evident, because a different method suggests how diffuse "ingredients" coalesce to stabilize objects like the Rationale and render them intelligible.

Moreover, I analyzed how the earlier curriculum interpretations assembled objects and "givens" that helped scholars understand the Rationale as a thing, the contents of which were then debated. When assembled, those principles reflect an organizational "arrangement" about the world—they reflect what Popkewitz calls *a system of reason*.[62] This system helps "assemble" the Rationale into a coherent unified thing and viewing those earlier principles as individual parts within an overall system of reasoning opens up how a divergent set of principles collectively order investigations into curriculum studies. Identifying the "different" approaches toward the Rationale as a system of reason helps identify "sameness" and guides a new vision for interpreting and historicizing the text.

Comparison and *double gestures* contribute to this system of reason. For example, chapter three later discusses how the cultural authority of modern cybernetic systems was built during the post-WII era. Distinctions helped generate "modern" categories and modes of being to frame what something "was" (or "is") and, equally important, what it "was not" (or "is not"), always silently present (a double gesture). By comparison, sometimes

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[60] Hayden White, *Metahistory: The Historical Imagination in Nineteenth-Century Europe*. Baltimore: Johns Hopkins University Press, 1973), 350.

[61] Ibid., 68.

[62] Thomas Popkewitz, "The Production of Reason and Power: Curriculum History and Intellectual Traditions." *Journal of Curriculum Studies* 29, no. 2 (March 1997): 131–64.

distinctions and categories of "difference" excluded and subordinated by categorizing some human bodies in the United States as "traditional." Yet, sometimes categories of "sameness" unified and privileged other bodies as "modern" beings. This system of reason of comparison and double gestures formed rules that established the conceptual boundaries for what the category of modern meant, and also the later parameters for inclusion and exclusion when modernizing and ordering society to achieve its potential. This way of reasoning, and of course, its politics, circulated freely during the period this chapter discusses.

Correlated with these ideas, the effect of *systems thinking* in the Rationale is another such concept. Mary Poovey's *History of the Modern Fact* elucidates one way to understand how the Rationale conceptually prefigures a system. "In emphasizing system over observed particulars," Poovey notes, systems advocates "elaborated what one might call the theoretical dimension" of systems, emphasizing how "internally coherent systems [...] carry moral connotations whose effects exceeded their referential function."[63] It is these supplemental "effects" that Popkewitz's analytical framework about a "reasoning" system helps tease out—the connective tissue, so to speak, that allows disparate parts to hang together.

Two further concepts help realize a different approach to the Rationale: Foucault's notion of the *author function* and Deleuze and Guattari's *conceptual personae*. These two concepts permit me to reposition Ralph W. Tyler and his curriculum building system alongside the broader epistemological conditions under which he worked. Why the "author function" or "conceptual personae"? For Foucault, the concept of an "author" masks the conditions that enable the production of the author's ideas (or any object of reflection) to exist in the first place.[64]

Closely related to the author function is Deleuze and Guattari's *conceptual personae*, which explores how a myriad of concepts might not only intensify and cohere around but also comes to be identified with a single subject like a thinker, such as with Tyler and "his" Rationale. Embodied within any intellectual exists certain ways that person imagines the world, certain concepts that are external to but also carried within that person. Intellectual historian Nils Gilman's history of modernization theory, for example, notes how University of Chicago sociologist Edward Shils' "definition of modernity" was not his but rather "reflected the time and place in which he was

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[63] *A History of the Modern Fact* (Chicago, IL: University of Chicago Press, 1998), xvi.

[64] Michel Foucault, "What Is an Author?" in *The Foucault Reader*, ed. Paul Rabinow (New York: Pantheon, 1984), 101-120.

writing."[65] Ideas, even ones like *modernization*, are not bound within the interior of a person only to be unleashed. Rather concepts like the *author function* and *conceptual persona* allow scholars to reimagine the flow of a set of values or beliefs, since such persona are merely couriers for the "philosophies whose concept[s] they expound."[66]

In *conceptual persona* terms, the Rationale's system prefigures a certain persona, and prefiguring persona suggests how we again can look to Ian Hacking and how his concept of *making up people* informs another cultural feature useful to interpreting the Rationale. According to Hacking, "some of the things that we ourselves do are intimately connected to our descriptions" within the human sciences and as analytical activity (that aspire to description of reality), doing and naming comingle. As Hacking notes, analytical activities suggest how "numerous kinds of human beings and human acts come into being hand in hand." In other words, "a kind of person came into being at the same time as the kind itself was being invented."[67] In the human sciences or even in historical description, explanations of human activity often prefigure subjectivity, a *persona* much like the agential individual, as well as other categories of being.

To conclude, these various concepts contribute to a particular kind of historicizing of the Rationale that also takes into account different forms of cultural production. For example, these concepts allow scholars to conceive of the Rationale as a culturally produced object through an approach that neither considers nor apprehends the Rationale as an already-organized piece of technology, where analysis rises or falls on the (in)suitability or (in)accuracy of an (already inscribed) object's content that we saw in the first section. Rather, I seek to understand the Rationale by way of what it does, the way in which content-empty processes provide content.to examine the cultural practices that erect the Rationale and how those practices open up—but also foreclose—other historical narratives. Taking up a method that focuses on "process" moves one away from an observational point of view that

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[65] Nils Gilman, *Mandarins of the Future: Modernization Theory in Cold War America* (Johns Hopkins University Press, 2007), 2. Also see how "the primary sources" that assembled the "theoretical framework" of Herbert Simon's *Administrative Behavior* "were the works of Talcott Parsons, Edward C. Tolman, Chester Barnard, and John Dewey," in Hunter Crowther-Heyck, *Herbert A. Simon: The Bounds of Reason in Modern America* (Baltimore: JHU Press, 2005), 99.

[66] Gilles Deleuze, and Felix Guattari, *What Is Philosophy?* Translated by Hugh Tomlinson and Graham Burchell, (New York: Columbia University Press, 1996), 63.

[67] Ian Hacking, "Making Up People," in *The Science Studies Reader*, ed. Mario Biagioli (New York: Routledge, 1999): 166, 170.

beholds an object of analysis to focus instead on historicizing the Rationale's procedures, to apprehend how its architecture structures an environment that steers the point of view of a subject immersed within it. This method considers not the Rationale's Table of Contents, but *The Content of the Form*.[68]

Parts and wholes together within a system

I sketch out in the next section in more detail how I pursue a cultural history of the Rationale. As an example, let me first discuss how to approach the Rationale as if one were historicizing a map. The Rationale is indeed a map to the curriculum building process.[69] Historicizing a map focuses not on only on the "content" of the map but also map-making processes. Cartographic processes change over time, and just as one can consider how a map's borders, legends and labels, and other representations change over time, or even as one can explore a map's features against other (carto)graphic representations of the same object, one can see how an object like a map reflects a set of cultural tools used in its construction. A map is a cultural technique—a technology of a particular culture—used for representing.[70] We can approach the Rationale in the same way historically to see how it appropriates culturally-based tools, techniques, and practices as a process to help bring curriculum into being. And rather than recommit to a concern with the content of the map, a cultural history of the Rationale would commit to considering the construction of its content.

The Rationale can be understood historically as a form of technology by focusing on historicizing its cultural processes. The Rationale's way of engaging with the world, for parsing it out and parsing it up—that is, by "making studies of life outside the school [useful] in studying the learner, it is necessary to divide life into various phases in order to have manageable areas for investigation"[71]—is a technological approach to engage the world. While I return to this point in a moment, I historicize the Rationale as a form of technology comprised of an *ensemble* of different techniques and practices used to attain a goal. Apprehending the Rationale through a lens of technology as a new technique for organizing curriculum and instruction in the post-WWII era enfolds the Rationale

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[68] Hayden White, *The Content of the Form* (Baltimore, MD: JHU Press, 1990).

[69] Thomas Popkewitz, "Educational Standards: Mapping Who We Are and Are to Become," *Journal of the Learning Sciences* 13, no. 2 (April 1, 2004): 243–56.

[70] Bernhard Siegert, "The Map Is the Territory," *Radical Philosophy* 169, no. Sep/Oct (2011): 13–16.

[71] Tyler, *Basic Principles*, 19.

into the history of technology, the emerging era of Big Science, and the history of the human sciences in which education retains a toehold. Allow me to explain first how the Rationale is a form of technology and then I then turn at the end to detail how the chapters proceed.

Liberal Technologies of Government

The Rationale can be viewed as a particular form of social technology. To explore this technology aspect of the Rationale, it is possible to think about how a myriad of concepts cohere and intensify within its organizing schema, particularly cybernetics. Cybernetics is the science of control mechanisms and its technology assembles parts into a *system*, which includes social systems. Systems technology transforms humans when applied as social technology, forming and regulating social activity, and creating *conceptual personae* and *making up people* to meet systems needs. A brief explanation clarifies this point.

Hardware or machinery are too simple a definition for technology. Technology is "know-how," a methodology to control the world.[72] That methodology extends even into human technologies in which mechanisms like self-control or self-regulation are taken up into the human body as part of the self, a way of *making up people* that includes the cyborg, a "cybernetic organism," part machine, part human. Moreover, as Otto Mayr has demonstrated, certain forms of technology often echo a political outlook within which such technology operates. What contrasts pre-Enlightenment forms of technology associated with authoritarianism are post-Enlightenment forms of technology aligned with the political outlook of Liberalism that maintain their autonomy and independence by holding the values of freedom and order in constant tension. This tension-based balancing act precludes centralized control because that constant tension allows competing elements to automatically control "themselves without the need of outside help, that is, without the intervention of a higher authority."[73] These technologies possess mechanisms of self-regulation and self-control. They govern without seeming to govern.

The technologies of cybernetics and systems reflect the "governmental" rationality discussed earlier. When

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[72] Howard Segal, *Technological Utopianism in American Culture*, 2nd ed, (Syracuse, N.Y.: Syracuse University Press, 2005), 13-14. Also see David Nye, *American Technological Sublime* (Cambridge, Mass.: The MIT Press, 1996).

[73] Otto Mayr, *Authority, Liberty, & Automatic Machinery in Early Modern Europe* (Baltimore: Johns Hopkins University Press, 1986), 139.

liberal technologies adopt mechanisms of balance, self-control, self- regulation, and *homeostasis* into systems, including human systems (as I discuss in the next chapter), they promote self-governance, curtailing the need for centralized authority or the state. According to Foucault, this form of rationality articulates a central principle of liberal political discourse discussed earlier: self-*governance* articulates a self-limitation of *government*.[74]

By incorporating mechanisms of self-control into regulating a human body, and by taking these social "values" into one's self, one's cultural identity helps to govern one's own conduct through self-regulation. Within this governmental reasoning, such virtues embody a practice of liberal governance because the individual from within the personal, private domain, aligns his or her conduct with the social domain through self-control, curtailing any call upon the political domain (the state) to control the individual. Because individuals learn to govern themselves, a principle of efficiency resonates in this governing rationality. One governs oneself so the state does not have to, so the idea of governance thus becomes the constant ground for part of an individual's identity. Such is the conduct of conduct. Such is the way of liberal governmentality. And such is the Rationale, as I show.

Subsequent Chapters

This chapter concludes with an outline of later chapters. Chapter two relates the Rationale historically to the emerging science of cybernetics and social thought in the post-war years. Despite the general focus in the educational sciences upon the concept of thinking and learning (a central feature of cybernetic mechanisms) and despite the increasing role in education of cognitive and computer science (all with one foot in cybernetics), and despite the recent work on the posthuman and the cyborg (the *cy*bernetic *org*anism), curriculum scholars—and the field of education more broadly—have long ignored the influence of cybernetics (and, more notably, the overall role of systems in policies). Even with the broad mid-century appeal of cybernetics across academic fields, and even with the current popularity cybernetics enjoys in the history of science and the social sciences,[75] education has shown

[74] "But what does 'the self-limitation of governmental reason' mean? What is this new type of rationality in the art of government, this new type of calculation that consists in saying and telling government: I accept, wish, plan, and calculate that all this should be left alone? I think that this is broadly what is called 'liberalism'." Foucault, *Biopolitics*, 20.

[75] For a sample of recent scholarship on cybernetics, see Geof Bowker, "How to Be Universal: Some Cybernetic Strategies, 1943-70." *Social Studies of Science* 23, no. 1 (February 1, 1993): 107–27; Jamie Cohen-Cole, *The Open Mind: Cold War Politics and the Sciences of Human Nature*. Chicago: University of Chicago Press, 2014; Jean-Pierre Dupuy, *On the Origins of Cognitive Science: The Mechanization of the Mind*. Princeton, N.J: MIT Press, 2009; Peter Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision." *Critical Inquiry* 21,

scant interest in cybernetics.[76]

Chapter two first reviews how previous interpretations overlook the Rationale's fundamental cybernetic components, such as how *feedback* helps make the Rationale a *purposive system*. The chapter lays out a brief historical background of the new science of cybernetics to highlight a few of the instruments and operations central to cybernetic mechanisms. It then turns to show how the Rationale's instructional programming mobilizes these same cybernetic instruments. It shows, among other elements, how to understand the concept of "the curriculum" works as a message in a greater system of communications. This chapter connects directly the Rationale and cybernetics as processes of social technology that envelops human bodies.

Chapter three establishes direct connections between cybernetics and other academic fields. The goal-state aims to show how cybernetics became intelligible as a mechanism both of curriculum reform (from the last chapter) and for social reform (taken up in later chapters).

This chapter disentangles how the cultural authority of the emerging cybernetic technology across the mid-20th century United States was assembled by science, politics, and religion. These three elements that entangle with other elements, where the reasoning processes of double gestures and comparison provided sufficient contrast to

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no. 1 (1994): 228–66; Donna Haraway, "A Cyborg Manifesto" in *The Cultural Studies Reader*, edited by Simon During. New York: Psychology Press, 1999; Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999); Lily Kay, "Cybernetics, Information, Life: The Emergence of Scriptural Representations of Heredity," *Configurations* 5, no. 1 (1997): 23–91; Ronald R. Kline, *The Cybernetics Moment: Or Why We Call Our Age the Information Age* (Baltimore: Johns Hopkins University Press, 2015); Philip Mirowski, *Machine Dreams: Economics Becomes a Cyborg Science*. New York: Cambridge University Press, 2002; Benjamin Peters, *How Not to Network a Nation: The Uneasy History of the Soviet Internet* (MIT Press, 2016); Andrew Pickering, *The Cybernetic Brain: Sketches of Another Future*. Chicago; London: University of Chicago Press, 2011).

[76] Scattered comments about cybernetics occur throughout the following scholarship: Noel Gough, "Complexity, Complexity Reduction, and 'Methodological Borrowing' in Educational Inquiry." *Complicity: An International Journal of Complexity and Education* 9, no. 1 (February 26, 2012); Stephen Petrina, "The Politics of Curriculum and Instructional Design/Theory/Form: Critical Problems, Projects, Units, and Modules." *Interchange* 35, no. 1 (March 1, 2004): 81–126; David Pratt, "A Cybernetic Model for Curriculum Development," *Instructional Science* 11, no. 1 (May 1, 1982): 1–12; and "Cybernetics and Curriculum," in *The International Encyclopedia of Curriculum*, edited by A. Lewy et al., (Oxford: Pergamon, 1991): 42–46. Jaap Scheerens, *Educational Effectiveness and Ineffectiveness* (Dordrecht: Springer Netherlands, 2016). Petrina's article on "The Politics of Curriculum and Instructional Design" gestures at the direct connection between the Rationale and cybernetics ("the cybernetic era immediately follow[ed] Tyler's rationale (85)") but then retreats into a discourse of "essences, form, and processes" in instructional design by seeking to "retain and embrace systems theory for subversive movements (95)." For a more direct role of cybernetics in education, see Bruce Buchanan, "Cybernetics and Educational Research," *Ontario Journal of Educational Research* 10, no. 2 (Winter, 1967-68); John Heffron, "Toward a Cybernetic Pedagogy: The Cognitive Revolution and the Classroom, 1948-Present." *Educational Theory* 45, no. 4 (December 1, 1995): 497–518; and L. N. Landa, "Cybernetic Methods in Education," *Educ. Technology* 17, 7–13 (1977).

establish social difference and sameness to mount a campaign of social modernization—modernization theory—to engineer consensus—consensus history. The interaction between the new science of cybernetics and "modernization theory" prepares a discussion in later chapters for how modernization theory served as the basis for a series of cybernetic-based domestic social, educational, and curriculum reform policies. This chapter first explores how the discovery of an emerging science of cybernetics and its technology across the 1940s-1950s contributed to the discovery of the potential, capacity, and promise of a "modern" American society, and cybernetics contributed to how that "modern" theory and category were assembled. How that theory of modern and the "new" science of cybernetics converge into a system shows how systems development simultaneously developed to regulate human subjects. Once disentangled, these elements are re-assembled in later chapters that give a better sense of the cultural appeal of cybernetics as a tool of social reform to regulate human beings.

Chapter four continues the interdisciplinary approach of this project by connecting cybernetics to other fields. This chapter further explores other elements that fed the cultural authority of cybernetics, and its application as a technique for domestic modernization. From one viewpoint, cybernetics gained cultural authority based on a discourse in which the narrative structure of the development into an already organized and modern cybernetic system reflected (and reflects) the narrative structure represented as a Universal Christian History. This chapter explores how the discourse surrounding cybernetic systems entangle with Francis Fukuyama's "End of History" modernization theory thesis, and also how diagnosing a developing complex system (like those in cybernetics) parallel the same criteria used in modernization theory, further entangling notions of consensus, modernization, and cybernetics. A sense of "natural" order is composed in understanding how complex systems develop, and naturalizing that order is brought into the works of 1950 American consensus historians, which link to the political theology of a national myth. This chapter tracks how the development into modern systems simultaneously constrained possibilities in conduct to regulate humans by "natural" means.

The fifth chapter strengthens the connections between cybernetics and what American historians call a post-WWII liberal social consensus in the United States. Earlier chapters connected how cybernetic technology and modernization theory informed each other. Later chapters connect domestic educational policy and cybernetics to domestic social "modernization" that linked to the governance of society through the institution of a cybernetic social system. This chapter connects how consensus liberalism (and by extension, consensus history) links to domestic social "modernization" to consider how cybernetics came to be regarded as a tool of social reform to

modernize and correct a social dys-function diagnosed within the nation, a dysfunction of an excess of social difference that needed to be erased to effect sameness (consensus). Cybernetics (science) contributed to the liberal social consensus, and modernization and that model of consensus (politics) can be viewed as a Protestant understanding of history (religion).

The sixth and seventh chapters explore topics of reform. Chapter six focuses on the use of cybernetics for "modernizing" social structures to produce a harmonious modern system tied to the liberal social consensus. Comparative reasoning constructed contrasting elements to feed a modernization narrative that diagnosed dysfunctional social relations in America's "new" and dynamic modern system. The modernization narrative intensified interest in the emerging field of human relations that cybernetically engineered (and still engineers) more harmonious human relations. Understanding the role of curriculum as a message helps to understand how that message stabilizes (human) relations between parts to stabilize the (social) system and considers one way some in higher education brought those human relations under scientific investigation to modernize structures within the social system.

Chapter seven continues the theme of "modernization," but concentrates this time on the reforms of modern functions (like human bodies) operating within those modernized structures. Considering the engineering-based reforms proposed at the famous 1947 University of Chicago Conference on curriculum considers how those proposals bridged cybernetics and curriculum to generate greater system harmony. The proposed reforms looked to create a new kind of modern person to ensure harmonious alignment between structure (social institutions) and functions (like humans). Cybernetic technologies were brought into schooling to reform the self, a new set of personality characteristics necessary to build a new kind of modern *persona* observed in education, and thus to a new kind of citizen, all which helped make intelligible the Rationale. and the Sputnik-era "New Curriculum" reforms.

Chapter eight broadens the historical focus to discuss current cybernetic operations in other select academic disciplines. The goal here seeks to show a sense of sameness across vastly different academic realms that use the same solitary algorithm. Cybernetics still circulates across the human sciences, humanities, and hard sciences, demonstrating the continued strength of its cultural appeal and this same algorithm works in domains considered atypical to a cybernetic bailiwick, applying the same cybernetic strategy to different classes of problems. This chapter examines those ignored cybernetic operations across the human domain and non-human domain.

The last chapter of the project circumvents a view that cybernetics is a pre-established, inevitable, and natural "thing" (or process) that extends into culture. It explores instead how culture elaborates cybernetics through a man-machine metaphor, a cultural response to the question of "What is a human?" Cultural narratives help construct cybernetics, and, in a full looping effect, its scientifically generated results reflect those same cultural narratives observed in politics and religion, embodying another cultural feature of what Foucault calls a "liberal technology of governance." This chapter focuses on the modernization, democratization, and steering of individuals through a series of alignment practices that reaffirm the Protestant trappings of redemption, connecting political-theological-scientific cybernetic operations as a strategy for governing human subjects.

CHAPTER TWO

THE TYLER RATIONALE AS A CYBERNETIC APPARATUS

This chapter shows how the Tyler Rationale relates historically to the emerging science of cybernetics and social thought in the post-war years. It begins by showing how interpretations overlook the Rationale's fundamental cybernetic components. The second section lays out a brief historical background of the new science of cybernetics to highlight operations central to cybernetic mechanisms, those of the "first order" or "classical" cybernetics that emphasized *homeostasis*. The third section spotlights how the logic of the Rationale's instructional programming mobilizes cybernetic operations to show, ultimately, how the Rationale "is a part of the theory and practice of the programming of programming."[77]

The Rationale: A System of Reason (Cybernetics)

The last chapter noted one effect of how the content-based interpretations diagnosed processes of *linear* and *behavioristic* qualities in the Rationale. The first section here takes up a second effect to show how such interpretations direct attention away from the Rationale's other parts, leaving an incomplete picture of the model.

The content-based interpretations that diagnose the Rationale's undesirable qualities of linearity and behaviorism overlook other parts of the Rationale. Understanding how first requires introducing briefly how the Rationale relates historically to cybernetics. The Rationale was first published in 1949 at the height of the Macy Conferences on cybernetics (1946-1953), known more formally as the conferences on "Circular Causal and Feedback Mechanisms in Biological and Social Systems," a conference on "first-order" cybernetics that emphasized *homeostasis.*[78] The Macy Conferences made visible an emerging "new" science of circular systems, later named *cybernetics*, which captured the imagination of North American scientists and public. Cybernetics developed over the 1940s and 1950s into the study of "the entire field of communication theory, whether in the machine or in the animal."[79] The "new" science of cybernetics envisioned how the processing, exchange, and communication of

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[77] Norbert Wiener, *Cybernetics, or the Control and Communication in the Animal and the Machine*, 2nd ed. (New York: MIT Press, 1961), xiv.

[78] Steve Heims, *The Cybernetics Group* (Cambridge, MA: MIT Press, 1991).

[79] Wiener, *Cybernetics*, 19.

information in all systems—whether human, animal, or machine—controlled behavior through *feedback*, a concept which was only "introduced into the social sciences" after 1943,[80] but which by 1948 had already "become a conscious part of the curriculum closely integrated with the formal curriculum of the 'change-agent skills' and the 'phases of group growth and development."[81] As historian Steve Heims points out, "Cybernetics, including information theory, systems with purposive behaviour and automaton models" had emerged from the 1940s as "part of the intellectual dialogue of the 1950s." Moreover, as Heims notes, cybernetics, "has since mingled with many other [academic] streams, has been absorbed and become part of the conventional idiom and practice,"[82] including those in the educational sciences.

Connecting the Rationale to the science of its time finds earlier content-based linear and behavioristic interpretations wanting. First, those interpretations overlook how the intellectual dialogue of cybernetics that Heims described was already circulating amongst the University of Chicago's interdisciplinary Committee on the Behavioral Sciences (BSC) in the latter half of the 1940s, where "a group of about 15 faculty members in different fields [...including] Ralph Tyler, in education [...] met weekly [and] began to concentrate on the concepts of systems and cybernetics dealing with various levels of complexity of biological and social systems."[83] Moreover, criticisms

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[80] George P. Richardson, *Feedback Thought in Social Science and Systems Theory* (Philadelphia: University of Pennsylvania Press, 1991), Ch. 3.

[81] Leland P. Bradford and John R. P. French, "Conclusions," *Journal of Social Issues* 4, no. 2 (April 1, 1948), 70.

[82] Steve Heims, "Introduction," in *The Human Use of Human Beings: Cybernetics and Society*, by Norbert Wiener (London: Free Association Books, 1989): xxii.

[83] Jessie Louise Miller, "A Look Back at the Systems Society," *Behavioral Science* 41, no. 4 (October 1, 1996): 265. Also see James H. Capshew, *Psychologists on the March* (New York: Cambridge University Press, 1999), 227; Richardson, *Feedback Thought*, 118; Philippe Fontaine, "Walking the Tightrope: The Committee on the Behavioral Sciences and Academic Cultures at the University of Chicago, 1949–1955," *Journal of the History of the Behavioral Sciences* 52, no. 4 (September 1, 2016): 349–70. A blackout exists between Tyler, systems, and cybernetics in education-based historical literature—in the interviews, in the personal reflections, and in Chicago's archive of Tyler's Papers. In contrast, within the historical literature of the social sciences—in the interviews, in the personal reflections (and likely in other archives)—is remarkably more straightforward. He was "happy to have had some part in that history" of the cybernetic- and systems-oriented BSC ("Dedication of the Mental Health Research Institute Building," *Behavioral Science* 6, no. 1 (January 1, 1961): 57). Also, "in the solution of common problems of curriculum" note the direct reference to "using all-university committees and interdepartmental groups [...] such as sociology, psychology, political science, human development and the other content fields" that overlapped with Chicago's interdisciplinary BSC (and Chicago's Committee on Human Development). Compare Virgil Herrick and Ralph Tyler, "Looking Ahead: Next Steps in the Development of a More Adequate Curriculum Theory," (in *Toward Improved Curriculum Theory. Papers Presented at the Conference on Curriculum Theory ... 1947*, ed. Virgil Herrick and Ralph W Tyler [Chicago: University of Chicago Press, 1950]), 120-121, and Miller, "A Look Back at the Systems Society." For more Tyler's role in the Committee, see James Grier Miller, "Born April 22, 1902 - Died

that focus on the Rationale's linear "means-ends" qualities[84] overlook the development of Tyler-based cybernetic expressions like "biological mechanisms," or how Step One of the Rationale (p. 50) presents a Boolean-based general-purpose logic machine capable of abstract symbolic computation labelled a "Two-Dimensional Chart," which mirrors what another Tyler-based research project from 1947 labelled a "thinking machine"—all which directly engage the cybernetic intersection of biology and mechanics, and all which emerged approximately at the same time as the Rationale's publication and none of which exists in Tyler's earlier work.[85] Finally, such linear-focused interpretations overlook how the Step One of the Rationale requires first establishing purpose, situating the Rationale and the educational program in which both operate as (cybernetic) *systems with purposive behavior*, or how the Rationale's fourth step—educational assessment—functions within such purposive systems as a feedback mechanism,[86] a cybernetic operation in which the "feedback of information" completes a circuit, part of what the Rationale and others called its "recurring" or "continuing cycle."[87] Despite the "newer" technology of a feedback mechanism, yet perhaps following Tyler's curious lead,[88] all interpretations situate the Rationale's "origins" as "older," during the 8 Year Study in the late 1930s.[89] The Rationale, however, follows the logic of the new circular

February 18, 1994," *Behavioral Science* 40, no. 1 (January 1, 1995): 7–14; also James Grier Miller, *Living Systems* (New York: McGraw-Hill, 1978), and "Editorial," *Behavioral Science* 1, no. 1 (January 1, 1956): 1–5; on Chicago's role (and Tyler's) in the social sciences, see Mark Solovey, *Shaky Foundations: The Politics-Patronage-Social Science Nexus in Cold War America* (New Brunswick, N.J: Rutgers University Press, 2013); Woodie Thomas White, "The Study of Education at the University of Chicago, 1892-1958." (The University of Chicago, 1977), (and briefly, Hunter Crowther-Heyck, "Patrons of the Revolution: Ideals and Institutions in Postwar Behavioral Science," *Isis* 97, no. 3 (September 2006): 420–46).

[84] Tristan McCowan, "Towards an Understanding of the Means–Ends Relationship in Citizenship Education," *Journal of Curriculum Studies* 41, no. 3 (June 1, 2009): 321–42. Also see Doll, *Post-Modern Perspective*, Ch. 2.

[85] Ralph W. Tyler, "Educability and the Schools," *The Elementary School Journal* 49, no. 4 (1948): 202; Cooperative Study in General Education, "Cooperation in General Education: A Final Report of the Executive Committee of the Cooperative Study in General Education." (Washington, D.C.: American Council on Education, 1947), 65 (also 68, 70).

[86] Richardson, *Feedback Thought*, Chapter 3.

[87] E. I. Sawin and M. R. Loree, "Broadening the Base in Evaluation," *The School Review* 67, no. 1 (April 1, 1959): 80; Tyler, *Basic Principles*, 123.

[88] Ralph W. Tyler, "New Dimensions in Curriculum Development," *Phi Delta Kappan* 48, no. Sept. (1966): 25–28.

[89] Wilford M. Aikin, Eugene R. Smith, and Ralph W. Tyler, *Appraising and Recording Student Progress*. [Foreword by Wilford M. Aikin.]. (New York: Harper and Brothers, 1942).

systems, not possible during that study, which ended before feedback mechanisms entered the social sciences after 1943.

Overlooking these elements in and around the Rationale thus troubles any diagnosis of the Rationale's undesirable qualities of linearity and behaviorism. Attending to the Rationale's cybernetic components and its overall circular (cybernetic) processes quickly dispatches with allegations that it is *linear*. Second, attending to how "behavio*ral*, not behavio*rist*, psychology"[90] underwrites all circular (cybernetic) systems dispatches with allegations of behaviorism. The new science of circular systems that the Rationale embodies necessarily rejects the logic of the *linear* one-way stimulus-response system (S→R) of the earlier *behaviorist* model.[91]

The point of this analysis is not to "unveil" a more "correct" interpretation of the Rationale. Nor is it to restore a greater order of behavioral psychology to then create an emancipatory future state. Rather, the point is to forge a new link between the Rationale, and thus curriculum theory, to an emerging science of circular systems and what the logic of such cybernetic thinking involves for the field of education. It seeks to explore what the circular processes bring and do, and how they are not based in "negative" power, but rather "positive" power. Systems are productive: they are assumed to emancipate and liberate. But they also simultaneously limit and inter possibilities.

Consequently, the process-oriented analysis taken below consider how both the text of the Rationale and the curriculum are assembled. A particular procedure known as the Rationale assembles curriculum through an algorithm.[92] Understanding how an algorithm compels a series of abstractions to be assembled into "the curriculum," that is, how a construct like "the curriculum" develops into an object of reflection to be measured, manipulated, tested, and researched—and subsequently attacked and defended in a series of Culture War battles[93]—mirrors, as historian Lorraine Daston puts it, "the coming into being of scientific objects."[94] Exploring the

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[90] Hunter Crowther-Heyck, "Patrons of the Revolution: Ideals and Institutions in Postwar Behavioral Science," *Isis* 97, no. 3 (September 2006): 442 (original emphasis).

[91] Tyler, *Oral History*, 388. Here the behaviorist claims are disputed.

[92] Jean-Luc Chabert and E. Barbin, eds., *A History of Algorithms* (Milan: Springer, 1999).

[93] Ronald Evans, *The Social Studies Wars* (New York: Teachers College Press, 2004); Keith Erekson, *Politics and the History Curriculum* (New York, NY: Palgrave Macmillan, 2012).

[94] Lorraine Daston, *Biographies of Scientific Objects* (University of Chicago Press, 2000).

Rationale's methods and processes begins by explaining the history and formation of the new science of cybernetics, taken up next.

Cybernetics: A Brief Review

Before showing how the Rationale manifests the elements of the new science in the next section, I begin this section with a problem: just how elusive the science of cybernetics is.[95]

Cybernetics transcends spatial and temporal classification. Conceptually, it is tied to a maritime idea from ancient Greece of what governs harmonious relations, from the aesthetic of symmetry that governed ship building processes to the art of steering by a "helmsman" (note the gender) who guided or "governed" a marine vessel's safe passage, aesthetic concepts that resurface throughout this and subsequent chapters. Cybernetics extended and extends to the European Enlightenment,[96] through the work of French scientist André-Marie Ampère (1775 – 1836), and also by another scientist from Poland, both "dating from the earlier part of the nineteenth century,"[97] and also includes Weimar-era work in Eastern Europe on consonance, and entangles with the governing principles of Austrian biologist Ludwig von Bertalanffy's Weimar-era General Systems Theory (GST). Even the concept of feedback itself holds a long history.[98] Finally, consider the likeness between cybernetics and what sociologist Johan Heilbron identifies as the transnational "sciences of government"[99] across the 20th century and how cybernetics materializes across diverse geographic spaces such as in China, Chile, and Russia, among others.[100]

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[95] I thank Ronald Kline and Benjamin Peters for their comments in their early review of this section.

[96] Allison Muri, *The Enlightenment Cyborg: A History of Communications and Control in the Human Machine*, 1660-1830 (Toronto: University of Toronto Press, Scholarly Publishing Division, 2007).

[97] Wiener, *Human Use*, 15.

[98] For *consonance*, see Mihai Drăgănescu, ed., *Odobleja: Between Ampère and Wiener* (Bucharest: The Academy of the Socialist Republic of Romania, 1981). For the role of von Bertalanffy, see Hammond, *Science of Synthesis*; also, von Bertalanffy, "Open Systems," and "An Outline of General System Theory," *British Journal for the Philosophy of Science* 1, no. 2 (1950): 134–65. On the history of feedback, see Otto Mayr, *The Origins of Feedback Control* (Cambridge: M.I.T. Press, 1970); Stuart Bennett, *A History of Control Engineering, 1800-1930* (London: IET, 1986) and *A History of Control Engineering, 1930-1955* (London: IET, 1993).

[99] Johan Heilbron, Nicolas Guilhot, and Laurent Jeanpierre, "Toward a Transnational History of the Social Sciences," *Journal of the History of the Behavioral Sciences* 44, no. 2 (March 1, 2008): 146, 147.

[100] For cybernetics in China, see Susan Greenhalgh, *Just One Child: Science and Policy in Deng's China* (University of California Press, 2008); in Chile, see Eden Medina, *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile* (Cambridge, MA: MIT Press, 2014); in Russia, see Peters, *How Not to Network a Nation*.

Situating the Tyler Rationale within this cybernetic framework is rendered even more challenging by contemporary historical research. Contemporary research locates the WWII-era strand of cybernetics in different domains, from a "birth" in American WWII military research,[101] a strain that extends into culture,[102] or from within the nation-state.[103] Moreover, many scholars link the official "birth" of the "first wave" or "classical" cybernetics to Norbert Wiener's 1948 best-seller *Cybernetics*. Yet others find that text merely synthesized for public interest earlier scientific research.[104] Meanwhile, no broad consensus even exists on the precise definition or parameters of that scientific research.[105] The different conceptions of its operations, from the hard cybernetics of Norbert Weiner to the soft cybernetics of Gregory Bateson, merely suggests its remarkable elasticity.[106]

Consequently, while multiple strands of interpretation of cybernetics can occur, and while below risks representing the present-day manifestation of cybernetics as a unified science with specific branches, the view below is just one measure of its operations with a particular focus on those elements that hold relevance to the Rationale's cybernetic project.

A "New" Science: Cybernetics

The yet-to-be-named science that Wiener's book eventually labeled "cybernetics" emerged, in part, on research that observed how the external activity of nervous systems appeared to explain the internal biological

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[101] Edwards, *The Closed World*; Galison, "Ontology;" Ian Hacking, "Weapons Research and the Form of Scientific Knowledge," *Canadian Journal of Philosophy* 16, no. sup1 (1986): 237–60; Donna Haraway, "The High Cost of Information in Post-World War II Evolutionary Biology," in *Philosophical Forum* 13, no. 2–3 (1981): 244–78; Heims, *Cybernetics Group*.

[102] See Donna Haraway, *Simians, Cyborgs, and Women* (New York: Routledge, 1990); Hayles, *Posthuman*; Braidotti, *Posthuman*.

[103] For a "Great Britain" view, see Pickering, *The Cybernetic Brain*.

[104] R. Cordeschi, *The Discovery of the Artificial: Behavior, Mind and Machines Before and Beyond Cybernetics* (Springer, 2002); David Mindell, *Between Human and Machine: Feedback, Control, and Computing before Cybernetics* (Baltimore: Johns Hopkins University Press, 2004).

[105] Bernard Dionysius Geoghegan, and Benjamin Peters, "Cybernetics," in *The Johns Hopkins Guide to Digital Media*, edited by Marie-Laure Ryan, Lori Emerson, and Benjamin J. Robertson (Baltimore: Johns Hopkins University Press, 2014): 109–13.

[106] Magnus Ramage, "Norbert and Gregory: Two Strands of Cybernetics," *Information, Communication & Society* 12, no. 5 (August 2009): 735–49.

functions of organisms.[107] Since scientific research had already understood the base unit of neurological structures was a single nerve cell, and since that research had already established that the fundamental behavior of a single nerve cell operated on binary processes (either firing or not), basic behavior formulated around binary processes appeared to follow functions that could be mapped out in terms of symbolic logic. Explorations in mathematical biology, such as the McCulloch-Pitts team working in the early 1940s in Chicago, gradually pushed past that elementary "active or inactive" formulation based on an individual nerve cell's behavior to propose instead a wider lens of how more complex behavior operated continuously as a network of neurons. Nerve cells appeared to function together as a neural network, based on a chain of mathematical operators—propositional logic—founded primarily on the concepts of logical circuits, set theory, and Boolean algebra. At a node (or nodes) of a logical circuit, a single binary value (output) was calculated as a function of its inputs, calculated primarily based on the rules of symbolic logic as developed by Russell and Whitehead in *Principia Mathematica*. Set theory was used to assess the equivalences between classes or categories, a "theory of things and collections of things, considering only their logical relationships and dismissing any individual qualities."[108] Finally, Boolean algebra assigned variables values of true or false based on the operators AND, OR, and NOT to describe their logical relations, mathematical work familiar to Tyler as early as 1945.[109]

The physiological structure of these neural networks mapped as a series of variously interconnected neurological "electrical switches" suggested that an active neurological circuit existed based on rule-following Boolean operators that continuously processed the activity between nerve, muscle, and the senses. That activity taken together explained the patterns of muscular operations and hence explained the greater patterns of behavior in more complex biological systems like a human. The combinatorial activity of all such neuronal systems appeared to function by design that could be understood as a "logical calculus."[110]

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[107] As Weiner later wrote in his biography, "life is a perpetual wrestling match with death. In view of this, I was compelled to regard the nervous system in much the same light as a computing machine." Norbert Wiener, *I Am Mathematician* (New York: Doubleday, 1956): 269. Quoted in Mirowski, *Machine Dreams*, 18.

[108] Freeman J. Dyson, "A Walk Through Johnny von Neumann's Garden," *Notices of the American Mathematical Society* 60, no. 2 (2013): 155.

[109] Ralph W Tyler, "Cooperation and Conflict in the Mental Development of the Child." *Mental Hygiene* 32, no. 2 (April 1948): 253–60.

[110] Warren McCulloch, and Walter Pitts, "A Logical Calculus of the Ideas Immanent in Nervous Activity," *The*

Research in this early phase of classical cybernetics began blurring biological and mechanical functions. Investigators used the foundational elements of biological activity to advance a functional equivalence between the fundamental operations of nervous activity in biological systems and the fundamental operations of certain mechanical systems. Exploring the shifting terrain among analog and digital properties, where digital processes functioned based on logical circuits, set theory, and Boolean algebra, the chain of operations observed in the elementary parts of a nerve network were likened to the chain of operations in the elementary parts of machines—vacuum tubes in (then) basic computers, or electrical switches and relays in electrical engineering. These elementary parts in both biological and mechanical domains functioned also in "all or nothing" binary positions and when strung together, they also operated to allow the continuous control of the mechanism's behavior. Even the senses in living organisms were seen as analogous to sensors like photocells or radar in machines, again blurring the biological and the mechanical.

Engineers had already mapped out how a chain of programmed operations worked, where any series of open and closed logical circuits based on Boolean operators could achieve intended results. This includes the general-purpose logic machine capable of abstract symbolic computation labeled the Two-Dimensional Chart in Step One of the Rationale (p. 50), or processing data in basic computing operations, or how a small, mobile machine with electronic sensors (like a programmed electronic "rat" or "tortoise") could learn to successfully navigate a maze.[111] Such man-machine comparisons, based on analogical reasoning about fundamental bio-mechanical functions further weakened the borders between the natural and the artificial.

This cybernetic coupling of the functions basic to both human and machine fell under the central principles of purpose, teleology, and feedback. Common to both biological and mechanical systems was a sense of *purpose* that directed future activity with regard to achieving a goal state, again just as Step One of the Rationale prescribes. Linked to purposeful activity was the principle of *teleology*, which explained how mechanisms of behavior actively

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Bulletin of Mathematical Biophysics 5, no. 4 (December 1, 1943): 115–33; D. H. Perkel, "Logical Neurons: The Enigmatic Legacy of Warren McCulloch." *Trends in Neurosciences* 11, no. 1 (January 1988): 9–12; Tara H. Abraham "(Physio)logical Circuits: The Intellectual Origins of the McCulloch–Pitts Neural Networks." *Journal of the History of the Behavioral Sciences* 38, no. 1 (2002): 3–25; Nicolas Rashevsky, *Mathematical Biophysics* (Chicago: Univ. of Chicago Press, 1938).

[111] See Hayles, *Posthuman*, 64-65. Also see James Beniger, *The Control Revolution* (Cambridge, Mass.: Harvard University Press, 1986).

tried to achieve that goal state, even in the face of disruptions like entropy.[112] *Feedback* mechanisms helped complete a circuit of operations by redirecting the system to its end goal through the continuous surveillance of that system's activity and by correcting for system errors or by allowing that system to adjust to disruptions. One scholar at the time noted how "The central concept in cybernetics is a feedback mechanism that, in response to information (stimuli, messages) received through the system, feeds back to the system instructions that modify [itself]."[113] Whereas positive feedback could excessively reinforce a system's goal-directed behavior, negative feedback restrained a system's behavior back to its intended goal, providing a sense of stability (*homeostasis*) to the purposive system. Researchers reasoning by analogy to theorize how a congruence between the structural components in both natural beings and artificial technology led to a congruence between the principles that organized every system's behavior.

Again, such abstractions are manifested in the Rationale's basic principles. For example, purpose, as I just noted, serves as Step One's organizing concept to impart a purposive system. Also as I just noted, feedback serves as the organizing principle behind Step Four. Moreover, homeostasis and stability also organize the conception of human technology observed in the role of the learner in the Rationale. As Kliebard observed in his analysis of the Rationale, "the biological concept of homeostasis" occurs in Step One's "extended discussion" that connects educational objectives to the biological "needs" of learners, such as a human "need for food when one has in mind a physiological state of equilibrium." Kliebard then criticized the Rationale's push for needs outside of the biological domain. But that criticism overlooked how a psychological concept of homeostasis occurs in the Rationale's reference to the "psychological writings" and systems research of University of Chicago psychologist and educator Daniel Prescott, who, according to the Rationale, viewed "a human being as a dynamic organism, an energy system normally in equilibrium" that has "physical [...] social [...] and integrative needs." The Rationale argued for researching into what "role the school can play in helping children to meet these needs" in order to restore

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[112] Arturo Rosenblueth, Norbert Wiener, and Julian Bigelow, "Behavior, Purpose and Teleology." *Philosophy of Science* 10, no. 1 (January 1, 1943): 18–24; J. O. Wisdom, "The Hypothesis of Cybernetics." *The British Journal for the Philosophy of Science* 2, no. 5 (May 1, 1951): 5 (ff#1). A "machine may start towards a goal, but after it deviates it may make no attempt to pursue that goal. It would then be in one sense "purposive" but not "teleological". To be "teleological" it must continue to seek its goal, which requires negative feed-back."

[113] C. Eisenhart, "Cybernetics: A New Discipline." *Science (New York, N.Y.)* 109, no. 2834 (April 22, 1949): 397.

homeostasis for a student around a preestablished physiological, social, and psychological order.[114] Not only are the functions of curriculum systems purposeful and goal oriented, so too are those of the human system embedded within it, blurring a border between the organic and inorganic.

Reformulating the concept of information

Moving on, no discussion of cybernetics would be complete without a discussion what circulated within cybernetic structures. What directed parts to function properly on either side of the man-machine divide was the reformulated concept of *information*. Again, scientific research had already established now external impulses of energy could excite nerves or power a machine's parts. But the new view of executing a chain of operations by either activating or inhibiting parts within an entire system suggested that basic pulses of energy were really a signal, a form of communication or a "message" that helped a system control the operations across a wide distribution of its individual components. Within such a system, these signals or messages circulated primarily based on models of communications, the most significant of which reflected electrical engineer Claude Shannon's *Mathematical Theory of Communication* (1949), a model that insisted that the "fidelity of [a] received message" (the actual state) carried by information (a signal) should match the intended message (the goal state).[115] In Shannon's model, an "*information source* selects a desired *message* out of a set of possible messages [...] the *transmitter* [encodes] this *message* into the *signal*" that was (and is) subsequently communicated over a channel and decoded for a receiver.[116] In Shannon's new development of information theory, "information" carried this message in the form of "binary digits, or more briefly *bits*," allowing information to control the two states of mechanical "device[s] with two stable

[114] Kliebard, "The Tyler Rationale," 60-61; Tyler, *Basic Principles*, 6-7. For the sake of convenience and space, I have hereafter listed all citations from the Rationale in parenthesis. For Prescott on homeostasis, see University of Chicago Collaboration Center on Human Development and Education, *Child Growth and Development Emphases in Teacher Education* (Oneota, NY: American Association of Teacher's Colleges, 1944), 17-19.

[115] Claude Shannon, and Warren Weaver, *The Mathematical Theory of Communication* (Urbana: University of Illinois Press, 1949), 113. For more on the connection between Wiener's *Cybernetics* and Shannon's Information Theory, see Abraham, "(Physio)logical Circuits;" David Mindell, Jerome Segal, and Slava Gerovitch, "From Communications Engineering to Communications Science: Cybernetics and Information Theory in the United States, France, and the Soviet Union," in *Science and Ideology: A Comparative History*, edited by Mark Walker (London: Routledge, 2002): 66–96.

[116] Ibid., 98 (original emphasis).

positions, such as a relay or a flip-flop circuit."[117] As one scholar notes, "So central to communication is the process of control that the two have become joint subject of the modern science of cybernetics."[118] I return in the next section to how Shannon's concept in the Rationale's model.

Cybernetic research incorporated this information-based model of communication to explain how the flow of messages helped a system achieve its final state. Information, as a set of binary messages, allowed the purposeful activity of neurons from the biological sciences to be situated on the same plane as an engineer's relay, or as an electronic switch from the mechanical sciences, allowing the implied communication and the control to be modeled by Boolean algebra on either side of the developing man-machine metaphor,[119] a feature we return to in the next sections' discussion of the Rationale. Just as telephone communications could prompt activity from one point on its grid to another based on a message (for instance, by one person calling another to purchase sourdough bread at a market), given certain conditions, the information exchanged in one part of a system could direct the behavior of another part based on a "message" that expressed a path of decisions to best achieve a system's goals. As Norbert Wiener explained, "the fundamental idea [of cybernetics] is the message [...] and the fundamental element of the message is the decision."[120]

What guided the entire system to achieve its goals was the "helmsman." A "governor," the conceptual namesake behind cybernetics (derived from Greek *kybernetes*, Latin as *gubernator*, later as "governor") served as the "control unit" that superintended the activity of the entire cybernetic system. Just as a steering mechanism stabilized a fragile maritime vessel pitching amongst chaotic seas to pilot a vessel towards a destination, the steersman controlled or governed the entire system by providing stability and direction through the automatic processing of information. Automata theory, reflecting the basis of this system, held that programming into a system

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[117] Ibid., 4 (original emphasis).

[118] Beniger, *Control Revolution*, 8.

[119] Martin Gardner, *Logic Machines and Diagrams* (Chicago: Univ. of Chicago Press, 1958), 129. See also Wiener's comments on "the application of the techniques of classical Boolean algebra of classes to the study of switching systems in electrical engineering." See *Cybernetics*, 13.

[120] As quoted in Hayles, *Posthuman*, 52.

a series of rules—algorithms—allowed up that system to calculate and execute certain lesser tasks automatically to allow that greater system freedom to direct itself towards a desired goal with no need for outside intervention.

Central to the overall configuration of cybernetics was not whether systems were organic or inorganic, but how the flow of information operated within such systems. Information flows gave the steersman a full understanding of the whole of the system, the whole of all of its instruments and devices through the command, communication, control, and information, what contemporary scholars call C^3I. The steersman's broad perspective, one common to electrical and communications engineering, attended less to singular instances of the flow of individual messages and information, but rather attended to the entire set of all possible messages.[121] Just as with Shannon's mathematical communication model, this engineering perspective aided the steersman to calculate comprehensively the different branches and probabilistic outcomes of each decision, a *statistical event* unto itself, allowing it to adjust and reduce the vessel's vacillations away from its central goal.[122]

Again, the Rationale embodies such theoretical constructs. The steersman's broad engineering perspective and mathematical technique guides how the Rationale's architecture presents the curriculum forming process. The Rationale already apprehended the entire set of all possible decisions and their alternatives to dictate which steps to take in the curriculum forming process. According to the Rationale, "When we consider the whole range of desired [learning] objectives," and not a restricted range, "We are then in a position to observe the degree to which the objectives are actually being realized." The Rationale's prescription of four steps already anticipates how a class of problems can be solved by automatic procedures. Those four steps already guide the entire curriculum-building process of "making decisions" around the flow of "certain kinds of information and knowledge"—and not others—based on the new view of information.[123]

Other examples also are possible. Older views tied information to a "psychological" concept of semantics and interpretation. The new view of information like Shannon's ties information to a "physical" concept of syntax and symbol sequence that guides goal-seeking activity from one point to another "through time or space," [124] just

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[121] Shannon, *Communication*, 100.

[122] Hayles, *Posthuman*, 32.

[123] Tyler, *Basic Principles*, 112, 4.

[124] W. F. Aspray, "The Scientific Conceptualization of Information: A Survey," *Annals of the History of Computing* 7, no. 2 (April 1985): 122. Shannon "reserved "meaning" for the content actually included in a particular message."

like how communicating information could guide a rocket's path through time and space to a target or even directing the choice of bread at a market. The Rationale realizes these ideas in how it advocates students learn information "only if the information is viewed as functional; that is, [as] being useful (72)" for performing work, a physical conception of information. Just like Shannon's theory, information in this view governs "the guidance of his [a student's] practices (74)" in goal-seeking activity across "varied contexts [and] varied ways appropriate to the different kinds of situations (74)" in time or space that human systems may confront, particularly "as a part of a total process of problem solving (73)," such as those kinds of problems facing curriculum development that the Rationale anticipated from the start. The Rationale already presents a broad engineering perspective replete with the helmsman, information, and goal states to guide education's goal-seeking activity.

Generalizing a theory of systems

Founded on nerves, built on binaries, the conclusions of the new science pointed to a generalized theory of a better understanding of all systems. Apprehending the basic operations of simple automatic machines allowed insight into the more intricate operations like brain behavior in biological systems that exceeded any simple on or off binary arithmetic to suggest a new class of complex behavior. As Wiener observed, cybernetics was "the study of what in a human context is sometimes loosely described as thinking and in engineering is known as control and communication."[125] The functions at an elementary level fed a developmental trajectory of a higher and more complex behavioral order to explain how all systems developed self-organizing activity.[126] Indeed, in case the reader is wondering, cybernetics aided researchers in breaking away from behaviorism and serves as the forerunner to today's cognitive sciences.[127]

Completing the integration of basic circuitry between the artificial and the natural completed the integration of humans and machines. The assimilation of man and machine included the description of normal activity, like

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[125] Wiener, "Cybernetics," *Scientific American*, v 179, (1948): 14.

[126] D. O. Hebb, The Organization of Behavior: A Neuropsychological Theory (Psychology Press, 1949). See also W. Ross Ashby, "Principles of the Self-Organizing System," in *Principles of Self-Organization: Transactions of the University of Illinois Symposium*, edited by Heinz von Foerster and George Zopf (London: Pergamon Press, 1962): 255–78.

[127] Jean-Pierre Dupuy, *On the Origins of Cognitive Science: The Mechanization of the Mind* (Princeton, N.J: MIT Press, 2009).

picking up a pencil. But it also explained dysfunctional activity or a disorder, like a pathological disease or schizophrenia, or when a computer hangs or crashes, both understood as disruptions in the communications process. Cybernetics also seemed to provide the inroad to answers for a wide range of problems examined across a wide range of fields that extended beyond the localized pursuits of psychiatry, physiology, or engineering to explain also more generalized social functions and dysfunctions. More importantly, however, this assimilation introduced into popular culture a cybernetic organism: the cyborg.[128]

Possibly the strongest feature presented by the "new" cybernetic perspective was how its explanations of phenomena differed from the past. Under earlier views, scientific explanations of events located isolated and "anonymous particles moving at random," influenced "by large-scale 'forces' acting at a distance, not unlike gravitation and the ether of classical physics,"[129] all housed under the view of a *static* Newtonian universe. The cybernetic perspective, however, adopted a 20th century view of physics and incorporated "ideas of a nature apart from those considered by Newton,"[130] all housed under the view of a *dynamic* universe.[131] The new perspective provided the conceptual tools that helped move scientific investigation from the study of objects as "static entities" to one of investigating "dynamic processes and the order of events as seen in a context or field where there are interreactions and circular processes in operation."[132]

Again, conceptualizations like these are taken up in the Rationale. It rejects the older static view to adopt the new dynamic perspective within this changing terrain. According to Tyler, the older static view circulating in "earlier scientific work assumed that human beings were largely incapable of autonomous action and were shifted hither and yon by forces beyond their control."[133] But the Rationale endorses a new "view [of] a human being as a

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[128] The "cyborg" was introduced into American culture a decade after the Rationale was published. See Manfred Clynes, and Nathan Kline, "Cyborgs and Space," *Astronautics*, no. September (1960): 26–27, 74–76.

[129] Lawrence K. Frank, "Foreword," *Annals of the New York Academy of Sciences* 50, no. 4 (1948): 189, 195.

[130] Norbert Wiener, "Time, Communication, and the Nervous System," *Annals of the New York Academy of Sciences* 50, no. 4 (1948): 200.

[131] Anatol Rapoport, *Operational Philosophy: Integrating Knowledge and Action* (New York: Harper & Brothers, 1953), especially "Frames of Reference."

[132] Frank, "Foreword," 190.

[133] Ralph W. Tyler, "Human Behavior: What Are the Implications for Education?" *Journal of the National Education Association* 44 (1955): 426.

dynamic organism, an energy system normally in equilibrium between internal forces [and...] external conditions (6)." This overall change in perspective entailed extending the Newtonian cosmology from an earlier organicist discourse that "assumed that the great society and [its] social institutions [...] can be studied as organisms,"[134] to an emerging systems discourse that assumed (and assumes) society and its institutions could be studied as a social system within a larger natural system, where "living and nonliving feedback systems alike obeyed common mechanical principles,"[135] all situated within a new world of complexity, one in which behavior "patterns, not elements, are transmitted"[136] by goal-seeking purposive systems, just like the Rationale, a result of the interaction and behavioral adaptation to a "field" of forces external "situations" demanded.

All such elements above suggest the persuasive power of the cybernetic view, particularly to those sub-disciplines across the life and human—and educational—sciences studying behavior. Unlike earlier perspectives that pitted man against man (part vs. part) or man against nature (part vs. whole), the aspirations of this scientific perspective sought to unite the subject and its environment, increasingly integrating both man and nature (part and whole) within a single unified framework.[137] The provisions of cybernetics gave "a new conceptual frame of

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[134] Ralph W. Tyler, "Memorandum: On an Overall Conception Around Which to Organize Much of the Research of the Social Science Division" (Ralph W. Tyler Papers, Special Collections Research Center, University of Chicago Library, n.d.), Box 18, Folder 12. According to the Center, in this section of the archive, "The majority of the papers in Series I concern Tyler's administrative work, and therefore the bulk of the series is made up of correspondence and reports arranged in alphabetical order by topic/subject, or occasionally by author." This particular section is bookended by folders on the "Social Sciences Division [1938-1943]" and folders on the "Social science research committee [1944-1947], and the date presumably falls in the earlier period (see also "Establishing the Interdisciplinary Committees" [Tyler, *Oral History*]). Also see the study directed by Daniel Prescott (whose work is referenced in the Rationale, p. 6): "A culture can be thought of as a super-organism, or epi-organism, the component unit cell of which is the individual human being. This epi-organism can be viewed both structurally and functionally" in Chicago Collaboration Center, *Child Growth*, 45-46.

[135] Peter J. Taylor, "Technocratic Optimism, H. T. Odum, and the Partial Transformation of Ecological Metaphor after World War II," *Journal of the History of Biology* 21, no. 2 (July 1, 1988): 221. For more on this change, see the work by Karl Wolfgang Deutsch, Tyler's colleague on the Committee on Behavioral Sciences (and who also is recognized in Wiener's [1964, p. viii] *God and Golem*), "Some Notes on Research on the Role of Models in the Natural and Social Sciences," *Synthese* 7, no. 6–B (1948): 506–33 (republished in 1968 as "Toward a Cybernetic Model of Man and Society"); Garland E. Allen, *Life Science in the Twentieth Century* (New York: Wiley, 1975), Ch. 6; Gregg Mitman, *The State of Nature: Ecology, Community, and American Social Thought, 1900-1950* (Chicago, IL: University of Chicago Press, 1992), Ch. 6-7; Cynthia Eagle Russett, *The Concept of Equilibrium in American Social Thought* (Cambridge, MA: Yale University Press, 1968), Ch. 7.

[136] F. Dermot Barrett and Herbert A. Shepard, "A Bibliography of Cybernetics," *Proceedings of the American Academy of Arts and Sciences* 80, no. 3 (1953): 204.

[137] Edward Purcell, *The Crisis of Democratic Theory* (Lexington, KY: University Press of Kentucky, 1973), 8, 10;

reference for scientific investigation in the life sciences,"[138] including how to understand learning processes. For example, in 1948, political scientist Karl W. Deutsch noted how "These new models offer suggestive analogies for such relationships as 'purpose', 'learning', 'free will', 'consciousness', and 'social cohesion'" and were "considered crucial in social science but were found incapable of effective representation by earlier models." A behavior like "Simple learning" was reimagined as "goal seeking feedback, as in a homing torpedo." However, "A more complex type of learning is the self-modifying or goal changing feedback [that] has parallels in Darwinian evolution [and in] The performance of a human goal-seeker who strives for new goals,"[139] an analytical framework that united man and nature.

The new contextual framework social scientists adopted helped better grasp a function's goal or "purpose" within a larger structural environment. This framework compared how a functional part learned and adapted to controlled environments, extrapolating how a range of "teleological" mechanisms guided entities navigating and adapting to unfamiliar and changing environments like a maze.[140] "An animal that learns," noted Wiener, "is one which is capable of being transformed by its past environment into a different being and is therefore adjustable to its environment within its individual lifetime."[141] By understanding the perspective of a situated subject interacting with an external dynamic "field" of chaotic forces that were pushing and pulling and tugging at it from different directions, researchers gained insight into the behavior patterns of how both nervous systems and mechanical systems operated under similar parameters of communication and control. Again, Wiener: "It has long been clear to me that the modern ultra-rapid computing machine was in principle an ideal central nervous system to an apparatus for automatic control."[142] Cybernetic apparatus had memory, thought, and learned, and were also amenable to

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Robert Redfield, ed., *Levels of Integration in Biological and Social Systems* (Lancaster, PA: Jaques Cattell Press, 1942). See Wiener's statement of how system *purpose* both in a "machine, as in Darwin's nature" correspond, in *Human Use*, 38.

[138] Frank, "Foreword," 190; also Barrett and Shepard, "Bibliography."

[139] Karl Wolfgang Deutsch, "Natural and Social Sciences," 512, 514.

[140] Hayles, *Posthuman*, Ch.3; Kline, *Cybernetics Moment,* Ch. 2.

[141] Wiener, *Cybernetics* (2nd edition), 169.

[142] Wiener, *Cybernetics*, 36.

change by understanding the contextual "situations" in which it was immersed, which is one reason why the Rationale focuses on learning situations, as we shall see.

To wrap up this cursory history, the science of cybernetics coalesced by linking external behavior to an entity's internal structure through multiple trajectories: binary computation and circuit design, control, communication, and information, and a systems view of subject and object unified within a field of forces common to both biological and mechanical explanations. Cybernetics grew intelligible under a novel approach that explicated the underlying "logic of systems,"[143] which permitted interdisciplinary teams of scientists to use language common to both human and machine. That discourse helps us in the next section where I focus further on how the architecture of the Rationale embodies cybernetic operations.

Step One: What Educational purpose should the school seek to attain?

The remainder of this chapter explicates how the Rationale's logic of curriculum formation manifests cybernetic principles. It begins from the point of view of a subjectivity, the "curriculum worker," as labeled by the Rationale. We can follow how Step One of the Rationale directs this curriculum *persona* to finalize a goal state for an educational system by using a series of programmed operations. Achieving this final goal state entails recognizing how "All aspects of the educational program are really means to accomplish" one thing: "basic educational purposes (3)." Just as cybernetic systems are purposive systems, pre-programmed to achieve a goal state in concert with their internal messages, the Rationale already understands education with this purposive view. The "ends," the goal or purpose of an instructional program is what initiates "desired changes in the student (44)" and fixing a goal state first "is very necessary" because the overall program needs "to have some conception of the goals [...] the educational objectives being aimed at (3)." The goals "indicate the kinds of changes in the student to be brought about (45)." Those changes are the predetermined future states of being that are planned for students that come from the kind of the messages schools want to send. Step One thus assigns the curriculum worker to decide on the objective or purpose of instructional programming to communicate a message that will "specify what the students are expected to do (45)" within in an educational system. But this goal-setting task still begs the question: "What educational purposes should the school seek to attain (v)?"

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[143] See Mirowksi, *Machine Dreams*, 14, where polymath John von Neumann in particular pursued distilling the strategies of behavior basic to all systems.

The answer to that question shows another cybernetic connection. Indeed, "no attempt is made to answer (1)" that question and understanding education today as a larger communications system is critical to understanding this cybernetic connection. One reason "no attempt" is made to select a purpose is that according to Shannon's mathematical model of communications, an "*information source* select[s] a desired *message* out of a set of possible messages,"[144] a view with less interest in any particular message than in understanding the full field of all possible messages.[145] Both the Rationale and Shannon's model are "designed to operate for each possible selection, not just the one which will actually be chosen since this is unknown at the time of design."[146] The Rationale follows this idea by directing a curriculum worker to source "desirable [educational] standards (6)" from the whole "set of desirable norms (9)" located within a flattened dimension of all possible educational objectives. From that whole set (set theory) of equally possible alternatives, the curriculum worker can then select appropriate "source[s] of information (5)" to begin assembling a message to send to students. But then that selection begs another question: which sources?

Answering that question shows how the Rationale's instructional programming deviates slightly from its model of communications engineering. From an engineering point of view, a range of equally possible sources of information exists for any engineering project and the selection amongst alternatives is wide open. From an educational point of view, however, a random selection of sources from which to send an educational message to students would not stand. Consequently, the Rationale pre-empts caprice by pre-programming the sources of information into its curricular algorithm. Given that the Rationale hopes students will to see science as a "possible contributor to social welfare (54)," its architecture gives equal weight to three social "scientific" inputs: data from studies of learners (5), studies of life outside of school (16), and what subject specialists hold as important (25). The Rationale imports such "external" social scientific data into schools to build a message to ensure that a student's conduct and "resulting behavior is socially acceptable (7)."

As a source of information, the collected raw data must then be cleansed. Because "a variety of data must be assembled," and because "[a]ny set of data permits multiple interpretations (24)," quite a bit of "unimportant"

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[144] Shannon, *Communication*, 98 (original emphasis).

[145] Ibid., 100.

[146] Ibid., 3.

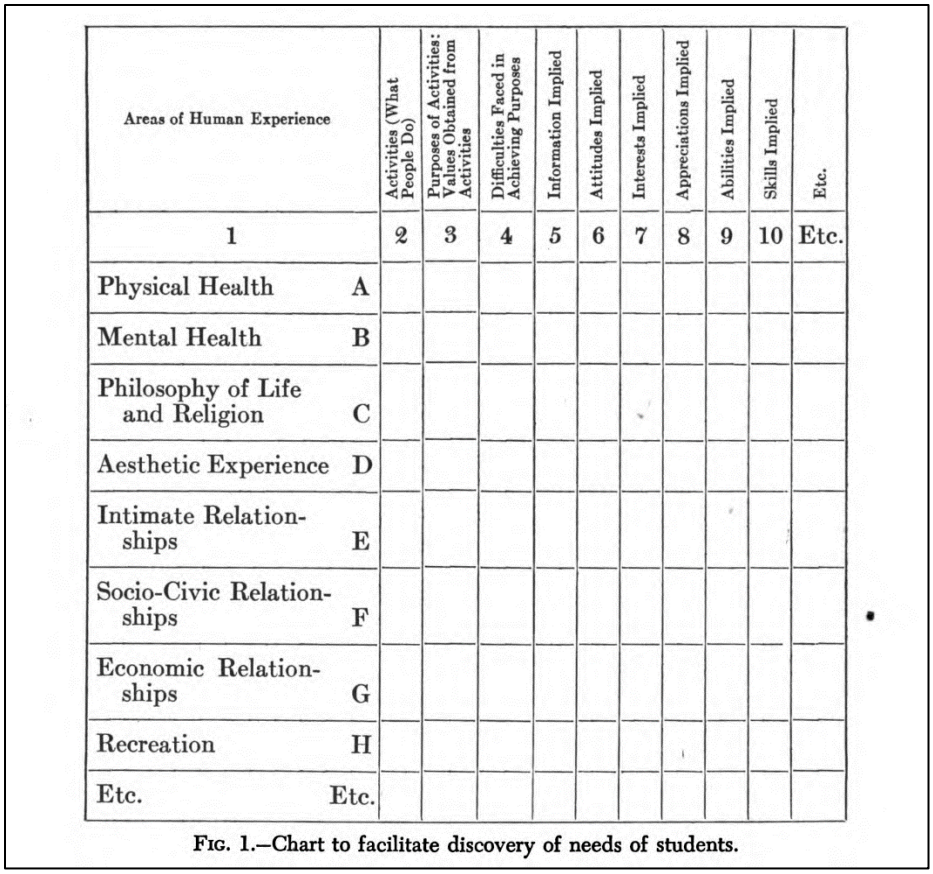
and "contradictory (33)" information—noise—exists in the raw data. Such noise will contaminate the desired message when picked up later on so it needs to be filtered out here, or, as the Rationale states, "screened out" by two values: an educational philosophy (33) and a psychology of learning (37).

We can see how at this stage in Step One that the Rationale has spelled out a task for the curriculum worker to fetch "social" data—today, Big Data—from already identified sources of information and screen it. But these are just two of many tasks contained in the first step. Processing the collected data, for example, has yet to come.

Digitizing the Data: What is the point of purpose?

Once screening has scrubbed the data of noise, converting the raw data into a message for transmission comes next. This sub-operation within the first step changes the data into a message/signal, again by following Shannon's model, where "the *transmitter* changes th[e] message into the signal"[147] for ease of communication across educational channels to produce a learning experience the original message envisioned. That message, like all messages in cybernetics, signals a choice, a decision that guides "all of the other activities of the curriculum-maker (62)," so the data must first be changed to be recognizable by the remaining educational system.

[147] Ibid., 98 (original emphasis).



Areas of Human Experience		Activities (What People Do)	Purposes of Activities: Values Obtained from Activities	Difficulties Faced in Achieving Purposes	Information Implied	Attitudes Implied	Interests Implied	Appreciations Implied	Abilities Implied	Skills Implied	Etc.
1		2	3	4	5	6	7	8	9	10	Etc.
Physical Health	A										
Mental Health	B										
Philosophy of Life and Religion	C										
Aesthetic Experience	D										
Intimate Relationships	E										
Socio-Civic Relationships	F										
Economic Relationships	G										
Recreation	H										
Etc.	Etc.										

FIG. 1.—Chart to facilitate discovery of needs of students.

Figure 1: The "thinking machine" (p. 68) from the Tyler-directed Cooperative Study in General Education (University of Chicago), "Cooperation in General Education; A Final Report of the Executive Committee of the Cooperative Study in General Education," *(Washington: American Council on Education, 1947, p. 66).*

Converting the message into an instructional "programming" language of properly formulated educational objectives is needed for the wide distributions of signals/messages. Translating messages into a new form is desirable because "it is desirable to state" behavioral goals "in a form which makes them most helpful (44)." This new helpful form for "stating objectives" is based on two "dimensions" or criteria: one criterion is "behavior," "the kind [of behavior] to be developed in the student," and the other is "content," the arena "in which this behavior is to operate (46-47)." These two dimensions of content and behavior—that is, thinking and acting—serve as a check from which to evaluate any "statements" of objectives. The curriculum worker must pass the signal through the Rationale's content and behavior-based "two-dimensional chart (50)," a 2-D instrument or "device (55)," the same "device or thinking machine"[148] referenced at the beginning of this chapter, which helps to ensure an accurate and distortion-free message.

[148] Chicago's *Cooperative Study in General Education*, 70.

This 2-D chart accomplishes multiple tasks simultaneously. First, it converts everyday expressions into machine language by providing "a form [...] so that their [the objective's] meaning is clearer [and] more obvious (55)," a move which also filters noise. Second, it also functions as a logical gate, since the 2-D device opens a channel for "approved" messages (and closes for others) based on a series of pre-programmed IF/THEN statements and Boolean operators (AND, OR, and NOT), efficiently screening a message upstream for carrying it downstream. Third, it also evaluates, since an "appropriate" objective must also meet all logical conditions by carrying the pre-determined dimensions or criteria of content and behavior, which the chart determines through the intersection of two axes expressed as an (x, y) coordinate. The "content domain" —the "internal" thought of a human on the Y axis (content knowledge)—must intersect with the "behavior domain" —the external conduct of a human on the X axis (skills). Their intersection thus yields a single point ready for evaluation in binary (yes/no) terms.

ILLUSTRATION OF THE USE OF A TWO-DIMENSIONAL CHART IN STATING OBJECTIVES FOR A HIGH SCHOOL COURSE IN BIOLOGICAL SCIENCE

		Behavioral Aspect of the Objectives						
		1. Understanding of important facts and principles	2. Familiarity with dependable sources of information	3. Ability to interpret data	4. Ability to apply principles	5. Ability to study and report results of study	6. Broad and mature interests	7. Social attitudes
Content Aspect of the Objectives	A. Functions of Human Organisms							
	1. Nutrition	X	X	X	X	X	X	X
	2. Digestion	X		X	X	X	X	
	3. Circulation	X		X	X	X	X	
	4. Respiration	X		X	X	X	X	
	5. Reproduction	X	X	X	X	X	X	X
	B. Use of Plant and Animal Resources							
	1. Energy relationships	X		X	X	X	X	X
	2. Environmental factors conditioning plant and animal growth	X	X	X	X	X	X	X
	3. Heredity and genetics	X	X	X	X	X	X	X
	4. Land utilization	X	X	X	X	X	X	X
	C. Evolution and Development	X	X	X		X	X	X

Figure 2: The Rationale's "Two-Dimensional" chart
(Tyler, Basic Principles*, p. 50, image courtesy of* University of Chicago Press*).*

That specific point generates an educational benchmark. This singular directive expresses the optimal "goal state" to be taken up by the receiver (the student) "situated" at a different time and in a different location, a directive that surfaces upon the same intelligible grid that houses the two dimensions that generate it. The 2-D chart's logical

gate thus authorizes the educational system to transmit that directive in a "helpful" form as a single point emplotted upon an education system's geometric plane of space and time, reflecting again Shannon's *Mathematical Theory of Communication*, where "The fundamental problem of communication is that of reproducing at one point, either exactly or approximately, a message selected at another point."[149] Producing the point of desired conduct—educational objectives—coordinates "interdependent (96)" relationships among other points that schools communicate to "bring about the desired change in students (44)" based on pre-approved conditions the 2-D device evaluates.[150]

The first step of the Rationale concludes with this last act of "digital" data processing. Producing a singular point, the "satisfactory formulation of objectives which indicates both the behavioral aspects and the content aspects (62)" is what "provides clear specifications to indicate just what the educational job is (62)" and this point of purpose governs later operations throughout the educational system. With those closing instructions, the Rationale clearly tackles a concern with the production and consumption of messages related to a noisy channel across different domains of communications. The selected, cleaned up, and now-digitized message gives direction to a larger purposeful system of education.

Now at the end of Step One, these elements showcase how information processing sub-routines extend the Rationale beyond merely four linear steps, and that algorithm-approved information cascades throughout the Rationale's cybernetic circuitry. Note how this first step ends by having already directed the curriculum worker to refine repeatedly the original selected "social" message. Boolean operators and logical conditions came not only in the form of the 2-D device but also near the conclusion of many sections based on questions steeped in binary terms that required a yes/no answer to produce all or nothing results.[151] The refined data was then loaded onto a data storage device that occurs throughout the first step, what I am calling "The List" (see pps. 33, 34, 43- 45, and 57), an "analogue of memory" that one historian termed a "hallmark" of the cyborg sciences.[152] These elements showcase

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[149] Shannon, *Communication*, 3.

[150] The Two-Dimensional chart's complete description can be found at https://uwmadison.box.com/s/8ebqjs9ykxfezsotgmd2d312ap0e6tmf .

[151] For example, see the set of questions peppered throughout *Basic Principles* on pages 35, 37, 43, and 56.

[152] For the List, "formulate a list of the educational objectives (33)." The list resembles a single-tape memory storage device. On "analogue," see "Moreover, the information received by the automaton need not be used at once but may

how information processing sub-routines contained within the first and later steps extend the Rationale beyond merely four linear steps, and that algorithm-approved information flows throughout the Rationale's cybernetic circuitry. With a purposeful message now in hand, the curriculum worker is ready for Step Two of the Rationale: planning.

Step Two: How Can Learning Experiences Be Selected Which Are Likely to Be Useful in Attaining These Objectives? Planning as a Process

Step Two plans for how best to communicate Step One's message. This second step of the Rationale reviews plans for possible learning experiences by weighing three cybernetic processes of behavior, information and a situation as a single unit of analysis. Planning an instructional program requires responding to the pre-selected purpose, and since any given learning situation will evoke a wide set of possible outcomes, this task focuses on selecting a way to program the most promising learning experience from Step One's message.[153] Because a learning "experience" involves "the interaction of the student and his environment (64)," the Rationale adopts a view that a subject's behavior patterns (a function) emerge from the interaction with the information flows contained within a "situation" (a structure) when planning for which learning structure to structure. To explain the processes in Step Two, I would like to focus on three of these cybernetic components in this unit of analysis—behavior, information, and situation—beginning with a *situation*.

The first component explored here affirms how a "situation" or "field" generates desired behavior patterns. The external environment "evokes" or "stimulate[s] the desired type of reaction (64)" within the student, and a particular set of external circumstances at any given moment in time will provoke one set of student behaviors from within a "field" of forces. Yet, a different set of circumstances at a different time would provoke another. Any plan to structure a learning situation, therefore, plies another "instrument" of education: the "conditions" of learning (105). Correlating learning conditions and "instrument" locates structuring a "situation" —or structuring any such

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be delayed or stored so as to become available at some future time. This is the analogue of memory." Wiener, *Cybernetics* (2nd edition), 43, for "hallmark," see Mirowski, *Machine Dreams*, 16. "'Memory' then became a holding pen for accumulated message symbols awaiting utilization by the computational processor."

[153] "Thus far we have been considering the ends to be attained by the educational program. These ends or objectives have been defined in terms of the kind of behavior involved and the content with which the behavior deals. We are next to consider the question of how these ends can be attained (63)."

structure—within the realm of technology. Structures and situations produce effects, just as do hammers or microwaves. Structuring a learning situation rests upon the technique of using an external environment to activate specific internal neurological paths in the learner through which the desired behavior patterns will emerge. A student's experience in a learning situation can thus evoke new patterns of conduct, forsaking old ones. Structuring the structure structures the learner, an idea expressed by cybernetic scholar Herbert Simon.[154]

A second component, behavior and behavioral patterns, a term used extensively throughout the Rationale, occurs within a psychological field. This field develops from what cybernetic social psychologist Kurt Lewin called "the underlying forces of behavior"[155] and organizing external structures is what organizes sufficient amounts of information flows from a "field" to produce educational "reality." Organizing learning environments produces a learner whose patterns of conduct conform to the social norms prescribed by Step One's objectives. As Step Two notes, the "intensity [...] and variety of impression of the information" (and not energy) cascading through a learning environment stimulates "remembering (74)" within the human body, where the function of memory ("remembering") is founded on activating a sufficient level of biophysical information to activate the firings of the nervous system (reflecting Hebb's Rule).[156]

Situations and behavior patterns highlight the third component: information flows. Given a time period, and given a high enough level of kinetic intensity and stimulation provided by the external environment in a situational view, the repetition, flow, and exchange of information eventually shapes a subject's "experience." Forces contained in a *situation* ("the field") are guided and structured under a sense of purpose, and by governing a given *situation*, "purpose" then governs the subject's behavioral patterns evoked by that situation. The intensity and variety of information housed within a given "learning situation" helps explain Step One's need for the 2-D device to earlier expunge unimportant and contradictory information when formulating educational objectives because later when "information is transmitted without loss from a transmitter to a receiver," any contradictory "pattern which existed

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[154] Herbert Simon, "A Comparison of Game Theory and Learning Theory," *Psychometrika* 21, no. 3 (September 1, 1956): 267–72. See Kline, *Cybernetics Moment*, esp. Ch. 5, "Humans as Machines."

[155] Kurt Lewin, "Field Theory and Learning," in *The Forty-First Yearbook of the National Society for the Study of Education: Part II, The Psychology of Learning* (Chicago: University of Chicago Press, 1942): 216.

[156] As Wiener noted, "The all-or-none character of the discharge of neurons is precisely analogous to the single choice made in determining a digit on the binary scale." See *Cybernetics*, 22.

among the elements at the transmitter will be represented in the [later] arrangement of other elements at the receiver,"[157] which produces conflict, disrupting *homeostasis* system-wide. Consequently, the early drive to accurately configure the structure configures the later flow of information, which administers the nature of the behavioral functions produced within the structure. This point bears repeating: when structure changes, the communicated message changes, which means a learning experience within a lesson, a classroom, or a school changes (63).[158]

A time series within the situational view thus organizes information flows to configure behavioral patterns. The intended behavior pattern is a future goal or point towards which planning a learning *situation* will direct future behavior. As the Rationale notes, "time is required to change the behavior patterns of human beings (33)," which does not hold behavior as a pattern based in the past, a view more common to behaviorism. In the situational view, the emphasis rests on the future, on predictability. Manipulating the subject/environment interaction manipulates the subject's desired behavioral pattern towards an expected goal, which is a future goal. The purpose or goal behind what is to be learned—a learning objective—stabilizes a student's future state of being, the outcome being sought. Self-corrections early on in the curriculum-forming process, those movements that are performed automatically (such as the feedback loops and binary questions described earlier), thus target errors and deviations within the learning objective to steer the overall future project to success.[159] If, however, errors were to contaminate the learning objective and thus the subsequent learning environment, the information flows in that subsequent situation will then communicate a wrong message to the subject in the field, producing a self-contradictory educational system, thereby producing a future "unstable" individual or "dysfunctional" society. A clean message is necessary early for a later stable social system.

Consequently, by adopting what I am calling Lewin's (cybernetically-infused) "situational view"[160] the Rationale has adopted an entirely new view of a human being: as an expression of information patterns. As the

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[157] Barrett and Shepard, "Bibliography," 204.

[158] "The term "learning experience" refers to the interaction between the learner and the external conditions in the environment to which he can react (63)."

[159] See Hayles, *Posthuman*, 63.

[160] Lee Ross, and Richard E. Nisbett, *The Person and the Situation: Perspectives of Social Psychology* (Philadelphia: Temple University Press, 2011), Chapter 1.

Rationale explained when it defined learning objectives, it is useful to define "the particular situation in which *the behavior* is expected to operate (61, emphasis added)" and not that in which *an individual* or *person* is expected to operate. And in case that point was overlooked, the Rationale repeats a few pages later how "it is important that the situation be such as to stimulate th[e] kind of behavior (69)" in the targeted human. Indeed, what is at stake is not the view of a human presented by behaviorism. Nor is it the view of a human as a virtuous individual within civic Republicanism nor as an active citizen within a deliberative democracy. Nor is it a view of an autonomous and rational Western Liberal subject, nor does there exist an intentional voice speaking to power.[161] Such outdated models were and are incongruent with contemporary remedies to the question of "What is a human?" Those outdated views dissolve when folding a student's body into the purposes of a larger system. Indeed, cybernetics, just like the Rationale, expunges individual agency. "The subject, the *I*," historian Steven Heims highlights, "is omitted in cybernetics."[162]

Indeed, the net result of folding humans into systems and this new conception of the human condition as a processor of information flows helps birth the posthuman.[163] "In the posthuman," Katherine Hayles notes, "there are no essential differences or absolute demarcations between [...] cybernetic mechanism and biological organism, robot teleology and human goals."[164] These same conditions obtain when the Rationale offers abstract computational processes interacting with human activity through the "thinking machine" (p. 50) or when feedback loops "flow not only within the [human] subject but also between the subject and the environment,"[165] relocating the sense of agency the Rationale presumes. The implications of cybernetics on humanist philosophy were not well considered and are easily pushed to logical conclusions that undermined the liberal humanism that formed it,[166] altering commonsense

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[161] For example, see Bernadette Baker, "What Is Voice? Issues of Identity and Representation in the Framing of Reviews," *Review of Educational Research* 69, no. 4 (Winter 1999): 365–83.

[162] Heims, *Cybernetics Group*, 277 (original emphasis). Also see Hayles, *Posthuman*, Chapter 1; Mirowski, *Machine Dreams*, Ch. 7; Dupuy, *Mechanization*, Ch. 6.

[163] See Hayles, *Posthuman*; Barad, "Posthumanist Performativity;" Rosi Braidotti, *The Posthuman* (John Wiley & Sons, 2013).

[164] Hayles, *Posthuman*, 3.

[165] Ibid., 2.

[166] Céline Lafontaine, "The Cybernetic Matrix of `French Theory'," *Theory, Culture & Society* 24, no. 5 (September 1, 2007): 27–46.

interpretations of the Rationale by entangling the human subject in communications activity and information flows through expanding levels of feedback control loops, relocating power and agency outside of the individual human body, dismantling the representations of objects in the interpretations of and within the Rationale (p. 9).

Human bodies here are conduits for information, communication, and control that span a spatio-temporal grid. Because only behavioral patterns endure—in cybernetics it is "Patterns, not elements, [that] are transmitted"[167]—a new view of the human subject results, one who is not fully "human." The eventual destination for the transmitted educational objectives—that is, the target of that singular directive communicated from one point on a grid to another point—is a human body. The Rationale achieves this by decontextualizing information and logical processes from one point (the social data) to be embodied within the biological mechanisms of the student at another (expressed as the desired conduct). Information flows through bodies situated within an environment, so by structuring a learning environment to communicate the directive (a desired behavior) the Rationale positions the bodies of students in a particular future spatial relationship with each other within an educational system on a grid. The situational view here is a subtle achievement of the Rationale, structuring an understanding of learning—and humans—across a nation. The above helps to explain the natural fit between cybernetics, learning, and schools. After all, "Education is," according to the Rationale, "a process of changing behavior patterns of people (5)."

By focusing on these three components of situation, behavior, and information in its unit of analysis, Step Two communicates an effective procedure to steer the curriculum worker into transmitting a purposeful message. Structuring a learning situation for schools taps the dynamic properties of a mechanical world to generate information patterns (and not energy) that traverse a variety of layered situations across both time and space [168] "[S]tructuring the situation so as to stimulate the desired type of reaction (64)" in the human body, the curriculum worker "uses situations which directly evoke the kind of behavior [...] desired (113)," which is why Step Two plans for situations governed by the purpose prepared in Step One. The information any given situation communicates is evoked by structuring the external environment.[169]

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[167] Eric Barrett, and Geoffrey Post, "Introduction to Some Principles of Applied Cybernetics," *The Journal of Psychology* 30, no. 1 (1950): 3.

[168] Hayles, *Posthuman*, 98.

[169] "…the teacher's method of controlling the learning experience is through the manipulation of the environment in such a way as to set up stimulating situations—situations that will evoke the kind of behavior desired (64)."

To conclude Step Two, the Rationale asks the curriculum worker to weigh the upper and lower limits for the effects of what a potential learning experience may provide, an exercise in prediction and control. Derived from a set of alternatives, the final selection of a learning situation should channel effectively the desired educational benchmark to produce a student aligned to social goals. That social message, the communicated educational objective, produces a desired kind of personality: dynamic, adaptive …modern. Because "educational objectives are essentially [future] changes in human beings (106)," careful planning is critical to fashion the instruments of education (like the learning conditions) in consonance with a larger goal state, the external conditions of learning that structure an internal "social" map within the student aligning both the function (the student's behavior) and the structure (cultural institutions like family, church, civic organizations, etc.) under a "cis-functional" relationship. Enacting these received plans comes in Step Three.

Step Three: How Can Learning Experiences Be Organized for Effective Instruction?

In Step Three, and again following Shannon's model, the received educational message needs to be decoded and reconstructed. In more "practical" terms, reconstructing the message entails organizing and structuring the educational instrument of "real" learning into a "coherent program [...] to produce a cumulative effect (83)" within the body of the student. Reconstituting a signal into an educational message across all points of a system comes by calibrating instruments and devices (learning conditions, teachers, etc.) to change the student more effectively so his or her resulting thought (content) and action (behavior) aligns with the learning objective, bringing behavioral functions in line with larger structured structures.

The "cumulative effect" the Rationale seeks to evoke comes by reconstructing an organized learning experience based on the message. A student's learning experience is made intelligible at different nodes throughout an educational network where localized sites of curriculum reconstruct the 2-D chart's single directive, that intersection on a grid of both "vertical and horizontal relations (84)" in curriculum.[170] Continuity and sequence across grade levels on a vertical axis (time) together with holistic "integration" across academic disciplines on a horizontal axis (space) again intersects as a point, which, according to the Rationale, is exactly what "an effective

[170] "Continuity refers to the vertical reiteration of major curriculum developments (84)," and alongside vertical "sequence [which] emphasizes the importance of having each successive experience build upon the preceding one," both aim towards "higher levels of treatment (85)." "[I]ntegration refers to the horizontal relationships of curriculum experiences (85)."

scheme of organization of learning experiences (86)" looks like. Just as with Shannon's communication model, any learning situation Step Three organizes effectively approximates the reproduction of an endpoint (based on a grid, here of continuity, sequence, and integration) across other points of a system, made real by the earlier use of Step One's 2-D chart. In this, the Rationale seeks to produce and synchronize fixed points from one time and location with others. Step Three organizes experiences aimed at recreating a message that students need to embody.

Pausing to cast an eye back to Step One suggests how all along Step Three was configured already to reconstruct a single fixed point based on a "helmsman" point of view. That fixed point hinges on the idea of an initial "purpose." Back in Step One, the purpose behind selecting student needs and interests "provide[s]" just one "starting point" from a set of possible points "for effective instruction (11)." But from the vantage point here in Step Three and then backtracking through the totality of the Rationale's algorithm, looking back sheds light on how the curriculum worker was charged all along with the task of collecting an initial set of data points from scientific measurements (the three sources of "scientific" data about learners, society, and specialists). Those points were processed by the 2-D device that resulted in a stable fixed point to be reproduced at other locations across a larger system. Presuming curriculum can be used for the reconstruction of desired behavior patterns, even in advance of Step One, or even in the conception of the book itself, presumes the concept of "the curriculum" as information that functions to organize student behavior into a mode of being. "[O]rganization is the carrier of information," one cybernetic scholar noted,[171] and again, from the overall viewpoint reached so far in Step Three, the Rationale is not a physical solution to the problem of constructing curriculum or its instruction. It is not testing the material components contained within any sort of "curriculum" or a school. Rather, it is an effective procedure that suggests a systematic solution by testing different procedures and stages within a communication problem, offering a possible solution among a set of possible alternatives (set theory). In advance, and just as with the steersman point of view, the Rationale already "sees" and anticipates the entire time series of statistical events as possible curricular choices and outcomes.

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[171] George Klir, "On the Relation between Cybernetics and General Systems Theory," in *Progress of Cybernetics; Proceedings of the First International Congress of Cybernetics*, edited by John Rose (London: Gordon and Breach Science Publishers, 1970): 158. As Klir notes, "it is the informational aspect of organization which chiefly interests us, [and] we are here concerned with informational problems, like the problems of communication, control, storing and processing of information, etc. Let these viewpoints be called cybernetic viewpoints."

Step Three's activities to organize experience reproduce the signal selected in Step One and the transmission of which was planned for in Step Two. Organizing learning experiences in Step Three refines another instrument of education—"a more effective educational program (86)"—to recreate a "greater unity of view (84)" in the student, and not transmit "information only as isolated bits (73)." The social data collected in Step One guides the organization of learning experiences because that data helps the student in "organizing his own understanding, attitude and behavior generally (102)" around the social message. Anchored in the learning experiences of organized units, courses, and programs, Step Three's organized hierarchy of information processing (98) structures an instructional program to produce "the greatest cumulative effect from the various learning experiences used (103)."

Turning to the next section's discussion of Step Four will complete the tour of the Rationale's circuit. There the overall communication and control aspects, as well as the aspects of machine learning, will come into full view. That view becomes clear, because there, the instructional programming is subject to modification, since, as Wiener noted,

> as long as the automaton is running, its very rules of operation are susceptible to some change on the basis of the data which have passed through its receptors in the past, and this is not unlike the process of learning.[172]

Step Four adjusts instructional programming based on a feedback mechanism. The Rationale programs the curriculum into an educational system that is itself an adaptive mechanism, part of what a January 1950, Time magazine article called a "Thinking Machine."[173] The educational system itself is recursive.

Step Four: How Can the Effectiveness of Learning Experiences Be Evaluated?

The Rationale introduces Step Four by noting how information throughout the various levels of the Rationale's hierarchical processes have been evaluated already. "[C]ertain preliminary evaluations have already been made (104)" of the developing instructional program through "preliminary" feedback checks, primarily the sub-operations near the end of sections, where, for example, "the learning experiences have [already] been checked (104)" to ensure that they aligned with the overall pre-determined purpose of the program

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[172] Wiener, *Cybernetics* (2nd edition), 43.

[173] "The Thinking Machine," *Time* 55, no. 4 (January 23, 1950): 56.

A final evaluation yet remains. The Rationale's algorithms have rendered the intended social message into a signal to be rendered as output: a data point. As Shannon's model notes, the "fidelity of [a] received message" (the actual state) carried by information (the signal) must match up with the intended message (the goal state).[174] Comparing the final data point against the initial data point evaluates the effectiveness of an instructional program. Did the programming actually achieve its intended goal state? Did it evoke the correct patterns specified by the social data? Step Four requires comprehensive evaluation because it is "impossible to guarantee that the actual learning experiences provided are precisely those that are outlined in the learning units (105)." Accordingly, one must begin "finding out how far the learning experiences [...] are actually producing the desired results (105)" by checking if the educational system sent the right message and if the student received it. Such is the "purpose" of Step Four.

This step's final evaluation procedure inspects the program's output by executing a series of tests. Again, logical conditions: "if there is [already improvement in learning outcomes], then it would suggest that [a] basis for improving the curriculum has [already] been identified (122)." In this instance, since the initial learning conditions ("IF") yielded improvement, "THEN" the test results reinforce the successfully organized learning conditions. But IF results found something "wrong with the course (123)," THEN "the next step is to modify the curriculum in the [desired] direction [and] to see where there is any actual improvement in student achievement (122)", suggesting how *negative feedback* requires the curriculum worker to "modify and improve the curriculum and instructional programs (123)"[175] As with feedback mechanisms, educational evaluation "checks the effectiveness of the particular instruments[...] that are being used to carry [or feed] forward the instructional program (105)" in the overall control system.

Alongside the cybernetic themes of *purpose* and *feedback*, Step Four allows also the designation of the Rationale as *teleological*. Note that any mechanism

> may start towards a goal, but after it deviates it may make no attempt to pursue that goal. It would then be in one sense "purposive" but not "teleological." To be "teleological" it must continue to seek its goal, which requires negative feed-back.[176]

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[174] Shannon, *Communication*, 113.

[175] Also see Eisenhart, "Cybernetics," 397.

[176] Wisdom, *Hypothesis*, 5 (ff#1). See above footnote 112.

Evaluation of educational outcomes is a *feedback* mechanism. Evaluation completes the entire cybernetic circuit to reflect the *purpose* and *teleology* of the entire automatic processes and allows the Rationale's program to run free of intervention from outside authority. The final step of feedback provides a sense of stability (*homeostasis*) to a system based on evaluating the intended purpose the first step provided. Moreover, because the Rationale's system automatically returns to its own state of equilibrium, it can be regarded, in simple terms, as displaying a form of *self-organization*.

The series of feedback checks and loops peppered throughout the Rationale, but particularly in Step Four, reflect the command, control, communication—and surveillance—components of the cybernetic mechanism. As Wiener noted, "The problems of control engineering and communication engineering were inseparable,"[177] and as part of the cyborg sciences, the Rationale is implicated in what one historian described as deriving "from the need to subject heterogeneous agglomerations of actors, machines, messages, and (let it not be forgotten) opponents to a hierarchical real-time regime of surveillance and control."[178] Here, too, the Rationale does not deviate from its cybernetic aspirations. How else can someone determine student learning without subjecting him or her to constant monitoring?

Final Notes

To end, I would like to circle back to where we began. The title—*Basic Principles of Curriculum and Instruction*—suggests the Rationale offers the most "fundamental (1)" principles from which to construct curriculum, as though it offers the most "basic," with no others before the ones it offers. But just how "basic" are its principles?

Three principles emerge before the Rationale offers any basic principles, and so assessing the text's "basic" claims requires that we step outside of the Rationale to access the terrain that forms it. The concept of "purpose," for example, exists in advance of the Rationale's operations and must be ported into the Rationale's architecture. To understand *purpose*, we need to explore the extant background upon which "purpose" exists, which entails

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[177] Wiener, *Cybernetics*, 15-16. These problems centered on "the much more fundamental notion of the message, whether this should be transmitted by electrical, mechanical or nervous means."

[178] Mirowski, *Machine Dreams*, 17. As Dupuy notes, "As the etymology of the word suggests, cybernetics is meant to signify control, mastery, governance." Jean-Pierre Dupuy, "Cybernetics Is Antihumanism: Advanced Technologies and the Rebellion against the Human Condition," *The Global Spiral* (June 5, 2008), 48.

understanding the entire domain in which probability theory operates inside and outside the Rationale and in the world today.

As explained earlier, from an engineering point of view (and others) in decision-making situations there exists a field of equally possible alternatives from which a choice can be made. Each possible state or condition within this field exists as a statistical *event* unto itself, where each *event* is equivalent to another across a flattened field of probabilities. Anything gained by selecting one resulting state or condition may be sacrificed in another. Any choice or decision has consequences under this view. Moreover, as a decision tree demonstrates, at any level of a given selection, the possible options are determined by an earlier selection, since subsequent sets of possible alternatives are already pruned down by a preceding decision. From outside of the Rationale, then, this probabilistic "point of view" has to be in hand *before* first encountering a "basic" principle of deciding the "purpose" in education. In advance of Step One's decisions about an educational purpose, the Rationale first has to inform the field of education about that probabilistic point of view and it does so early on by noting "that no single source of information is adequate to provide a basis for wise and comprehensive decisions about the objectives of the school (5)" because that which informs any "basic" principle about educational objectives must be drawn from a comprehensive field of all possible sources of information. Inputs, the "sources" of data that guide a decision about "purpose" are all the same kind, taken from a flattened dimension located outside of the Rationale.[179]

From this field we can ascertain the arrival of a first principle before the Rationale's most basic of principles. From this unified dimension, from this space of suspended selection, if you will, one that exists outside of the Rationale and is filled with flattened fields full of possibilities and sets of equally probable alternatives, from these groundless grounds that issue the grounds for exclusion, from this transcendental dimension of equally possible directions, there tenders forth a principle of action: a *decision*, a "cut" into the world, as Derrida described.[180] Straddling the inside/outside border of the Rationale's architecture alludes to an initial principle, a single decision that education must be *purposeful*. This solitary act helps construct the architecture of Rationale well before approaching any "basic" principle stated in the first pages of the book.

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[179] Dupuy, *Mechanization*, 122.

[180] Jacques Derrida, "Force of Law: The Mystical Foundation of Authority," *Cardozo Law Review* 11 (1990): 963.

What is more, and still straddling this border, a second *a priori* principle emerges: that rather than suspending any decision to take a wait-and-see approach, the Rationale takes immediate action to execute a "cut." Eliding a discussion of equally possible options or alternatives and deliberating their effects in advance of any subsequent cut suggests an urgency to make a decision about assigning purpose. But why? One possible answer pre-dates the Rationale and reaches back to a question asked in education: "What is and always has been the purpose of education?" As Shannon's communication model suggests, "[T]he purpose of all communication is to influence the conduct of the receiver."[181] By echoing Shannon's model about transmitting messages, the answer the Rationale gives to "What is and always has been the purpose of education?" is to change people, because "Changing human beings [...] is the essential nature of education."[182] The Rationale sees the purpose or goal of instructional programming as targeting a desired kind of conduct to produce a kind of person,[183] and kick starts in advance a decision-making process to immediately achieve a purposeful state or condition—an *event*—to communicate a message to change human beings. We can see how a second principle—that of immediacy—also inheres in advance of any "basic" principle.

A third and final *a priori* principle emerges here as well: that process or method is the best way to achieve or generate (curricular) knowledge. Recall that in lieu of offering direct answers to its four questions, the Rationale offers instead "procedures by which [any] questions can be answered (2)." What the Rationale offers is a process-based solution to a problem of "developing any curriculum and plan of instruction (1)." Behaviorism's response to that very-same problem would have yielded a single answer. But in the context of a post-WWII movement to a more rationalist revolution, the Rationale prescribes the solution to the problem of curriculum development by prescribing a set of rules. The Rationale indeed states this point directly at the outset of the book: do not expect to it to offer a particular answer. That type of system is dead. Instead, the answer that the Rationale offers in its four steps comes *as*

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[181] Shannon, *Communication*, 97. The Rationale: "Education is a process of changing the behavior patterns of people," and "educational objectives then, represent the kinds of changes in behavior that an educational institution seeks to bring about in its students (5-6)."

[182] Ralph Tyler, "The Responsibility of the School for the Improvement of American Life," *The School Review* 52, no. 7 (September 1, 1944): 402.

[183] Hacking, "Making Up People."

a strategy—in a game, a theme taken up in a later chapter.[184] Indeed, an algorithm is how we have come to know the Rationale, if not all of curriculum making since.

Conclusion

I conclude with one final observation on a little considered perspective offered by the Rationale: the expansive power of its circular processes. On one level, the Rationale directs a subject (the curriculum worker) to locate a sense of educational "purpose" in order for schools to communicate a social message to a destination (the student). On this level, the instructions to the curriculum worker are based on a pre-existing source code, an already-written language of programming tapped by the Rationale so it can execute a program (software) to direct the educational instruments in a material world (hardware).

Yet, on a higher level of operations, another "situation" exists: the curriculum worker—the reader—and the text of the Rationale together form a "learning situation." That same pre-existing source code enables the Rationale's program to inscribe within the reader a sense of "purpose" to learn instructional programming by following the protocol laid out in its text. Educational objectives, educational benchmarks—purposes— "are essentially changes in human beings (106)." Understanding that particular "higher" learning situation begs a question: has that learning situation "evoke[d] the kind of behavior which is desired (113)" in the reader? The programming of the Rationale already implicates all readers, the anonymous "anyone who would study and interpret [...] instructional programs"[185] into a broader cybernetic system. You too are already a part of the programming of programming.

Closing on this final observation, I hope I have achieved my "purpose" of opening a new realm from which to discuss the intersection of the science of cybernetics with the human sciences and notions of curriculum. The use of algorithms for programming procedures to plan "the curriculum" brings curriculum into being as an object of

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[184] "A strategy was defined as a 'plan which specifies what choices [one] will make in every possible situation, for every possible information which [one]may possess at that moment in conformity with the pattern of information which the rules of the game provided for [one] in that case.'" Mirowski, *Machine Dreams*, 134-135 (and also 130). See also S. M. Amadae, *Rationalizing Capitalist Democracy: The Cold War Origins of Rational Choice Liberalism* (Chicago: University of Chicago Press, 2003); Paul Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: The MIT Press, 1996); Paul Erickson, *The World the Game Theorists Made* (University of Chicago Press, 2015).

[185] Ralph W. Tyler, *Basic Principles of Curriculum and Instruction, Syllabus for Education 360* (Chicago, IL: University of Chicago Press, 1950), 1.

scrutiny. Those same programming procedures also plan for kinds of people to bring them into being simultaneously as objects of surveillance, for what the intersection of the science of cybernetics and curriculum demonstrates is a particular way of thinking about "human nature," one that is inscribed both within the student of a classroom and the reader of the Rationale and the post-war human sciences. Programming the curriculum-forming process programs a human-forming process.

I hope also the field can begin to disabuse itself of the notion that the Rationale's pursuit of objectives is steeped in scientific management movement and Taylorism, or even the physical behaviorism of the 20th century. In many respects, the Rationale is so "new" and "modern" that it already anticipates other curriculum models because it self-programs. It modifies its own performance based on the results it achieves because its instructional programming algorithm learns from itself. And those self-organizing features, in turn, feed into a larger system—and thus code the collective behavior of a social system, a nation—behind a process that automatically stabilizes and maintains a set of variables, which helps to limit the need of outside intervention from something like the state—the acme of Western liberal democratic governance.

CHAPTER THREE

ASSEMBLING MODERNIZATION PRINCIPLES IN THE CYBERNETIC ERA OF THE RATIONALE

The next few chapters move from the localized site of the Rationale to more broadly discuss how cybernetics moved into social thought to become intelligible as a tool of reform and why. The cultural authority of cybernetic technology, assembled by science, politics, and religion, entangles with other elements of the immediate Post-WWII period, including modernization theory and consensus history. The next few chapters disassemble and then later chapters reassemble these elements, all which grant a better sense of the cultural appeal of cybernetics as a tool to regulate human beings.

This chapter introduces the intimate linkages between cybernetics and modernization theory. The first section explores how the discovery of an emerging science of cybernetics and its technology across the 1940s-1950s contributed to the discovery of the potential and promise of a future state for modern American society. The second section explores how the idea of "modern" was assembled based on a classification process that used a double gesture to locate difference and sameness. The third section explores how the "new" science of cybernetics and that theory of modern converge into a system through developmental theories and a materialist reading of history. I show throughout the chapter how the development of modern systems simultaneously developed a form of regulation in and among human subjects.

Diagnosing America's modern promise, a "new" science, and a cybernetic system of reason

This chapter explores the style of reason used in relation to the Rationale by borrowing from and extending Geoffrey Bowker's (and others') brief interrogation of cybernetics. Bowker and others identified a group of "rhetorical and practical" strategies that contributed to the cultural appeal of classical cybernetics (1943-1970). Below I explore one set of those rhetorical strategies: that which helped to explain cybernetics as a new and "universal discipline." By jumping between abstract and concrete registers to explain different phenomena scientifically, these rhetorical strategies enabled the formation of what Bowker called a "new universal language," and, in turn, a "new reading of human history."[186] New, universal, and "modern" are concepts needed to understand

[186] "Universal," 107–108, 112, 123. For a similar consideration, see also Carolyn Marvin, "Information and History," in *The Ideology of the Information Age*, edited by Jennifer Daryl Slack and Fred Fejes (Norwood, N.J.: Praeger, 1987), 49–62.

cybernetic technology as reform technology.[187] We can gain a sense of the cultural appeal of cybernetics by beginning with how those scientific explanations fed a "new" reading of history that informed a cybernetic vision for a "new" and modern America.

The "new" science of cybernetics advanced an explanatory mechanism that fed a meaning of modern by joining domains that before had been hopelessly separated. "Man" and machine, nature and society (or nature and culture), *nomos* and *physis*—all now could be synthesized under a common "system." Synthesizing many of those previously separated domains helped hoist cybernetics into a realm of "newness." As an unprecedented scientific achievement, cybernetics was so "new" that a 1948 *New York Times* book review of *Cybernetics* heralded its scientific advances as "an intellectual turning point in man's understanding of himself and his universe."[188] A 1949 review noted how the very "subject [of cybernetics] is so complex [and] so awe-inspiring in its relation to the future and to all of the sciences to which it is related."[189] This advanced modern science and technology had dwarfed achievements of the past and its "relation to the future" helped leverage developing a theory as to what modern meant. The rapid sense of change wrought by science and technology during this postwar period assembled a new science of "complexity" that seemed to explain a new world order by surpassing older, "simpler," and linear models of behaviorism, announcing that the modern world now beheld the dawn of "another social potentiality of unheard-of importance."[190]

Cybernetics provided a modern sense of unmatched social potential and promise. That potential and promise was adopted into psychology and intersected with the field of education at the 1948 "Centennial

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[187] Allow me to offer a few notes on usage. The use of the term "America" throughout refers not to the entirety of the Americas, but to the United States, and its use comes with full awareness of its loaded intellectual baggage. The use of the word "modern" up to this point has been suspended in quotes because it is taken from the referenced literature and below it is used the same way without quotes to show continually how it reflects an ensemble of problematic concepts and meanings, all without any attempt to ground it. The use of the gendered term "man" below may be interchanged with the term human, both of which are meant here to be inclusive, despite its use otherwise in the scientific, educational, and modernization discourse at the time. Finally, periodization and the use of Universal Time remains problematic. Here I follow the standard set by other texts primarily to make connections.

[188] William Laurence, "Science in Review: Cybernetics, a New Science, Seeks the Common Elements in Human and Mechanical Brains," *New York Times*, December 19, 1948: E9.

[189] Harrison Smith, "The Machine in Man's Image," *The Saturday Review of Literature*, January 8, 1949, 22.

[190] Wiener, *Cybernetics*, 37.

Celebration" conference of the American Association for the Advancement of Science (AAAS). The schedule of conference speakers included only "the most distinguished scientists of the country"[191] to address the stated "theme of [...] 'One World of Science',"[192] and the discussion silently suggested a theme that the nation's fullest potential could now be realized finally in a modern era. The conference speakers recognized how the free "spirit [of science] can be of the greatest service to mankind" in "a perilously divided world." The theme of potential behind restoring a "belief in the possibility of limitless progress in an orderly and dependable universe"[193] referenced a double gesture: "great promise for us, as well as peril." On one hand, fears surfaced that America had not achieved its fullest potential, expressed chiefly behind the need to organize a conference around restoring that promise. On the other hand, hope prevailed that such potential could be realized through scientific research into all reaches of American life, "the state of affairs in the life of man with which [the AAAS] is chiefly concerned,"[194] where research into "High Polymers" and "Waves and Rhythms" applied equally to research in "Educational Potentials" and the "Sciences of Society." At this conference, for example, Ralph Tyler articulated how

> the potentialities for some kind of learning of children and youth at all levels, from the most superior to the least, are greater than are commonly realized. Our present schools and colleges do not achieve anything like the results that are suggested by the potentialities indicated by [current scientific research].[195]

Conference speakers placed their hopes in current research, like that of the new science of cybernetics. Current research could help guide a nation's social modernization to restore its fullest potential. Yet, on what basis was this category of modern built, from which then a nation could be inserted and diagnosed with potential?

The particular theory of modern and its potential was assembled by different elements explored below. Those elements are explored by understanding how a *style of reasoning* (Hacking) contributed to a modern *system of*

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[191] Edmund Sinnot, "Preface," in Centennial: Collected Papers Presented at the Centennial Celebration, Washington, D.C., September 13-17, 1948 (Washington, D.C.: The Association, 1950), iii.

[192] Staff Report, "'One World of Science' Stressed at AAAS Centennial Celebration," *Chemical & Engineering News Archive* 26, no. 39 (September 27, 1948): 2886.

[193] Edmund Sinnot, "One World of Science," in Centennial Program; 1848-1948: The One Hundred Fifteenth Meeting and Sixth Washington Meeting, Sept. 13, 1948 to Sept. 17, 1948 (Washington, D.C.: The Association, 1948), 9.

[194] Sinnot, "Preface," iii.

[195] Ralph Tyler, "Educability and the Schools," in *Centennial: Collected Papers Presented at the Centennial Celebration, Washington, D.C., September 13-17, 1948* (Baltimore: The Association, 1950), 47. Tyler added that "there should be a narrowing of this great gap between the level of present school practice and the potentialities for learning which is indicated by many experimental studies."

reason (Popkewitz). Two elements contributed to the system that reasoned about what modern meant: a sense of comparative reasoning (analogy and metaphor) and, as just witnessed, a double gesture (e.g., the double of *a hope* in science to ameliorate *a fear* that America had not achieved its fullest potential). Comparison and this "doublet" (concepts introduced in chapter one) organized knowledge of how societies modernized by formulating distinctions and categories.

The next section unpacks how this system of reason assembled the category of modern and its potential. There I begin with the double gesture's element of difference—those distinctions in the overall system of reason that helped to assemble the meaning behind the category of modern. Difference explained a changing view of science from a "classical" Newtonian view to a more quantum modern view of statistical mechanics, and the "awe-inspiring" perception of cybernetics as the modern science *par excellence*—its relation to the nation's future potential and its domestic social order—helped bolster a theory of modern. Note here that the emphasis at the time accentuated difference to locate what the term modern meant. Yet after that discussion of difference I explore in the third section how such a definition of the category of modern was and is possible by implicating the concept of sameness.

Deconstructing and reconstructing difference

A theory of modernization fed a discourse that situated American society at an intellectual turning point. This theory positioned "America" at a higher, unique stage across history—that it was modern—which the objective science of cybernetics established as fact. Nils Gilman's *Mandarins of the Future* defined modernization theory as "rooted in the contrast between 'traditional' and 'modern' societies" and modernization theory "posited the existence of a common and essential pattern of 'development,' defined by progress in technology, military and bureaucratic institutions, and the political and social structure."[196] The comparative logic of difference and

[196] Gilman, *Mandarins*, 3. For other references on the post-was "American" and Western definition of modernization, see Perry Anderson, *A Zone of Engagement* (Verso, 1992); David Engerman, "Modernization from the Other Shore: American Observers and the Costs of Soviet Economic Development," *The American Historical Review* 105, no. 2 (April 1, 2000): 383–416; Thomas Haskell, "Modernization on Trial," *Modern Intellectual History* 2, no. 2 (August 2005): 235–63; Michael Latham, *Modernization as Ideology: American Social Science and "Nation Building" in the Kennedy Era* (University of North Carolina Press, 2000); and Latham, "Modernization," in *The Cambridge History of Science, Volume 7: The Modern Social Sciences*, ed. Theodore M. Porter and Dorothy Ross (New York: Cambridge University Press, 2003), 721–34; Thomas A. McCarthy, "From Modernism to Messianism: Liberal Developmentalism and American Exceptionalism," *Constellations* 14, no. 1 (March 1, 2007): 3–30; *Total War and "Modernization,"* ed. Yasushi Yamanouchi, J. Victor Koschmann, and Ryuichi Narita (Ithaca, N.Y.: Cornell Univ East Asia Program, 1998).

"contrast" that Gilman identified helped synthesize two constituent elements—traditional versus modern—and alongside the development of the science of cybernetics, and, in conjunction with the rapid changes seen in techno-scientific know-how, all suggested that the modernization process was already under way in the nation.

Three elements were used to establish a sense of difference from which to then diagnose the nation on a modern stage. The first element includes a theory of scientific progress. Notions of scientific progress enabled identification of an older, static Newtonian view and its characteristics and categories (that Gilman ramifies across technology, military and bureaucratic institutions). The second element includes how that old Newtonian view enabled researchers to identify new scientific views, and their characteristics and categories focused on dynamic processes, states, and conditions. A third element situated the United States as being on the new end of the trajectory of progress, as being on the cusp of a new frontier (which connects with a narrative of exceptionalism, taken up in the next chapter).

First, a theory of scientific progress enabled the identification of characteristics and categories of an older static Newtonian view based on things. The designation of that which was "old" was mounted on an assumed historical trajectory of scientific progress that spanned from Newton to the modern cybernetic era, and identifying an old and outdated "traditional" worldview would identify old-fashioned social categories based on class, rank, race, or ethnicity.[197] Social psychologist and Macy Conference member Lawrence Frank made visible some of the changes across social thought in his "Foreword" that summarized a Fall 1946 conference on "Teleological Mechanisms." Any traditional worldview was derived from a scientifically antiquated "Newtonian conception" of the world, an "older cause-and-effect" linear view that implied a "potent 'cause'," a "mysterious power" or a "large-scale" causal force that "operat[ed] upon a passive something to produce the effect" by "acting at a distance."[198] This obsolete idea was introduced already in the last chapter when Tyler referenced how "earlier scientific work assumed that human beings were largely incapable of autonomous action and were shifted hither and yon by forces beyond their control."[199] Such an obsolete view and its related categories preserved an "animistic conception" by

[197] "However, it is certainly true that the whole scale of phenomena has changed sufficiently since the beginning of modern history to preclude any easy transfer to the present time of political, racial, and economic notions derived from earlier stages." Wiener, *Human Use,* 45.

[198] Frank, "Foreword," 189, 194.

[199] Tyler, "Human Behavior," 426.

assuming that "living organisms exhibit only the elementary forms" of behavior, disregarding "the essential circular processes of action, reaction, and interaction, taking place in the 'field' of intra- or interorganic events." Preserving an antiquated traditional view in society would only preserve "an earlier stage" on this historical trajectory and reveal a static social world, "a regressive movement" back to those "anachronistic" social categories of blood, nationalism, chauvinism, or other outdated social categories anchored in Newtonian physics and energy mechanics, conclusions based solely on socially static "*product*s" that "neglected the dynamic *process* producing them."[200]

Second, the trajectory of scientific progress that enabled identifying a set of older static Newtonian categories allowed identifying a new and different set of dynamic modern categories based on states or conditions. Antiquated Newtonian frameworks were dismantled by new appraisals that emerged from a probabilistic world of statistical mechanics. Mechanism versus vitalism, causality versus teleology, machine versus neurons: the centuries old impasse among a series of competing scientific Newtonian categories collapsed when a modern cybernetic science ushered in new knowledge, as Wiener explained,[201] again leading to a sense of a different era. By contrast—that is, by comparison—a modern "systems" view, as chemist and education reformer James Conant explained to a conference on the Unity of Science movement, emphasized not the static but "the dynamic nature of science"[202] under which objects, including biological phenomena, developed under processes governed not by a distant force but by a very present dynamic field. Again, Tyler expressed this idea when he referenced how the life and social sciences increasingly emphasized the *active* subject of study, one "directed not only by basic biological drives and needs," but also by understanding "the individual [as] a dynamic organism,"[203] one no longer a *passive* product of earlier linear process. A modern world generated a different set of categories marked by states or conditions, categories based on processes, not products. Any diagnosis of the nation's modern potential would thus rest not on

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[200] Frank, "Foreword," 194-196 (passim), 191 (original emphasis). Also see Pierre Kerszberg, "Cosmology: Newton to Einstein," in *Companion to the History of Modern Science: Cosmology from Newton to Einstein*, ed. R. C. Olby et al. (London: Routledge, 1990), 639–50.

[201] Wiener, *Cybernetics*, 2nd ed, 1961, 37-38.

[202] J. B. Conant, "Greetings to the National Conference of the Institute for the Unity of Science. Boston, Massachusetts: April 1950," *Proceedings of the American Academy of Arts and Sciences* 80, no. 1 (1951): 13.

[203] Tyler, "Human Behavior," 426.

traditional categories of standalone products or things that had sparked trouble in the past, but on the social processes that generated modern modes of being within and among objects.

Comparing basic processes situated along a trajectory of scientific progress helped locate a modern condition. First, the state or condition of simpler lesser-developed systems could be identified by locating their simpler, lesser-developed processes. Contrasting the activity of processes across a developmental framework enabled those processes and their corresponding objects to be distributed across developmental categories. For example, take the learning process, as described by two systems theorists at the time: "Nonhuman animals learn by trial and error. They are less complex, less human, as a result, because they are less purposeful, less mechanical."[204] The diagnosis and distribution of a solitary object across a developmental trajectory, based on a hierarchy of processes like those observed in learning, applied equally to social "systems." A focus on process allowed designating traditional societies as socially different: simpler, smaller, and with less purpose, such as how Tyler contrasted the processes of "the primitive culture of the Indian or the Eskimo" against the processes that developed "the complex organization of [an American] local urban community."[205]

Moreover, juxtaposing complex urban social organization against "primitive cultures" shows how the modern advanced social condition was characterized by different states or conditions. Positioning the processes correlated with complex urban social organization against the processes correlated with "primitive cultures" exemplifies how a modern social condition was characterized as different. In contrast to older, simpler, and traditional processes based on trial and error, the historical trajectory of scientific progress made visible, according to cybernetic theorist Ross Ashby, how "The organisms we see today are deeply marked by the selective action of two thousand million years' attrition. Any form in any way defective in its power of survival has been eliminated [, so] when we study the brain we are again studying a means to survival"[206] embodied in complex modern conditions.

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[204] C. W. Churchman, and R. L. Ackoff, "Purposive Behavior and Cybernetics," *Social Forces* 29 (1950-51): 33. For conceptual differences between static and dynamic, see Beniger, *Control Revolution*, 109-112.

[205] Ralph W. Tyler, "The Organization of Learning Experiences," in *Toward Improved Curriculum Theory. Papers Presented at the Conference on Curriculum Theory ... 1947*, ed. Virgil Herrick and Ralph Tyler (Chicago: University of Chicago Press, 1950), 65.

[206] W. Ross Ashby, *An Introduction to Cybernetics*, 2nd Impression (London: John Wiley & Sons Inc, 1957), 196 (original emphasis).

Modern cybernetic systems were guided by more "mature" forms of reasoning and rationality about the world, argued cybernetic adherent and political scientist Karl Deutsch.[207] Such systems, according to social psychologist Frank, were based on "successive levels of complexity and multi-dimensional interrelationships"[208] that produced a modern world characterized by civilized, urbanized, industrialized, cosmopolitan—and *purposeful*—social systems, just like those observed in the (then) United States (a point taken up shortly) and that inaugurated a way of regulating human conduct.

Finally, the modern condition and its underlying processes carried moral qualities, not in a progressive and emancipatory sense, but in ways that constrained and limited possibilities for human conduct. Locating basic modern processes naturalized how to reason about different standards for human conduct. For example, the post-war era systems scientists who "espoused the behavioral persuasion," writes Ron Robin, "approached the human species as, first and foremost, a self-seeking organism, dominated by egotistical cravings for survival, sexual gratification, and the diminishing of hunger and fear," those lesser developed behavioral processes closely associated with nonhuman and simpler organisms. By contrast, according to Robin, those vulgar human behaviors oriented around the simpler self were mollified by "contemporary social circumstances"—like those contained in the more advanced modern systems, I argue—social conditions that "had repressed and tamed these primitive, basic instincts."[209] In this view, the more modern and dynamic an environment, the more a human organism was directed away from its atavistic modes of conduct and toward a more machine-like, rational, and enlightened standard of behavior, all with increased attention to a system's greater whole, a view underscored by observations made in Riesman's *The Lonely Crowd* (1950) and Whyte's *Organization Man* (1956), or the Rationale's emphasis on social rather than selfish attitudes.[210] Advancing toward a modern system worldview and away from a traditional one entailed a way of reasoning that governed human conduct and constrained possibilities for human activity. In this, difference ordered

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[207] Deutsch, "Natural and Social Sciences," 506–33.

[208] Frank, "Foreword," 193.

[209] Ron Robin, *The Making of the Cold War Enemy* (Princeton, N.J.: Princeton University Press, 2009), 96.

[210] David Riesman, Nathan Glazer, and Reuel Denney, *The Lonely Crowd: A Study of the Changing American Character*, revised (Yale University Press, 2001); William H. Whyte, *The Organization Man* (Philadelphia: University of Pennsylvania Press, 2002); *Basic Principles*, 46-56 (*passim*).

new worlds, interred old ones, and comparative references to "back then" became part of a usable past. And a moral order.

The third and final element repositioned the United States as different. Upon a historical trajectory of progress, the same "contemporary social circumstances" that Robin identified were the same conditions that quickened the new modern science, that repositioned the United States as (once again) resting on the cusp of a new frontier. On a cultural level, a "September 1945 [issue of] *Look* magazine published a photographic essay picturing the distinctive features of American society" that emphasized "a partial list of America's new frontiers [...] the modern house [...] the automatic washer [...] the express highway."[211] On a policy level, Vannevar Bush's 1945 report on the "Endless Frontier" sought to mobilize government funding to aid agency "research efforts to expanding the frontiers of knowledge," which was "the modern way to do it," a necessary step both because "We can no longer count on ravaged Europe" and because it was "in keeping with the American tradition—one which has made the United States great."[212] These scientific developments were "The newest developments, particularly in the United States,"[213] which included cybernetic scholar Kurt Lewin's *Frontiers in Group Dynamics*.[214] On a research level, one MIT scientist noted in 1953 that "[f]or biological and social scientists," what cybernetics contributed to research was not a return to an old static view, but rather "a new point of view" and a new modern "*system* of concepts for studying the organism[,(a function)] its relations with other organisms [another function] and with the inorganic environment [a structure]."[215]

A new "systems" point of view unified how a function and structure interacted. This interaction provided new insights into how contemporary American social circumstances were different, which meant America was

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[211] James B. Gilbert, *Another Chance: Postwar America 1945-1968*, 1st edition (New York: Random House USA Inc, 1988), 3.

[212] Vannevar Bush, *Science, the Endless Frontier: A Report to the President* (on a Program for Postwar Scientific Research) (U.S. Government Printing Office, 1945).

[213] Anatol Rapoport, *Operational Philosophy*, viii.

[214] Kurt Lewin, "Frontiers in Group Dynamics [I] Concept, Method and Reality in Social Science; Social Equilibria and Social Change," *Human Relations* 1, no. 1 (June 1, 1947): 5–41; Kurt Lewin, "Frontiers in Group Dynamics II. Channels of Group Life; Social Planning and Action Research," *Human Relations* 1, no. 2 (November 1, 1947): 143–53.

[215] Barrett and Shepard, "Bibliography," 204 (emphasis added).

different, if not exceptional. On a "micro" level, the advanced science of cybernetics provided a new framework to study how the processes isolated among a function's constituent elements contributed to its development and adaptation to a greater environment, regardless of whether that function was mechanical or not. Yet, when taken to a "macro" level, the new framework provided those working in the biological and social sciences the capacity to generate a new set of conclusions by generalizing how the activity of an organized whole—an organism—functioned as a part of a larger environment. Any organism thriving in a unique, new, and modern environment, like the contemporary social circumstances, suggested how the American "social body" held unique, new, and modern qualities that granted its capacity to function, adapt, and survive in that new, modern, and dynamic environment. Earlier structural and functional evolutionary developmental frameworks had already concluded more advanced organisms possessed higher-level functions and complex processes (taken up in the next chapter). The discovery of a new advanced science like cybernetics within a new, modern, and dynamic world suggested American social conditions housed the capacity or "potential" for higher-level functions and complex processes absent from traditional societies and other contemporary nations, suggesting also America's position as different, as the most advanced of all nations in a new and modern world. An American social system was new, dynamic, and modernizing at the frontiers of a different stage of maturity.

The dynamic modern environment in which the American system found itself had already reconfigured perceptions of the American social order. The modernizing processes were part of what Wiener diagnosed as the "second industrial revolution," again a new version of the old, since "new technological developments" belonged "to the [present] age."[216] Such changes meant traditional features were out; modern was in.[217] For example, observers of the social landscape, including an educator like Ralph Tyler, had already diagnosed that "The urban community is the most significant social development of modern times. This unique form of social organization is the logical culmination of a complex industrialized society, the cultural fruit of technology. It symbolizes modern America."[218]

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[216] Wiener, *Cybernetics*, 38.

[217] Robert M. Collins, "David Potter's People of Plenty and the Recycling of Consensus History," *Reviews in American History* 16, no. 2 (June 1, 1988): 329. Also see Kenneth D. Benne, "An Approach to Issues Underlying Curriculum Development," *The Journal of Educational Research* 41, no. 8 (April 1, 1948): 562.

[218] Ralph Tyler, "Relations of the Urban Community and the Modern School." *The Elementary School Journal* 43, no. 1 (1942): 14.

Another educator, B.O. Smith of the University of Illinois at Urbana-Champaign, observed in 1947 how "America was blessed with power" in many forms "beyond the wildest dreams of the most adventurous of history's speculative minds," and it was during this unique period, "surpassing that of any other period in human history"—indeed, during "no other cultural period"—that educators needed to abandon "obsolete habits of thinking in a linear and compartmentalized fashion"[219] to favor instead the modern cybernetic circular processes. The inexorable march of scientific progress past traditional categories had led the nation into the category of modern.

To conclude this section on difference, the argument here is not to position a "technological determinism" but to emphasize how a comparative framework and a sense of difference within a double gesture appended to the authority of science and technology to define what the category of modern meant. Difference and contrast were one set of the building blocks that helped diagnose and supply the "facts" that then helped explain a *new* modern order that then helped to assemble a larger narrative about the distinct nature of a new science, the processes of modernization, and the potential of the modern nation, all with implications for its domestic social order. The persuasiveness of this narrative, again based on the authority of science and technology that circulated in society, indeed employed a narrative of exceptionalism, taken up in the next chapter, for these elements of difference fed the discourse that American society (and Western culture) existed at a new frontier, at a higher stage in a "new" reading (Bowker) of history. These elements also suggested functions (people) within this larger system needed to be reformed to adapt to modern circumstances.

Connected to Sameness

The rhetoric that articulated the category of modern required from another angle a sense of sameness. The idea of difference that elevated modern America was predicated on an idea of sameness that placed all societies on the same continuum from simple to complex, from primitive to modern, and thereby allowed a modernized society to be placed on the privileged end. To explore sameness, and to further naturalize the standards of human conduct under the "new" and modern circumstances, this section discusses how a sense of sameness was needed to define modern through a linear theory of development.

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[219] B. Othanel Smith, "Social Perspective as the Basic Orientation of the Curriculum," in *Toward Improved Curriculum Theory. Papers Presented at the Conference on Curriculum Theory*, edited by Virgil Herrick and Ralph W Tyler (Chicago: University of Chicago Press, 1950), 4-5.

The traditional-to-modern distinction occurred upon a spatiotemporal trajectory of sameness. Upon an embedded narrative of the "same" linear development upon which difference and distinction were given intelligibility. This Spenserian simple-to-complex "metanarrative" was needed to demarcate the different "stages" of historical development that explained "man's" movement toward modern technological advances. For example, in 1948, Yale philosopher and Macy Conference regular F.S.C Northrop argued sameness in how "the brains of men in early so-called primitive societies are provided with ["trains of impulses"], just as are the brains of men in so-called modern societies," although "it [also] follows [that] the specific [normative social theories] may be different" for each society.[220] In the discourse of this spatiotemporal trajectory, traditional societies were grouped as "primitive," simpler, and underdeveloped, suggesting again how the "primitive culture of the Indian or Eskimo" were different from the more modern "system" societies with higher levels of "complex organization [recognizable in a] local urban community."[221] The complex and different characteristics that defined modern and its societies represented what Wiener termed a "split" from the past[222] and were based on an initial socio-cultural symmetry (sameness) that changed through "the common and essential pattern" of development drawn toward a technological present that Gilman's study elucidated.

This sense of sameness was needed for the comparative venture to succeed. On one level, with sameness, cybernetics explained much broader and wider social phenomena beyond just the neurophysiological behavior of a human system. As University of Chicago systems psychologist Daniel Prescott (referenced in the Rationale) explained in 1944, "Cerebral functioning, involving thinking, reasoning, problem-solving, is man's heritage" (sameness). Yet, on another level, that functioning also served as the basis of "his hope of lifting himself further and further up from savagery on to an ever rising [different] plane of civilization."[223] In the grand scheme of the linear theory of development within historical progress, the double gesture to difference and sameness functioned to define what modern meant and explained how the current character of that important symbol called "America" reflected a

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[220] F. S. C. Northrop, "The Neurological and Behavioristic Psychological Basis of the Ordering of Society by Means of Ideas," *Science* 107, no. 2782 (April 23, 1948): 416.

[221] Ralph Tyler, "Learning Experiences": 65.

[222] Wiener, *Cybernetics*, 39. Also see Northrop, "Means of Ideas," 417.

[223] Chicago Collaboration Center, *Child Growth*, 36.

sense of complexity and scale that organized society looked like. Since all societies were the same by evolving along the same line of development, and since the conditions of traditional societies were all the same by being simple in their "economic organization, political institutions, and central values that held societies together,"[224] then a modern nation was different—and complex—in each of the same, a point to which we shall return. But within this comparative system of reason that which was not privileged, that which was not modern, fell to "sameness" and were grouped as the same kind: underdeveloped, traditional, and backwards. Consequently, the new relationship between part and the whole within a new and modern cybernetic system, and the relationship between traditional and modern, carried constraints for human conduct, since anything new and different in modern society was not "that kind."

Difference extracted from sameness through materialism

A comparative system of reason comes into greater relief if we understand how difference was extricated from sameness based on material dimensions.

To begin, first, materialism served as the lens through which to compare, contrast, and assess the idea of modern, based on physical facts and features mounted on the simple-to-complex same trajectory of development. Comparative reasoning interacted with this "old" sense of materialism (not the New Materialism discussed in Chapter One) to extract difference and sameness to articulate what modern meant. As Gilman points out, "modernization refers to the technological and material dimension of bourgeois society,"[225] and the historical materialist interpretations were not Marxist, yet they similarly assembled materialist elements that were stamped onto a scientific view.[226] These material dimensions, as in "science, technology, and industry as the keys to global peace and prosperity,"[227] distinguished the achievements of a modern social system. In this "old" materialist view, war had indeed been "destroying the material culture of a large part of our own country and of the world and with it

[224] Latham, "Modernization," 723.

[225] Gilman, *Mandarins*,7.

[226] On the variations between the Marxist and progressive line of thinking, see John Higham, "Changing Paradigms: The Collapse of Consensus History," *The Journal of American History* 76, no. 2 (1989): 460–66.

[227] McCarthy, "Messianism," 4.

much of the intellectual, artistic, and moral heritage dependent on that material culture."[228] Measuring historical differences through a materialist lens accentuated difference among cultures, which bolstered the credibility of the unfolding scientific discovery of communication and control, an advanced modern technology that was different from the earlier, same old technology steeped in energy mechanics, which, in turn, reaffirmed the spatiotemporal uniqueness of the historical period.

Second, material distinctions applied to systems technology and organization. Extracting difference from sameness in this scientific view comes by understanding organization as a form of technology. According to the new science, disorganization prevails in a universe of chaos. The staging ground for the existence of anything is the same: disorder, which leaves no measure of information or "patterns." But when out of that chaos things come into being and scattered parts finally organize into a whole, it is *information* that organizes (recall that "[O]rganization is the carrier of information,"[229]). Information is what emerges to circulate and communicate as the binding and controlling force that makes visible an organized whole on a field of chaos.

From this conception, only a short step is needed from interpreting divergent levels of organization of a given system at one level (such as a human system) to interpreting the same divergent levels of organization at another (such as a social system), which, according to Wiener, underscored how "the importance of information and communication as mechanisms of organization proceed beyond the individual into the community,"[230] a point critical to understanding both why a notion of consensus was needed to keep a complex system together, and curriculum (information and it's channels) as a social message. If the levels of an organized social system were more advanced and complex (different) than other (same) societies, surely such a system was technologically more advanced and required an advanced modern educational *system* to transmit *information*.

The doctrine of materialism being used explained how a system stays organized further constrained standards of human conduct by compelling new and modern human relationships. The functions within these new dynamic systems (humans) had to adapt to the new circumstances by embodying a new set of relationships to stabilize that system. For example, Prescott's systems-view of the personality (the self) understood "The human

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[228] G. Evelyn Hutchinson, "Social Theory and Social Engineering," *Science* 104, no. 2694 (August 16, 1946): 167.

[229] Klir, "Cybernetics and General Systems Theory," 158.

[230] Wiener, *Cybernetics*, 27. "It is certainly true that the social system is an organization like the individual." Wiener, *Cybernetics* (2nd edition), 24.

organism" not as a primitive agent, but as a different "multi-systemed structure of complex and dynamic energy systems" and already "This organism [was] highly differentiated" and already was integrated with other "inter-dependent systems which act together to maintain" overall organizational stability. When "The energies of the organism in excess of that required for its own maintenance and growth are freed[, they] may be directed toward creative or investigative activities which contribute to the self-realization of the individual and to the well-being of society." This view held an already embedded particular relationship between the part to itself, to others, and to the whole. To help instruct the part function in its new role "as a self or personality," Prescott urged that "The teacher should be helped to see" how the function (the individual human) already embodied particular ethical commitments by being "conscious of its [the function's] continuity in time, of its relationship to other personalities [another function], [and] of its roles in society [a structure]." Material distinctions about organized wholes generated conclusions about modern systems that compelled new relations between the modern American (a function) to itself, to other Americans (a function), and to a modern American society (a structure), situating all under the same simple-to-complex trajectory that distinguished acceptable behaviors needed for maintaining organization within a complex system from out of the entropic soup.

Third, materialism and systems thinking comingle. Tapping principles "[f]rom the physical point of view" generated material diagnoses about systems.[231] Under this material and physical view, systems were, are, and always will be in motion (not static),[232] and were, by default, always present on the arrow of time, moving from "back then" and forward to a future on the same Spenserian same trajectory of simple-to-complex (Prescott's "continuity in time"). For example, just as historians had recognized how "Commerce, industry and science turned the medieval world upside down within a span of two hundred years," so too did educators, who tapped these systems of reason, need to heed these "Emerging Traces of the New Era," argued B.O. Smith.[233] The movement across continuous "stages" of the same progressive development stressed how the modern turn in science had developed from a

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[231] Ludwig von Bertalanffy, "The Theory of Open Systems in Physics and Biology," *Science* 111, no. 2872 (January 13, 1950): 23; Gregory Bateson, "Physical Thinking and Social Problems," *Science* 103, no. 2686 (June 21, 1946): 717–18.

[232] Wisdom, "Hypothesis," 20.

[233] Smith, "Social Perspective," 4-5.

Newtonian stage into a quantum one, which was preceded by the displacement of Aristotelian science by Copernican by Galilean by Newtonian with the later culmination into a new stage of systems science. The material dimensions used to understanding "new" technology, science, and worldwide challenges (modernization) were mounted on "different stages of transition from the old to the new," articulated Lewin, and always away from an "earlier stage" in the "movement toward a more effective conception of the problems we face today" in modern systems.[234] Indeed, "One of the byproducts of World War II of which society [was] hardly aware [was] the new stage of development which the social sciences ha[d] reached. This development indeed may [...] be as revolutionary at the atom bomb."[235] The physical diagnosis of systems allowed the possibility to differentiate the modern stage.

To review, the interactions of difference and sameness were a part of a double gesture that helped to define the concept of modern. These interacting elements entangled with the rhetorical and practical strategies (Bowker), which assembled "commonsense" explanations about the appearance of "new" phenomena under study, reaffirming a diagnosis and cultural appeal about the cybernetic apparatus as new, modern, and universal. The interaction of such features also fed a discourse that assembled a category of what modern meant, and the subsequent "fitness" of an American society into that classification as moving into a higher stage, into a future state of modern history with untapped potential, part of the "new" modernizing historical narrative that had enveloped the nation. In the next section, we further explore how a sense of convergence helped to pull cybernetics and the idea of modern closer.

Difference and Sameness Converge to Organize a System

The techno-scientific knowledge within this system of reason assembled a "developmental" interpretation situated in a sense of Universal Time that helped form the category of what contemporaries called modern. One axis of "different" vertical stages of scientific progress interconnected with another axis on the "same" horizontal trajectory of simple-to-complex growth. When both axes intersected, they generated an intelligible grid, which shaped interpretations about the "potential" of social life internal to a (now) modern American society, particularly when scientific and technological growth were tied to economic differences around the world (thereby strengthening

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[234] Frank, "Foreword," 191.

[235] Kurt Lewin, "Frontiers I," 5. Also see "the essential notion that modernization was a universal process structured over time into distinct stages" in modernization theorist Walt Rostow's influential *The Stages of Economic Growth*, in Hunter Heyck, *Age of System* (Baltimore: The Johns Hopkins University Press, 2015): 154. See also Yamanouchi, "Total War," 31-32.

American faith in capitalism, taken up in a later chapter).[236] When comparison and double gestures entangled with the intelligibility of this grid, a seemingly pre-established sense of natural order became visible. From within this natural order, new notions of scientific integration, complexity, and of modern systems were generated, from which emerged "the common and essential pattern of 'development'" that Gilman's study elucidated. What enabled the vertical and horizontal axes to intersect into a grid, from which came the diagnosis of America as modern, was the idea of convergence.

Modernization theory and cybernetics unite under the same discourse of convergence. As part of the discourse of the era,[237] convergence, according to Gilman, ranked as "the strongest of all the unexamined assumptions of the modernization theorists: the belief that modernization was a convergent process,"[238] in which cybernetics had a hand. Moreover, the belief in convergence of scientific and technological processes helped build resolve to integrate the sciences upon the "essential" nature of systems.[239] One observer summarized the converging scientific research from the period, noting the broad "convergence in basic theoretical approach[es ...] related to recent trends in physics and mathematics[,] in logic [,] and in modern art and architecture."[240] In the *style of reason* that Tyler embodied, convergence of interdisciplinary research into a complete science of systems was required even about knowledge: "Children who grow up without systematic instruction are generally incapable of participating as responsible adults in our society and are usually maladjusted and unhappy individuals."[241] Modern ideas in many forms conveyed and coalesced around systems.

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[236] "[W]e already have the kind of material civilization that has been developed by material inventions." Ralph Tyler, "Major Issues in Education Today," *Ohio Schools* XXV (February 1947): 87.

[237] "Many scholars today speak of the imminent convergence of communications and computer technologies. At MIT in the early 1950s, just such a convergence was taking place." Hunter Crowther-Heyck, "George A. Miller, Language, and the Computer Metaphor of Mind," *History of Psychology* 2, no. 1 (February 1999): 49.

[238] Heyck, *Age of System*, 281.

[239] Redfield, *Levels of Integration*.

[240] Laura Thompson, "Some Significant Trends toward Integration in the Sciences of Man," *Proceedings of the American Academy of Arts and Sciences* 80, no. 2 (May 1, 1952): 175.

[241] Ralph W. Tyler, "The Importance in Wartime of Co-Operation between Schools and Parents," *The Elementary School Journal* 43, no. 6 (February 1, 1943): 330.

Correlated with convergence came the push to integrate academic disciplines with a unified science. At the apogee of such scientific knowledge rested cybernetics: as the science of all systems. Lateral integration of the life, physical, and human sciences was pursued under the convergent understanding of systems.[242] Cybernetics indeed contributed to *The Science of Synthesis*,[243] and a unified physical approach to the world reflected more comprehensively how "the traditional dual division between 'natural' and 'social' sciences [was] becoming outmoded."[244] The pursuit of an overarching theory of a single science followed the Unity of Science movement (in wide circulation at the time), particularly in the four consecutive "Special Issues" published annually between 1951-1954 by the Proceedings of the American Academy of Arts and Sciences about the "Contributions to the Analysis and Synthesis of Knowledge."[245]

The achievements of this "new" scientific synthesis (convergence) represented an unparalleled modern achievement within the assembled schema of this upward historical trajectory metanarrative. The broad array of sciences converging within cybernetics and systems study suggested that nothing existed "newer" than a science at "the frontiers" of knowledge. Scientific "[r]esearch means taking the next step from the known into the jungle of the unknown,"[246] Lewin argued, and since science and technology were imagined as occupying the frontiers of knowledge, their advances unfolded historically to situate the West, but particularly the cybernetic sciences emerging out of the (now modern) United States, at the forefront of scientific practices. Although the past was

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[242] F.S.C. Norton's philosophy of science drove such research, where "A greater emphasis on theory and mathematical formulation in biology would allow physics and biology to be integrated." Abraham, "(Physio)logical Circuits," 7. See also Bateson's "Physical Thinking and Social Problems."

[243] Debora Hammond. *The Science of Synthesis* (Boulder, CO: University Press of Colorado, 2003).

[244] Laura Thompson, "Significant Trends," 174. Also, James G. Miller, "Toward a General Theory for the Behavioral Sciences," *American Psychologist* 10, no. 9 (September 1955): 513–31.

[245] The inaugural issue begins as "Contributions to the Analysis and Synthesis of Knowledge," *Proceedings of the American Academy of Arts and Sciences* 80, no. 1 (1951): 1–112. On the Unity of Science movement, see Charles Morris, "The Science of Man and Unified Science," *Proceedings of the American Academy of Arts and Sciences* 80, no. 1 (1951): 37-44; Peter Galison, "The Americanization of Unity," *Daedalus* 127, no. 1 (January 1, 1998): 45–71; George Reisch, *How the Cold War Transformed Philosophy of Science: To the Icy Slopes of Logic* (New York: Cambridge University Press, 2005). For the role of cybernetics in this movement, see R. Cordeschi, "Cybernetics," in *The Blackwell Guide to the Philosophy of Computing and Information*, edited by Luciano Floridi (Malden, MA: Wiley-Blackwell, 2003): 186–96.

[246] Lewin, "Group Dynamics,"6.

steeped in the same energy mechanics of Newton, the future was different, steeped in "the newer study of automata, whether in the metal or in the flesh, [as] a branch of communication engineering."[247]

Conclusion

To conclude this chapter, the reasoning through a set of processes, elements, and rhetorical strategies assembled a way in which cybernetics was understood to advance through time to achieve the status of "new" and modern. The first section explored how an enterprising "new" science contributed to the potential and promise of a modern American society across the 1940s-1950s and linked how science and technology had already informed one sense of domestic "modernization." The next sections explored how comparison and a double gesture, both organized around difference and sameness, contributed to a theory of "modern." The final section considered how a "new" science of cybernetics and a theory of "modern" converged as an intelligible grid, not only in the form of knowledge, but also as an organized system. These developments helped to explain how the American nation had met a set of conditions which observers could then diagnose as modernizing and located a modern American system society with untapped "potential" and an unfulfilled promise, part of a new reading of history and a "universal discipline." Comparison and double gestures configured the concepts of new and modern, needed to understand cybernetic technology as the authoritative tool for social reform, and for reconfiguring human conduct. We take up other cultural elements that fed this reform dimension in the next chapter.

[247] Wiener, *Cybernetics*, 42.

CHAPTER FOUR

A SYSTEM OF POLITICAL THEOLOGY

This chapter explores other elements that fed the cultural authority of cybernetics. With an intelligible grid in hand in the form of an organized and modern American system (from the last chapter), a return to Bowker's analysis shows a further cultural appeal of cybernetics.

Again, Bowker's mode of "rhetoric" is not being used here solely as "classical" rhetoric, often limited to an empty or vacuous form of expressing truth, as in a rhetorical question. The rhetorical mode being used here certainly includes those persuasion aspects assumed within the "classical" mode of rhetoric, as a form of political action. But rhetoric here also includes such rhetorical "expressions" as a way of making visible particular elements of the world under universal presumptions—of time, of space, of isolating components, all cultural views of science that envelop other cultures under a single, invariant universal rational order, as through an "uncovering" by a distant and sagacious expert[248] is a way to unveil truths that will lead to the liberation of the social. In this way, rhetoric operates here as a political strategy to reform a science of society through the application of cybernetic technique.

Another set of the rhetorical strategies Bowker explored included "directly appropriate[ing] both religious and political discourse, arguing that their [cybernetic scholars] science spoke best to the concerns of the new age."[249] What further helped diagnose the nation's development into the category of modern was religious and political discourse—*political theology*, which I borrow from American studies scholar and literary critic Sacvan Bercovitch's *American Jeremiad*. Religious and political discourse further helped diagnose the nation's development into the category of modern and is woven throughout this section into the development of cybernetic systems and modernization theory.

The first section explores how a narrative structure that foretold of the development into an already organized and modern system reflected the narrative structure represented as a Universal Christian History. Here, modernization theory and cybernetic systems entangle with Francis Fukuyama's "End of History" thesis, which in

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[248] John S. Nelson, Allan Megill, and Donald N. McCloskey, *The Rhetoric of the Human Sciences: Language and Argument in Scholarship and Public Affairs* (Madison, WI: Univ of Wisconsin Press, 1987).

[249] Bowker, "Universal," 112.

1992 "rehabilitate[d] modernization theory."[250] The second section explores how the criteria used to diagnose a developing complex system (like those seen in cybernetics) parallel the same diagnosing criteria used in modernization theory, and entangles the notions of consensus with modernization and cybernetics. The third section shows how a sense of natural order assumed into the historical trajectory of a developing complex system is brought into the works of American consensus historians, both which then link to the political theology of a national myth. The fourth section returns to explore the "End of History" as an ideal realm, a category which doublets helped form and into which science and society integrated. Again, and along the way, we track how the development into modern systems simultaneously constrained possibilities through moral conduct to regulate humans by "natural" means.

Universal History

The narrative structure of the modernization/systems-culminating historical trajectory detailed in the last chapter parallels a narrative structure which some theorists represent as Christian Universal History. The historical trajectory metanarrative, on which an American liberal system to achieve the status of modern depended, reflected a story of a nation's people who had achieved greatness, perched once at a wild frontier, but perched now at a scientific frontier. As a point of comparison, consider how modernization theorist and political philosopher Francis Fukuyama's late 20th century "End of History" historical thesis resuscitated a representation of Christian Universal History. Fukuyama's thesis recapitulates the same modernization/systems-culminating narrative structure discussed in the last chapter. Fukuyama's thesis projects small-scale cybernetic "system" operations onto a grand scale of a universal historical system. "As the Christian account of history makes clear," according to Fukuyama, at least,

> an 'end of history' is implicit in the writing of all Universal Histories. The particular events of history can become meaningful only with respect to some larger end or goal, the achievement of which necessarily brings the historical process to a close. This final end of man is what makes all particular events potentially intelligible.

In Fukuyama's teleological "Christian account of history," a future final "end or goal" state reaches back through time to direct "particular events" of the past into the present to finally close out historical processes in a future end state, the End of History.

Fukuyama's modernizing narrative structure of a universal historical process and its teleology is consistent with the narrative structure of how cybernetic systems process change teleologically across a time series into a goal

[250] Gilman, *Mandarins*, 268, and the extended discussion, 267-270.

state. In cybernetic processes, a future purpose or goal reaches back to direct the past, present, and future operations in its system. As historian Roberto Cordeschi explains about Aristotelian science, "The term 'final cause' suggests that the purpose is supposed to guide the behavior directed towards its attainment, despite the fact that, insofar as the purpose is a state to be attained (end state), it is a future state." This Aristotelian scientific principle violates modern scientific principles. The Aristotelian "reversal of causal order" places a sequence of effects before their cause, which implicates the *post hoc* fallacy. "[T]he founders of cybernetics," however, reworked this problematic "vocabulary of teleology," not by addressing the problem of causal order, but by redefining purpose. In the reworked cybernetic definition, "purpose" no longer serves as a cause. Rather "purpose" serves as a larger goal or end state: "the final state *G* pursued by a system *S*, either natural or artificial, is the state that serves as a reference parameter for *S*, and *S*'s teleological [or purposeful] behavior is nothing else but *S*'s behavior under negative feedback control."[251] In the cybernetic framework, and in using Cordeschi's formulation, the future (the goal state, *G*) "causes" (or reaches back) to direct the system's (*S*'s) past and present behavior through feedback.

Fukuyama's modernizing Christian account of history similarly follows the same formulation. Fukuyama "determin[es] whether we have reached the end of history" by falling back on either what "might be termed a 'trans-historical'[...] approach based on a concept of nature." In that concept of nature, "human nature" contains "either [...] a structure within which man's self-creation occurs, or as an end point or *telos* toward which human historical development appears to be moving."[252] Just as cybernetics reworked *purpose* as a reference point, a future goal or end that reaches back to direct earlier processes, Fukuyama's modernization thesis inserts a future reference point to reach back and guide human historical developmental processes into the present. With the 1989 collapse of the Berlin Wall and with the subsequent collapse of other forms of social organization like fascism and communism, Fukuyama argued "that liberal democracy may constitute the 'end point of mankind's ideological evolution' and the 'final form of human government,' and as such constituted the 'end of history.'"[253] Liberal democracy, unique as a form of government in Fukuyama's modern view, "permit[s] participation and therefore feedback," the embodiment

[251] Cordeschi, "Cybernetics," 188.

[252] Francis Fukuyama, *The End of History and the Last Man* (New York: Simon and Schuster, 2006), 138.

[253] Ibid., 56, xii, xi.

of a cybernetic mechanism that Fukuyama's thesis recasts as "popular pressure."[254] We can see here a set of striking parallels between the operations of cybernetic systems and Fukuyama's thesis, his model of the human, social organization, political systems, and a theory of history.

The systems-developing narrative structure discussed in the previous chapter recapitulates the Christian representational accounts of history. Recall that in Fukuyama's account of the Christian account of history, "particular events of history can become meaningful only with respect to some larger end." In this Christian account, as in Fukuyama's thesis, and as in modernization theory, "history [is] understood as a single, coherent, evolutionary process, [which] is implicit in our use of words like 'primitive' or 'advanced,' 'traditional' or 'modern,' when referring to different types of human societies."[255] The systems development metanarrative structure discussed in the previous chapter reiterates a Christian account of history by recounting how a single, coherent line of systems evolutionary development upward and across the arrow of time from simple into a complex modern American social system, starting with a sense of simple sameness to the exalted plane of difference and American/Christian exceptionalism, is driven by a future goal or endpoint—*teleology*, or purpose in the parlance of cybernetics.[256] These parallel terms and conditions describe the same developmental trajectory toward a complex modern American social system, complete with an "End of History" narrative as America's *mission*, the complexity of which I take up next.

Finding complexity

Observers during the emerging cybernetic-social modernizing style of reasoning identified increased complexity in the nation. For some observers, like Vannevar Bush, 'man' "has built a civilization so complex that he needs to mechanize" many aspects of operations.[257] There existed for others "complex phenomena of contact between contrasting cultures," observed cybernetic anthropologist Gregory Bateson,[258] or "complex phenomena like the social structure of a community" that extended up to larger "complex organizations of systems, like [...] the

[254] Ibid., 115, and pressure on 240.

[255] Fukuyama, *The End of History*, xii.

[256] See a similar account in Reinhold Niebuhr, *Faith and History* (New York: Scribner and Sons, 1949).

[257] Vannevar Bush, "As We May Think," *The Atlantic*, July 1945, 13.

[258] Gregory Bateson, "Physical Thinking," 718.

United Nations," observed behavioral psychiatrist James G. Miller.[259] In the face of such observations about complexity, cybernetics offered to cybernetic psychologist Ashby, "the hope of providing effective methods for the study, and control, of systems that are intrinsically extremely complex."[260] For Ralph Tyler, "the simple society of the nineteenth century had been almost entirely swept away," replaced by the "Greater complexity of society" in the mid-20th century.[261]

Two scientific concepts were used to identify such "complex" and higher-order phenomenon. The first was specialization and the second was a division of labor, both long used to explain analogies between society and biology. First, physiologists in the early 1800s identified "complex phenomena" by locating how different functions within more advanced life-sustaining "organs bec[a]me specialized" and thus became more differentiated in their work. Despite their more specialized and differentiated function, these processes still also cooperated to keep the "higher organisms" alive. Second, the concept of a division of labor, which "applie[d] as well to organisms as to societies," particularly later on within Durkheim's (and other's) social theory, became "a useful tool to understand the differences between lower and higher organisms as their functions bec[a]me more specialized and localized." Within these more advanced higher organisms, the "perfection of the physiological functions, which is forwarded by the division of physiological labour," reflected an already established natural order of things.[262]

Observers during the emerging cybernetic-modernizing reasoning used these same two scientific concepts of division of labor and specialization within a society-biology comparative framework to identify a complex modern American system. In his 1947 Presidential Address to the American Sociological Society, University of Chicago sociologist Louis Wirth referenced Spencer, "compare[d] human society with the biological organism," and identified how "mass societies are a creation of the modern age and are the product of the division of labor." Wirth

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[259] Miller, "Behavioral Sciences," 522, 515.

[260] Ashby, *Cybernetics*, 5-6.

[261] Ralph W. Tyler, "Trends in Teaching: How Research Is Affecting Our Understanding of the Learning Process," *The School Review* 59, no. 5 (1951): 265-6.

[262] Camille Limoges, "Milne-Edwards, Darwin, Durkheim and the Division of Labour: A Case Study in Reciprocal Conceptual Exchanges Between the Social and the Natural Sciences," in *The Natural Sciences and the Social Sciences: Some Critical and Historical Perspectives*, ed. I. Bernard Cohen (Boston, MA: Kluwer, 1994), 319, 330, 325.

concluded that "if organized social life [...] is to endure [...] in the face of [...] size and complexity and […] internal heterogeneity," one binding element "essential [to] the social organism can be supplied through consensus."[263] Also, a 1944 report by systems psychologist Prescott, set in the context of human development in America, suggested any "Advance in Civilization is Accompanied by Differentiation of Social Functions and Specialization in Performing These Functions," and noted that "As division of labor and specialization progress, society tends to become divided."[264] The increased division of labor and advanced levels of specialization had beset a *complex* modern American system, and as discussed in a later chapter, increased specialization further required investigating how "General Education in a Free Society" could serve as a binding agent, and, as Wirth's Presidential address noted, how constructing consensus as a cultural bond could further tether parts to parts and to the whole.[265]

To such observers, the two concepts of division of labor and specialization characterized how "America" had evolved along a trajectory into a "higher," "advanced," and more "complex" form, and thus fed a theory of modernization. As Gilman points out, "According to modernization theorists, modern society was characterized by," among other features, "a complex division of labor."[266] This consideration still holds in Fukuyama's thesis: "Technological innovation and the highly complex division of labor has created a tremendous increase in the demand for technical knowledge at all levels in the economy [...] The higher 'information' content of modern economic production [comes] at the expense of 'traditional' manufacturing occupations."[267] Moreover, as Chicago sociologist Wirth observed in his 1947 address, the price of "living in an interdependent and technologically highly advanced world" came at the price of a "sense of belonging and of participation."[268] Heterogeneity (difference) eroded the social fabric (sameness) of an advanced modern complex system.

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[263] Louis Wirth, "Consensus and Mass Communication," *American Sociological Review* 13, no. 1 (1948): 2, 9.

[264] Chicago Collaboration Center, *Child Growth*, 56-57.

[265] *General Education in A Free Society* (Cambridge: Harvard University Press, 1945). While "our complex age [of] specialization whereby colleges and teachers' colleges each perform their unique function (23)," the study more broadly "envisage[d] general education as an organic whole whose parts join in expounding a ruling idea and in serving a common aim (57)."

[266] Gilman, *Mandarins*, 5.

[267] Fukuyama, *End of History*, 92.

[268] Wirth, "Consensus," 4.

These conditions allowed such systems-oriented theorists to think about complex modern conditions characteristic of American society and make visible a set of complex problems—and their solution. A 1950 Time magazine article reported that with "the fact [that] man's society [had become] more elaborate"[269] suggested how a now modern American society had also grown unwieldy, unmanageably diverse, and too large. The nation was falling short of its potential, as the previous chapter described. These modern and complex problems, however, also conveniently ushered in their own solution: cybernetics. "In the simpler systems," Ashby asserted, "the methods of cybernetics sometimes show no obvious advantage over those that have long been known. It is chiefly when the systems become complex that the new methods reveal their power."[270] The newly uncovered cybernetic technology offered redress to the problems of scope and scale in complexity because "It introduce[d] the principles that must be followed when the system is so large and complex (e.g. brain or society) that it can be treated only statistically."[271] The regulatory mechanisms housed within cybernetic systems simplified complex problems, and the modernizing period in this regard summoned the principles necessary both to assemble cybernetics and to treat the ills of modernization,[272] fostered by a comparative system of reasoning and the double gesture of sameness and difference discussed in the previous chapter.

Complexity, moreover, also ushered in the need for consensus, stronger communications, and the notion of curriculum as a message. Again, as Chicago sociologist Wirth observed, the price of "living in an interdependent and technologically highly advanced world" came at the price of a "sense of belonging and of participation." Consequently, to engender a "consensus that makes an aggregate of men into a society," Wirth gestured to how the "world-wide scope of communication which science exemplifies [can] surmount local, national, sectarian and class barriers," surmounting those tradition-based cultural barriers that inhibited modern conditions. To foster communications between parts and the whole, Wirth linked two notions: education and information. Complexity and division required "an unrelenting effort for popular education and for access to reliable sources of information."

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[269] "The Thinking Machine," *Time*, 56.

[270] Ashby, *Cybernetics*, 5.

[271] Ibid., vii, and "The Very Large System," 61-72.

[272] Jamie Cohen-Cole, *The Open Mind.*

Wirth called education one of "the principal channels [by] which consensus is reached," a "means for arriving at a sufficient degree of agreement [...] despite differences in interests," since that which travels through these channels of "education [enables] the citizen to participate [...] as well as to equip him to act with greater knowledge and responsibility."[273] Wirth's statements link the regulatory properties of communications and education, curriculum and information, and consensus. In this explanation about the historical trajectory of complexity in systems, the social regulation of humans and human relations(hips) was inevitable to keep wholes organized and restore a sense of order to a complex system, whether through the activities of the state, or through the concept of culture (either through curriculum or consensus or both).

Founding a National Story

Drawing on complexity to justify consensus presumed an already established sense of order.[274] First, reaching a complex, advanced, or modern society necessary to inhabit an End of History mirrored a presumed and already established sense of natural order (consensus) in the "mind" of the nation. Second, these achievements reflected a national myth.

First, a sense of natural order presumed a few elements. A sense of natural order preserved the perfection of a nation's naturally occurring and naturally matured developed system. In 1953, American historian Daniel Boorstin (central to the Consensus History movement, according to American historian John Higham) relied on the society-biology comparative framework when he suggested "a way of describing the organic nature of society." Boorstin identified American social institutions as "organisms which grow out of the soil in which they are rooted and out of tradition from which they have sprung." Since "all parts of an organism[']s whole] preexist in perfect miniature in the seed," and since American "institutions, and especially political institutions [a function], are intimately related to the peculiar environment [a structure] which nourishes them," the unique American environment, the unique "values and theory of the nation [that] were given once and for all in the very beginning" had ensured the greatness of the

[273] Wirth, "Consensus," 3, 12, 11, 8, 11.

[274] For example, see Friedrich Hayek's comment that "The achievement of human purposes is possible only because we recognize the world we live in as orderly. [...] Without the knowledge of such an order of the world in which we live, purposive action would be impossible," as cited in Bernard E. Harcourt, *The Illusion of Free Markets* (Cambridge, MA: Harvard University Press, 2011), 129. Also, Arno Wouters, "Marx's Embryology of Society," *Philosophy of the Social Sciences* 23, no. 2 (June 1, 1993): 149–79.

nation's institutions and its people.[275] Boorstin's "notion [was] essentially static" in its timeless view of parts developing within a larger natural American systematic whole.

Another of Higham's culprits, consensus historian Louis Hartz, presented a similar thesis. In 1955, Hartz "attempt[ed] to uncover the nature of an American society [...] to interpret our history." As part of that nature, "One of the central characteristics" Hartz found was "Its liberalism [...] a 'natural' phenomena." By taking "natural liberalism as a psychological whole," which all along had been "embracing the nation and inspiring unanimous decisions," Hartz sought to diagnose within the structures of this already established *system* certain mechanical processes that functioned to maintain *homeostasis*. Hartz found just that: American "society [...] has within it, as it were, a kind of a self-completing mechanism," and therefore a feedback function (just as does Fukuyama's thesis) that "insures the universality of the liberal idea" within that larger structure, a cybernetic mechanism that ensured the adaptability of a nation to survive and stay the course within an even greater natural order of the world.[276]

The 1950s Consensus Historians consequently appropriated a sense of natural order. First, such strategic maneuvers naturalized the internalized moral constraints on modern human conduct discussed in the previous chapter. Human relations coordinated within and between functions (humans) and the structural whole (the nation) were natural under an always already developing system. Upholding the system placed moral commitments on humans to act in a certain way, and that conduct was governed by social ethics like cooperation (common within the Rationale). For example, with the growth of the American suburban housing landscape over the 1950s, "Togetherness and informality became the watchwords of suburbia. [...] the very nature of suburban life encouraged cooperation and volunteerism. Young families banded together[...] parents banded together [...] the vogue of togetherness and group participation reigned supreme"[277] during a modernized period of parts oriented to parts through beneficent and natural relations to ensure the stability of the whole.

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[275] Daniel J. Boorstin, *The Genius of American Politics* (Chicago: University of Chicago Press, 1953), 175, 10-11, 6, 10. As Gilman notes, "The two most famous works of consensus history to highlight the exceptionalism of the United States were Daniel Boorstin's *The Genius of American Politics* (1953) and Louis Hartz's *The Liberal Tradition in America* (1955)." See Gilman, *Mandarins*, 65.

[276] Louis Hartz, *The Liberal Tradition in America: An Interpretation of American Political Thought Since the Revolution* (New York: Harcourt, 1955), 5-6, 14.

[277] William Chafe, *The Unfinished Journey: America Since World War II*. 6th edition (New York: Oxford University Press, 2007): 115.

Second, these achievements reflected a national myth. A nation's natural development across the arrow of time and upward from simple into complex draws an advanced modern system society to a goal or end point—again, *teleology* or purpose in the parlance of cybernetics, and the nation's natural development again recapitulates a Christian account of history which conforms to an "End of History" narrative about America's *mission*, as seen in Fukuyama's thesis. A national myth recounts the story of "America's" founding as a "City on a Hill," a nation's origin story understood as a break from those European nations mired in the divisive Old World traditional categories of monarchy, blood, creed, and class. This myth was again repeated more recently in Fukuyama's thesis that "a remarkable consensus concerning the legitimacy of liberal democracy as a system of government had emerged throughout the world over the past few years, as it conquered rival ideologies like hereditary monarchy, fascism, and most recently communism."[278]

A cultural thesis emerges from this natural order. In relation to the narrative structure of an American nation's natural developmental trajectory into a systems society, and through an "End of History" modernization narrative structure into which societies develop from an organism into operating under the principles of modern systems, just as the "modern" stage in history was a break from the "traditional" stage, we can see here the outlines that composed a "foundational national story," which literary critic Sacvan Bercovitch argued was "that vision of America as an unfolding prophecy." This prophesy was based on a Judeo-Christian god's pre-determined divine plan, akin to the presumed sense of natural order discussed above. For example, Boorstin invoked his view of a Christian millennium when he compared the American political system to the five-year planned economies of communism:

> It is not surprising that we have no enthusiasm for plans to make society over. We have actually made a new society without a plan. Or, more precisely, why should *we* make a five-year plan for ourselves when God seems to have a thousand-year plan ready-made for us?[279]

The sense of natural order and national myth contributed to the cultural authority of cybernetics, social modernization, and as one historical text of the period noted, reflected "the basic elements constituting our myth of purpose and destiny."[280]

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[278] Fukuyama, *End of History*, xi.

[279] Boorstin, *Genius*, 179 (original emphasis).

[280] Edward Burns, *The American Idea of Mission: Concepts of National Purpose and Destiny* (New Brunswick, N.J.: Rutgers University Press, 1957), 347.

The End of History ends in a system

This development from society as an organism into society as a state or condition of a system again reflects a cultural thesis. The development into inhabiting such a location implicates what Bercovitch called an "ideal realm that fused sacred and secular, Scripture prophecy and Enlightenment universals, the Christian history of redemption and the Romantic faith in progress." Bercovitch also discussed the symbol of an ideal "America" from within this ideal realm around which the American jeremiad is organized.[281] The conditions that modernism issued brought forth their own requirements for survival that only America could sustain, but perhaps also the West, because America had mostly already adjusted to those conditions, had out-competed its rivals, and could ensure a healthy future for generations.[282] Although the later 1950s-1960s Cold War "modernization theorists [...] asserted that secular, materialist utopia had already been achieved in the supposedly post-ideological United States,"[283] this utopia in the earlier 1940s-1950s was reflected in building domestic consensus and cultural nationalism.[284]

To situate this ideal realm as a spiritual and utopian End of History, two elements will be discussed below. The first considers how a doublet exists in this ideal realm. The second explores how this doublet helped fuse the scientific realm and the social realm through natural lines of integration and convergence into that ideal realm.

First, as discussed in the previous chapter, a difference/sameness doublet narrated a historical developmental trajectory into a theoretically ideal realm: as a trajectory into that of a modern system. This difference/sameness doublet contributed to the logic, classification, and concepts related to the comparative reasoning that helped diagnose a new and modern American social system. Just as the category of "new" is bound to "old," that which embodied "newness" and generated social modernizing processes simultaneously gestured to the exclusion and containment of that which existed within "old" categories. The effect was orchestrating a liberal consensus in American society (discussed in the next chapter) which instantiated the same conflict it sought to

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[281] Sacvan Bercovitch, "Preface to the 2012 Edition," in *The American Jeremiad*, 2nd ed. (University of Wisconsin Pres, 2012)," xv.

[282] "America is the exemplar of the highest standard of living the world has ever known. This is a source of great satisfaction, for it proves our superiority over those nations that still blindly prefer the arts and crafts of their ancestors to modern mechanical improvements [...] Americans have demonstrated this, and therefore have a call to confer such blessings upon the rest of mankind." Burns, *Mission*, 349.

[283] Gilman, *Mandarins*, 14.

[284] White, "Education at the University of Chicago," 457-459; Wirth, "Consensus."

dispel. Mobilization to sustain organization may forestall disorganization, but death and discontinuity always are brought along for the ride.

This doublet of new and old generated two problems that required solutions. First, evidence had already suggested "America" had triumphantly evolved politically, economically, and socio-culturally into the model category as an "American" system. The nation had already developed "eventually to achieve the world's highest standard of living," and through a materialist lens, resources were abundant. The notion of complex phenomena had already diagnosed the nation's advanced capabilities.[285] Yet, despite ascending into the status as a "new" modern system, what interfered with its true potential was the presence of "old" social structures and "traditional" institutions. The solutions offered at the 1948 AAAS "Centennial Celebration" suggested as much. American religious values of redemption required reforming, updating, and modernizing a complex society to reach this ideal—to address what was labeled a "cultural lag"[286]—and to lift an unfinished society lagging behind the light of science and technology to inhabit the frontier of the universe. Modernizing society would help America reach its full potential and to restore its promise of greatness. Modern was present.

Second, despite being "guided by a high sense of social values," the consensus and organizational emphasis on social unity underscored disunity (another double gesture).[287] Few considered the nation as living up to its modern potential, and commentary on the modern cybernetic era across the political spectrum was replete with such diagnoses: it was called the age of anxiety, an age of confusion, an age scarred by "the disorder of modern culture,"[288] in part because of the specialization and division of labor identified within a complex advanced system. Boorstin diagnosed his American organism with "Cultural Hypochondria."[289] Moreover, while every dystopia

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[285] Burns, *Mission*, 63. Also, Chafe, *Unfinished Journey*, 106-111.

[286] Niebuhr, *Faith and History*, 11; Taylor, "Optimism," 234.

[287] Tyler, "Educability," *Elementary School Journal*, 206.

[288] Arthur Schlesinger, *Vital Center: Politics of Freedom* (London: HarperCollins Distribution Services, 1949); Wiener, *Cybernetics*, 3; "The defects of modern culture are the defects of its intellectual leaders, its teachers and savants. The disorder of modern culture is a disorder in their minds." Mortimer Adler, "God and the Professors," in *Science, Philosophy, and Religion: A Symposium* (New York: Conference on Science, Philosophy and Religion in Their Relation to the Democratic Way of Life, 1941).

[289] Boorstin, *Genius*, Ch 6.

presumes a utopia, historian Howard Segal's study of the comingled themes of technology and utopianism in the United States suggests how there exists "a cultural context" contained within such technologically utopian texts, a context that already emphasizes moral wanderings of society. In such a context there inheres a "will to know" (my term) in such religious visions (my term).[290] The theory of historical development toward technological advancement into a system required "lifting" America into an idealized point, to be "more so" like a modern society that could fully realize the good life, the highest abstraction of the postwar American Dream based on an idea that it had not reached. Something was wrong with society, and a regimen of stability and conformity around social norms was offered as vital to that modern vision.

We can again look to the moral management of human relations within a modern social system to explore how. Regulating human relations governs human conduct as a part in a greater whole. Diagnosing a larger system as dysfunctional—what Tyler labeled as "the disease of society"[291]—or under *confusion* or *in a state of malaise* signals how the social body, as an organism or even as a system, was under stress, ready to collapse. Contained within the part's relation to the whole were thus the ethical commitments of all and each function(s) to ease the overall demands on the structure, to direct therapeutic techniques upwards to ameliorate the sickness of the whole. This commitment required the function to conform and constrain wayward behavior to align its conduct, to ease the burdens on the whole, and not violate the laws that shaped the new "modern" environment. This view generated the overall 1950s sense of conformity around established social norms, and to the overall push to eliminate dysfunctional behaviors (errors) that were burdens on system stability (*homeostasis*). Those "who did not conform [...] were likely to be marginalized, stigmatized, and disadvantaged" by parts (humans) governing and regulating their relations with other parts (other humans).[292] Under the rules of moral conduct, each part had to do its part to police its own conduct (part to self), the conduct of others (part to part), and all efforts were directed upward to restore the health of the ailing system (part to whole). Diagnosing sickness, in the end, was based on a doublet that reaffirmed incontrovertible facts about notions of progress in science and American society.

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[290] Segal, *Technological Utopianism*, 5-6. Also see Segal, *Future Imperfect: The Mixed Blessings of Technology in America* (Amherst, MA: Univ. of Massachusetts Press, 1994).

[291] "Dedication," *Behavioral Science*, 57.

[292] Elaine Tyler May, *Homeward Bound: American Families in the Cold War Era* (New York: Basic Books, 2008), 15.

Convergence, again

We can return to the ideal realm to see how a double gesture served as the condition which enabled both triumph and dysfunction. Both can be explained by the presence of a system, by how the lines of basic lateral operations integrated with vertical levels of hierarchical operations, the intelligible grid of a system. In the realm of scientific operations, the integration and convergence into a "system" as an ideal realm of scientific practices was considered by Wiener to be a "spiritual necessity"[293]—returning us again to Bowker's point about religious discourse—and that spiritual link suggests cybernetic techniques alone were insufficient to help it qualify as an innovative science. The set of practices that articulated any

> syntheses of communications and control, [of any] human and machine, articulated broad converging patterns as much as created new ones. Cybernetic ideas had as much to do with established and evolving engineering traditions as with any radically new military mindset. Cybernetics, the book as well as the movement, articulated a vision of changing human/machine analogies which resonated with a broad audience. Its ramifications in the United States and abroad were significant, if as much for the overarching vision as for any concrete results.[294]

Similarly, the vertical and horizontal integration of lines in the realm of American society again suggested a sense of convergence. The vertical and horizontal movement occurs toward a central nodal point: an ideal realm of American society as a modern system, an overarching "spiritual" vision of converging patterns that helped map out an evolutionary trajectory into the category of modern. Even one curriculum specialist remarked how "We live between two great cultural syntheses, one of which is dying and the other is being born. Such a transition is marked by [...] the rise of new beliefs, loyalties and patterns of conduct."[295] Consequently, a spiritual vision traveled alongside the concept of *convergence* on both sides of the science/society line, a vision for a new future, within a new stage of development as a "new" systems society into reaching and inhabiting a new American ideal realm.[296]

A sense of domestic modernization to cure the notions of cultural lag thus required sustaining an already upward momentum of social progress by applying social technology (like cybernetics). For example, according to cybernetic social psychologist Lewin, those

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[293] Wiener, *Cybernetics*, 9.

[294] Mindell, et al., "From Communications Engineering," 74.

[295] B.O. Smith, "Social Perspective," 3.

[296] Beniger, *The Control Revolution*, Ch. 2. For more on social modernism, see Anthony Woodiwiss, *Postmodernity USA: The Crisis of Social Modernism in Postwar America* (London: SAGE Publications, 1993).

> interested in engineering [...] have turned more and more to what is called basic research[.] In regard to social engineering [...] progress will depend largely on the rate with which basic research in social sciences can develop deeper insight into the laws which govern social life [that] will have to include mathematical and conceptual problems of theoretical analysis.[297]

Basic scientific research into the social domain helped explain how a series of spatially interdependent relations—that is, the relations between the part to itself, part to part, part to whole, and whole to part—helped organize systems, best exemplified in Talcott Parson's *The Social System* (1951).[298] Rather than emerging as a separate academic discipline, the entire cybernetic/social systems enterprise converged into a cross-disciplinary analytical schema that had been building well before the collection of scholars gathered informally at the Josiah S. Macy Conferences on cybernetics.[299] The integration of scientific investigations with the underlying logic of systems unavoidably located an integrated world of converging scientific and social systems, a world that located how "the general laws of social relations"[300] made known a comprehensive—and regulating—social system not in discord, but rather with parts in consonance and in harmony with itself, the focus of a later chapter. That cybernetic style of reason (Hacking) viewed the nation as an integrated whole "system," one that mobilized differentiated (horizontal) parts oriented to feed the higher order (vertical) operations of a larger American nation.[301] This orientation and structure reflected the nascent *teleology* or assumed *purpose* of a particular American system operating in the background of cybernetic research practices. American society had evolved over time, from the outpost of a tiny religious sect at Plymouth Rock to develop into a supra-system, and had indeed reached an ideal realm, a modern End of History observed in Fukuyama's thesis. The doublet of old and new helped assemble modern notions of the ideal realm, the diagnoses of a dysfunctional age, and helped link conclusions about integration of the scientific and

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[297] Kurt Lewin, "Action Research and Minority Problems," *Journal of Social Issues* 2 (1946): 35-36.

[298] Talcott Parsons, *The Social System* (London: Free Press, 1951), and later *The System of Modern Societies* (New Jersey: Prentice-Hall, 1971); Craig Calhoun, and Jonathan Van Antwerpen, "Orthodoxy, Heterodoxy, and Hierarchy: 'Mainstream' Sociology and Its Challengers," in *Sociology in America: A History*, edited by Craig Calhoun (Chicago: University of Chicago Press, 2007): 386-387.

[299] Wiener, *Cybernetics*, "Introduction." "For the similar problems of human organization, we sought help from the anthropologists Drs. Bateson and Margaret Mead; while Dr. Morgenstern of the Institute of Advance Studies was our adviser in the significant field of social organization belonging to economic theory (27)." Also, Heims, *Cybernetics Group*.

[300] Joel Isaac, "Theorist at Work: Talcott Parsons and the Carnegie Project on Theory, 1949–1951," *Journal of the History of Ideas* 71, no. 2 (2010): 288.

[301] Gilman, *Mandarins*, 31-32.

social realms.

Conclusion

To conclude, the historical narrative about a scientific convergence of processes into the convergence in cybernetics (from the last chapter), coupled with the diagnosis about a nation's new potential and organization, nourished the discourse of social "modernization." The comparison-generated binaries about chronological time (past versus present) fused to stages of growth (traditional versus modern) and to levels of structural inter-dependence (simple to complex). "Back then" was old, traditional, outdated. "Now," however, was new, modern, and systems oriented, because the basic structure of systems, understood through the integrated science of systems, had uncovered that natural and universal fact about the nation, which marks a transition in the next chapter into narratives of exceptionalism, American consensus, and further into the ideas of a sacred history. The discourse of cybernetics and modernization indeed conjoin under a historical narrative structure that repeated cultural theses, and in doing so, helped reflect ways to re-organize society and set standards for moral (and immoral) conduct in a new social system.

CHAPTER FIVE

A MODERN THEORY OF HISTORY TO ACHIEVE A SYSTEMS SOCIETY

The next chapter connects domestic educational policy and cybernetics within a mid-20th century American cultural context. The previous past few chapters contributed to that discussion by connecting two familiar but previously unrelated elements. The first, taken up in earlier chapters, connected how cybernetic technology and modernization theory informed each other. The second, taken up in this chapter, strengthens the connections between cybernetics and the march of the 1950s liberal social consensus, both of which had "sprung up in barely more than a decade" and both of which shared characteristics with the scholarship that American intellectual historian John Higham "in 1959 [had] labeled consensus history."[302] In this regard, connecting consensus liberalism (and by extension, consensus history) to domestic social "modernization" links the governance of society through instituting a cybernetic social system, one that by the late-1970s and 1980s came to be called a cybernetic society.[303]

To preview this chapter, the first section considers how cybernetics came to be regarded as a tool of reform and modernization. This section explores how cybernetics could correct the social dys-function diagnosed within the nation (discussed in the earlier chapter). The second section considers how cybernetics contributed to tenets of the Liberal Consensus. The final section considers modernization and consensus as a Protestant understanding of history.

Modern systems unify by aligning the current and ideal

With the abundant diagnoses of social disorder and dysfunction (fears) and untapped potential (hopes) discussed in the previous chapters, the science of cybernetics as a tool of social reform could modernize and help

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[302] Higham, "Changing Paradigms," 464. Modern American historians struggle to synthesize the changes during this era of modernization. In his attempt to synthesize these changes, Robert Collins teases out opposing historical interpretations using "culture of abundance" paradigms. The first paradigm recognizes a shift from production to a culture of consumption, an approach focused on consumer culture. The second is an "organizational synthesis" that mirrors Marxist "social structures of accumulation." A third synthesizes a "cyclical ideological development," ("ideological" in Geertz's sense, not Marx or Gramsci), and a fourth is a "Public culture" thesis advanced by Thomas Bender. See "David Potter's People of Plenty and the Recycling of Consensus History," *Reviews in American History* 16, no. 2 (June 1, 1988): 321–35.

[303] Michael Arbib, *Computers and the Cybernetic Society* (New York: Elsevier, 2014 [1984]); Ralph Parkman, *The Cybernetic Society* (New York: Pergamon Press, 1972).

restore harmony to the nation. Because cybernetics was accessible to only a select group of sufficiently complex and advanced Western nations and not to simple societies, a double gesture was again the constant ground of cybernetic operations. A sense of progress from "back then" (time) and "back there" (space) that advanced from "those days" of simpler times to "here and now" traveled alongside higher categories of norms and "purpose" and notions of "complexity," which situated the American nation on a path of progress toward a nodal point.[304] This continual advancement toward a system was a particular structure, a singular cohesive society now understood as a (modern) systems society. That monolithic framework, constructed on the unilinear, holistic and diametrical terms described earlier,[305] resulted in an idea of modern that included greater coherence, conformity, and uniform wholeness.[306] Consequently, what systems science narrated was a modernist framework that projected a final state or condition for the perfection of humankind (the ideal realm, the End of History). In that final state, modern structures and functions aligned as a harmonious system. The harmonious system, which was the goal pursued by curriculum reform detailed in an upcoming chapter, hailed the vision of an integrated society and, by extension, social consensus—a view contained in the Rationale, as Kliebard highlighted[307]—under a modern framework in which a society aimed for the highest of Western ideals. But as we saw earlier, few observers diagnosed harmony in the American system. Structure and function dysfunctioned.[308]

The problem that confronted scientists from the systems view before cybernetics, a problem that was a result of a double gesture, was how to achieve harmony. In the domain of the human sciences, the notion of dysfunction, and a dysfunctional society, occurred when the function and structure misaligned, especially when

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[304] Gilman, *Mandarins*, 86.

[305] McCarthy, "Messianism," 9.

[306] Gilman, *Mandarins*, 75-76. See also McCarthy, "Messianism," 26. "A genuine science of politics would have as its ideal a community a commonwealth or a state, of free men cooperating in all the great concerns of life, achieving, that is, a rational freedom. It would so order its component sciences that each would be at once a support of the central idea and a system of thought useful in the solution of practical problems." Stanley Dodge, "Education for the Social Science Student," *Science* 101, no. 2626 (1945): 422.

[307] Kliebard, "Tyler Rationale," 62. Also see Chicago's *Cooperative Study in General Education*, 47-48, and for the connection between the social sciences, consensus, and education in White, "Education at the University of Chicago, 1892-1958," 457- 460.

[308] See Crowther-Heyck, "Producing Reason," 101; Jamie Cohen-Cole, "The Creative American: Cold War Salons, Social Science, and the Cure for Modern Society," *Isis* 100, no. 2 (June 1, 2009): 219–62.

organicist discourse compared equilibrium/disequilibrium. Again, a double gesture: the hopes for a harmonious society pointed simultaneously to the pathological threats to those hopes (fears).[309] For example, in 1947, Warren Seyfert from Chicago's Laboratory School "emphasize[d] that, with [...] the restrictive environment [structure] posed by modern living conditions, our younger children [functions] do not have the opportunities they need in order to master their developmental tasks."[310] Research from the systems view often diagnosed the problem of disequilibrium on how a structure's overbearing demands limited the full freedoms of the function, who always anyway seemingly underperformed in the way social observers hoped. In other words, and to be more concrete, American social observers expected more from American citizens (a function of the state), who rarely delivered, and these observers believed that the nation's civil and social structures limited the full freedoms of the American citizen—the function was overburdened by social rules and structures, where, according to one social observer from the period, "It seems to be an axiom of history that as a society increases in complexity its ideal of [individual] liberty undergoes a progressive constriction."[311] Consequently, and on one hand, the domain of the human sciences that engaged in the system's view increasingly located the function's "problems" within a framework of an American citizen seeking greater freedom. Yet, on the other hand, the same set of human sciences also had already limited that freedom by organizing past civil and social structures under a too monolithic framework. In other words, and again to be more concrete, an existential socio-political question existed for one Harvard (*Red Book*) committee: how "as Americans, [are] we [...] necessarily both one and many, both a people following the same road to a joint future and a set of individuals following scattered roads as gifts and circumstances dictate"?[312] The problem that plagued many social scientists was the fundamental misalignment between the society (structure) and individual

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[309] "There is an "imperative need for a social structure to contain [the life-changing] velocity [of science and technology]—a social structure within which the individual can achieve some measure of self-fulfillment." Schlesinger, *Vital Center*, 5.

[310] Seyfert, "The Characteristics of a Modern Educational Program. I. Meeting the Needs of Children and Youth," *The Elementary School Journal* 48, no. 2 (October 1, 1947): 73 (also p.80); Also see Jeffrey Sklansky, *The Soul's Economy: Market Society and Selfhood in American Thought, 1820-1920* (Chapel Hill: The University of North Carolina Press, 2002), 142; Stephen J. Cross and William R. Albury, "Walter B. Cannon, L. J. Henderson, and the Organic Analogy," *Osiris* 3 (1987): 168.

[311] Burns, *Mission*, 127.

[312] *General Education in A Free Society* (Cambridge: Harvard University Press., 1945): 79.

(function)—a dysfunctional system—one that stressed people and destabilized families and thereby threatened society.[313]

One challenge the human sciences faced in discussing this dysfunction, before the arrival of classical cybernetics, at least, was that its scientific frameworks held structure and function as separate units of analysis. This separation by definition limited solutions to the problem of social dysfunction. By mid-20th century, however, the convergence in life and human sciences of both structure and function as a single unit of analysis (a system)[314] under circular causality raised the virtue of cybernetics as the technology to ameliorate that problem. Under the "new" circular view, systems gave functions sufficient freedom to reach maximum potential, while feedback kept a function's conduct under control behind the image of stabilized interaction within a structure (*homeostasis*).[315] Under a unified framework, what the convergence of the structure and function allowed was not social dysfunction but its resolution, thereby restoring American social ideals.

Even so, while a double gesture signaled a nation did not inhabit its highest ideals, its End of History, as the "age of anxiety" had diagnosed, this doublet also signaled that a modern society needed to operate as a harmonious system. Dysfunction prevailed, which demanded reform of society, which demanded functions—human bodies—be yoked into new "modern" lines of conduct and governance to ensure they aligned with new modern structures. The regulatory features in cybernetics could do just that.

Cybernetics and consensus

Cybernetics could indeed serve as the modernizing tool to move the nation past the current state of its social dysfunction into a new future harmonious goal state. That future ideal realm as a system would come by

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[313] This view culminated in the growing need for both personal and group therapy. For example, see Christopher Lasch, *The Culture of Narcissism: American Life in an Age of Diminishing Expectations* (New York: W. W. Norton & Company, 1991), Chapters 1 & 2; Deborah Weinstein, *The Pathological Family: Postwar America and the Rise of Family Therapy* (Cornell Studies in the History of Psychiatry. Ithaca, NY: Cornell University Press, 2013).

[314] Robert Redfield, "Introduction," in *Levels of Integration in Biological and Social Systems*, ed. Robert Redfield (Lancaster, PA: Jacques Cattell Press, 1942), 1–26. See also W. F. Aspray, "The Scientific Conceptualization of Information: A Survey," *Annals of the History of Computing* 7, no. 2 (April 1985): 128; and Cross and Albury, "Organic Analogy."

[315] "In any attempt to understand human activities full recognition must be given to this cultural environment since it is usually more coercive and restrictive than the geographical environment of nature and the internal environment of his own organism." Lawrence Frank, "Man's Multidimensional Environment," *The Scientific Monthly* 56, no. 4 (1943): 348.

establishing social harmony and liberal consensus and to reach the End of History by moving the nation closer to a greater sense of social system stability (*homeostasis*). That could only be reached, however, through the vigor that an integrated science and technology would provide.[316]

The push for social stability connects to classical cybernetics directly through what post-WWII American historians call the "liberal social consensus." This social and political consensus was anchored on four principles: "confidence in capitalism as an economic system, belief in the efficacy of reform, distaste for and disapproval of 'class' conflict, and dedication to social unity at home as a means of fighting communism abroad." As a standard undergraduate text on post-1945 U.S. History observed, "the 'liberal consensus' itself was, by definition, conservative [...] Most of American politics since World War II had operated within these parameters."[317] The beliefs of this consensus expressed "Confiden[ce] to the verge of complacency about the perfectibility of American society,"[318] again, the presumed sense of natural order surrounding modern systems. The consensus centered on views about political economy and social relations to ensure a harmonious social order, a line of uniformity, conformity, and homogeneity coursing through a diffused set of different people stabilized by the umbilicus of what historian Arthur Schlesinger, Jr. at the time called "The Vital Center."[319] A view of a cybernetic social system helped assemble this unity and consensus.

The contributions of cybernetics to narrating the liberal social consensus are restricted below to three of its four principles. The fourth principle, that of belief in reform, is what generated the cybernetic-based curriculum reforms of the Sputnik era and is taken up in a later chapter. The other three principles of consensus liberalism taken up here include first, the confidence in a capitalist economy, second, reducing class conflict, and third, maintaining social unity. Bracketing "traditional" social elements constructed "modern" consensus and social harmony. Much

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[316] Gilman, *Mandarins*, 70-71.

[317] Chafe, *Unfinished Journey*, 178.

[318] Godfrey Hodgson, *America in Our Time: From World War II to Nixon--What Happened and Why* (Princeton, N.J: Princeton University Press, 2005): 75. On skepticism of an actual consensus, see Gary Gerstle, "Race and the Myth of the Liberal Consensus," *The Journal of American History* 82, no. 2 (September 1, 1995): 579–86; Arnold Hirsch. *Making the Second Ghetto: Race and Housing in Chicago, 1940-1960* (New York: CUP Archive, 1983); Thomas Sugrue, *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit* (New Haven: Princeton University Press, 1996).

[319] Schlesinger, *Vital Center*.

like Marxism's pursuit of historical progress, one that culminated in an end-stage of socio-political-economic utopia, the systems view of the steady pursuit of progress that underwrote an End of History pursued an American liberal social consensus. The material dimensions and its related consumer culture prevalent during the heyday of the 1950s cybernetic project during the "Kitchen Debates" contributed to fulfilling the idea of the American Dream, the underlying materiality that would fulfill human actualization (which coincides with the Marxist achievement of the last stage of proletarian rule *sans* two un-American elements of Bolshevism and godlessness).[320]

Consider first the principle of confidence in American capitalism as part of this narrative of consensus. The optimism embedded in cybernetic discourse and other enhanced technology upheld the benefits of material achievements to "uplift" humankind.[321] The optimistic reform of—and not the revolution of—the material trappings of a capitalist economy were at stake in consensus liberalism. Markets could bring goods to help lift people up,[322] and materialism and rationalism in both public and private operations contributed to a consensual process necessary to achieving a prosperous and improved American social order. Cybernetic visionaries like anthropologists Gregory Bateson or Margaret Mead remained hopeful about the broad application of cybernetics to "uplift" society and a nascent liberal orientation is suggested in Wiener's title *The Human Use of Human Beings*. Yet Wiener stayed skeptical of Bateson and Mead's view. It was not that he considered the application of cybernetics to social problems to be inappropriate. Rather, it was that such an application would fail because of a mathematical impossibility due to the "limitations of the data which we may hope to obtain." Weiner did maintain the cybernetic management of broad social problems was possible, given his view that cybernetics could improve the workplace environment, bringing about an "assembly-line without human agents" to obviate the drudgery of capitalist labor exploitation.[323] Cybernetics could bring material values of design, engineering, and automatism to human bodies to

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[320] See May, *Homeward Bound*, chapter 1. For the connection between the consumer, consumer economics, and the cybernetic mechanism consider Ashby's description of a purchase: "The driver about to choose a new car often proceeds in [discrete stages]. He first says, perhaps, 'It must cost less than £1000'. This criterion effects some reduction in the number of possibilities. Then perhaps he adds that it must also be able to take five people. So he goes on. Each new criterion makes the surviving possibilities fewer [...] The abstract selection (or design) of a machine can similarly take place in stages." Ashby, *Cybernetics*, 257.

[321] See A. Neelameghan, "Some Issues in Information Transfer: A Third World Perspective," *IFLA Journal* 7, no. 1 (March 1, 1981): 8–18.

[322] Gilman, *Mandarins*, 93.

[323] Wiener, *Cybernetics*, 33.

help bolster a better economic vision of the "good life" for American workers and citizens.[324]

Second, in relation to consensus liberalism's principle of addressing class conflict, cybernetics served as the great equalizer for the unfolding modern social consensus. Neither race nor class, traditional barriers to modern social cohesion, could endure a "modern" cybernetic machine's ability to unify an advanced modern society. As a science, cybernetics expunges difference and under a view of modern history, the tradition-based phenomena of social division—race or class, but not sex or gender (which would have to wait for Betty Freidan or the Stonewall Riots)—evaporate because the cybernetic focus on relations superordinates—to use Wendy Brown's term[325]—greater social demands over lesser social categories. Despite building modernization's social discourse from privileged tradition-based categories based on a tradition-based cultural position—white, male, educated, urban, post-industrial and uniquely conformist—modernization's vision of a monolithic conflict-free society transcended the two of the three legs of "traditional" society's focus on race and class (and again, not sex or gender) that ostensibly promoted social discord, such as those views "arbitrarily enforcing a particular set of views held by a given group of teachers," those "middle class old American teachers"[326] that the Rationale sought to dispel, since those views reinforced lesser views unbefitting a greater moral order. Modernization and cybernetics anticipated such discord by favoring social harmony that a unified and technologically complex society reached.[327]

Consensus liberalism's second principle leads to the third: social unity. The view of an unfolding technological complexity that engendered a sense of "unity at home" corresponds with the consensus history that emerged during this period. The consensus historians (and different strains of educators and social scientists) would envision an End of History by rejecting the earlier Progressive historian's vision that the engine of history was

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[324] On Kurt Lewin's efforts to improve industrial relations, see "Action Research in Industry," in Alfred Jay Marrow, *The Practical Theorist: The Life and Work of Kurt Lewin* (New York: Basic Books, 1969), 141-152.

[325] Wendy Brown, *Regulating Aversion: Tolerance in the Age of Identity and Empire* (Princeton: Princeton University Press, 2006).

[326] Tyler, *Basic Principles*, 77.

[327] "Even as mid-century social scientists strove to distinguish their form of expertise as objective, apolitical and value-free [one can find] cybernetic scientists' persistent strategy of speaking about themselves, their models and people in general in the same breath." Jamie Cohen-Cole, "Cybernetics and the Machinery of Rationality," *The British Journal for the History of Science* 41, no. 01 (2008): 114.

conflict.[328] Both cybernetics and consensus history, as theories of change, as steeped in materialist theories of history, denied that conflict between race or class compelled historical change. Consensus history held instead that America was always unified and united, that its politics and economics always aligned, and that a thread of consonance had always existed in most Americans' opinions—even radicals and revolutionaries—based on the principles of economic interest, property, and trade. For example, in Richard Hofstadter's view,

> Almost the entire span of American history under the present Constitution has coincided with the rise and spread of modern industrial capitalism. In material power and productivity the United States has been a flourishing success. Societies that are in such good working order have a kind of mute organic consistency.[329]

The liberal consensus view and consensus history unite here to present an argument about sameness. The chief critic of consensus history, John Higham, castigated how the consensus conformity was based on "structures" or "patterns,"[330] not conflict or difference, or at least a view in which difference was gradually rendered into sameness, a central feature of cybernetic operations. Whereas the previous generation of Progressive historians had highlighted conflict, crises, and sharp divisions, the emerging consensus view rolled each divergence into an absence of conflict (or sameness—that is, consensus). Cybernetic adherent Ross Ashby spoke to Hofstadter's "organic" consistency by noting a double gesture in proposing Ashby's Law of Requisite Variety:

> Regulation in biological systems certainly raises difficult problems [...] because variations in size tend to be correlated with variations in the source of the real difficulty. What is usually the main cause of difficulty *is the variety in the disturbances that must be regulated against*.[331]

Ashby's Law states that a unified whole system or organism must contain a variety of united regulators (parts). The variety of regulators, united in orientation, militate against any corresponding variety of external disturbances because "If regulation is not possible, the organism perishes—an extremely common outcome that must not be forgotten." Even "when the organism as regulator faces a very large and complex environment with limited

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[328] John Higham, "Beyond Consensus: The Historian as Moral Critic," *The American Historical Review* 67, no. 3 (April 1, 1962): 609–25. Gilman, *Mandarins*, "Consensus History and Modernization Theory," Ch. 2; Richard Pells, *The Liberal Mind in a Conservative Age: American Intellectuals in the 1940s and 1950s* (New York: Harper & Row, 1985), Ch.2.

[329] Richard Hofstadter, *The American Political Tradition and the Men Who Made It* (New York: Vintage, 1948), viii.

[330] Higham, "Changing Paradigms."

[331] Ashby, *Cybernetics*: 244 (original emphasis).

resources—there are various ways that may make regulation possible." Again, reiterating the point about technological complexity that engenders a social unity at home, among the different ways that makes regulation possible is that any variety of desired "regulator can be selected from some general set of mechanisms (*man*, non-regulatory)," a selection made either by natural means or "*by being made*."[332]

Moreover, these regulators are standardized. Many of Ashby's desired "regulators have as goal the bringing of some mechanism" like a human "[in]to standard form." Standardizing a mechanism under a sense of social sameness comes even as that regulator has a "goal, of course, distinct from that of the [social whole]," a goal with difference housed within a standard form of sameness.[333] In an age of anxiety seeking to reach an End of History, each different part of a system had to do "his" part to ensure social *homeostasis*.

In rejecting Progressive history, the emerging consensus view held that materiality softened social conflict, that material wealth fostered consensus, and that American opinions, despite any difference, had always already conformed to the same view. In this formulation, no social *difference* was imagined within the nation. Social harmony and material components of wealth and industrialism already went hand in hand in this view of a systems society.

Aligning current states and ideal states through cybernetic principles could reconcile differentiation, specialization, and a high degree of a division of labor to preserve both social and system unity. In other words, by already imagining a complex modern American society as a unified cybernetic system society, again, Hofstadter's "organic consistency" (and Boorstin's organism and Hartz's liberal system),[334] and then seeking to explain historically how that singular social system achieved its current unity, an "engine" of history must explain for how the social system's parts cooperated organically to reach that "whole" end. This engine of reconciliation reduces difference between reaching a nation's goal state (a vision of a nation unified behind a set of values) and the current state of social conflicts (that is, the actual states of conflict), a process that reconciled what Bercovitch called "an

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[332] Ibid., 263 (emphasis added).

[333] Ibid., 246.

[334] See the discussion of consensus, systems, and all three scholars in John P. Diggins, *The Proud Decades: America in War and in Peace, 1941-1960* (London: W. W. Norton & Company, 1989), Ch. 7.

idealized True America against the actual (but inessential, correctible) evils of the Real America."[335] When the current state of social *difference* and conflicts are rendered into sameness and conformity to attain a goal state of a unified and harmonious social system, the "engine" of this historical change (homogeneity and *homeostasis*) mirrors how the machinery of cybernetics operates. The material components of wealth, industrialization, and abundance from an advanced political-economic system inflected by advances in modern science and a complex technology like cybernetics generated a consensual march to a final stage of social development, an End of History.[336] This consensus "reckoning" coincides with Wiener's rejection of the ruthless capitalistic exploitation of the human subject, the conditions of "slave labor" pursued by the special interests of the business class—"the hucksters [who] recognize no national boundary" of an American society.[337] As historian Jeffery Sklansky observes in *The Soul's Economy*, "Christian belief [...] animated commonplace visions of the good life dedicated to the service of God rather than the pursuit of individual or collective interest, along with images of the good society predicated upon spiritual communion instead of private property and social compact."[338] Wiener's quarrel with "hucksters" stems from a religious and moral standard entwined with an image of a nation inhabiting an ideal realm. Again, here's Bercovitch: "The objects of lament, from slavery to corporate greed, were shifting forms of derangement: aberrations of the values and principles that had united the states from the start and explained for the greatness of the Union."[339] Wiener's quarrel reflects a "social gospel" theological tradition coupled to a *nation's* social-political identity—*political theology*—where no part in a unified "organic" systematic whole (sameness) could be selfish (different), including business tycoons—or in education, as Tyler's Rationale would have it, teachers[340]—since each part in this system must conform to reach harmony, a national whole, a system society that constrains "selfish"

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[335] Bercovitch, "Preface," xvi.

[336] Gilman, *Mandarins*, 63-67.

[337] Wiener, *Cybernetics*, 37.

[338] Sklansky. *The Soul's Economy*, 14-15.

[339] Bercovitch, "Preface," xvii.

[340] Schools often "failed to consider" how they promoted "assumption[s] that the points of view of the middle class old American teachers were the desirable point of view" instead of more comprehensive modern ones. Tyler, *Basic Principles*, 77. "Unless we can get control [of education] by the social forces of the complete community, rather than by particular political groups or pressure groups, we shall have an inadequate educational program." Tyler, "Major Issues," 86.

interests from dominating. At issue here is collective belonging and social attachment. Neither Ayn Rand nor Gordon Gekko are suited to a cybernetic political economy.

Overcoming Traditional Barriers

Particular tradition-based social categories of narrow special interests like class or race needed to be excluded and bracketed out to achieve consensus liberalism. To explain how, below I take these social categories in order. Those "traditional" social classifications had to be subsumed to a more abstract "general interest" and modern "system" principles, disciplining and effacing those "lesser" and traditional categories to instead connect a social "normal" to higher values of national ideals. In the trajectory of historical progress, the higher "system" values earned the status of an unstated virtue toward which social unity was channeled.

First, appeals to national ideals took precedence over that which impinges on nationhood, including economic class. Modernization could indeed bring people economic prosperity, but religious and moral reservations were already expressed about maintaining social values in the face of the dangerous desires like graft, greed, and wage labor promoted by the modern marketplace. The hope and optimism that envisioned a better nation, a better socio-economic order, in Wiener's view, akin to another Social Gospel movement "based on human values other than buying or selling"[341] entailed a rejection of the selfish interests and character of *homo economicus* to favor instead the greater "virtue" of American democracy.[342]

Second, "consensus" bracketing occurred also within the cultural domain. What transcended narrower, lesser, "traditional" cultural categories of race were a set of universalized qualities ascribed to modern science and technology, thereby privileging hopes for a "higher" national vision into that of a "color-blind" society. For instance, modernizing educational programs meant to one curriculum specialist that "we do our best to get students to read great books instead of the comics, to listen to symphonies instead of 'jive', to give allegiance to democratic ideals and practices rather than to accept authoritarianism."[343] The "bracketing" of race here appeals to "higher" Euro-

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[341] Wiener, *Cybernetics*, 37, 38, and the chapter "Information, Language, and Society." For the Social Gospel and Reform Movement, see Richard Hofstadter, *The Age of Reform* (New York: Vintage, 1956); James Kloppenberg, *Uncertain Victory: Social Democracy and Progressivism in European and American Thought, 1870-1920* (New York: Oxford University Press, USA, 1988).

[342] Dorothy Ross, *The Origins of American Social Science* (New York: Cambridge University Press, 1992).

[343] Seyfert, "Characteristics," 81.

centric cultural standards, since jive music and dance, unlike symphonies or opera, do not originate in high culture, nor are the comics a type of text that students must read that will create the well-rounded kind of person to better solidify the democratic ideals of the nation and Western civilization. (Gender roles, however, were not "bracketed" since the scholarship presumed male researchers in leadership roles, such as in the way that research institutions sought to attract new scholars based on local accommodations found in the "Community life [for the] wives and children" of these researchers.[344]) The systems view governed personal attributes by orienting parts to higher values for each and all functions to reach their fullest potential.

Much of the burden to orient parts to that full "American" potential fell to education. Those throughout the nation excluded from modern categories had to be brought into the fold to reach consensus.[345] The parts Tyler targeted for higher levels of social integration occupied the "backward" South,[346] or the racist unionized shops in the industrial North, or parts in the rural southwest. These tradition-bound sites needed to be modernized into a modern category, "an important American problem," sites and locations where not *systems*-based, but traditions-based socio-cultural characteristics of race- and class-based differences prevailed. These tradition-bound sites designated many inhabitants as "uneducable," a traditional view incompatible with imbuing the modern ideal of full "potentiality" (but in line with Life Adjustment education, as seen in an upcoming chapter). However, "[m]aking children more effective and happy in their lives and creating for society benefits" could be reached by addressing head-on "Educability and the Schools."[347] Schools, Tyler argued, could promote "organizations which provide for the wider participation of children and youth, participation in groups *which cut across class lines, geographic boundaries, and*

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[344] Allen Barton, and David McClelland, "The Center for Advanced Study in the Behavioral Sciences: Report of the Planning Group," June 1952. Herbert A. Simon Collection, http://doi.library.cmu.edu/10.1184/pmc/simon/box00042/fld03362/bdl0001/doc0001: 1, 14. "The Director of the Center should be a man of high respect in the social sciences and in university administration generally. He should be noted for his intellectual leadership, his sound judgment [...] his administrative skill, his capacity to represent [...] and generally his fairness and judiciousness. He should have clear responsibility." Also see K. A. Cuordileone, "'Politics in an Age of Anxiety': Cold War Political Culture and the Crisis in American Masculinity, 1949-1960," *The Journal of American History* 87, no. 2 (September 1, 2000): 515–45.

[345] On the backward, rural reactionary and populist traditional areas—those not forward looking to the Frontier—see Daniel Singal, "Beyond Consensus: Richard Hofstadter and American Historiography," *The American Historical Review* 89, no. 4 (October 1, 1984): 980.

[346] Gilman notes the development of the Tennessee Valley Authority in the "backward" South. *Mandarins*, 38.

[347] Tyler, "Educability," *Elementary School Journal*, 212.

economic prejudices,"[348] to operate under a "fundamental principle that I think we all agree to [...] the principle that educational opportunity must be provided for young people regardless of where they are born or what their racial or ethnic group is"[349] to transcend artificial social barriers in favor of a higher classification—as a member of a class of systems within a greater system.

Herein lies the heart of the consensus bracketing of socio-cultural qualities: that which prevented harmony and equilibrium within the system was located in the qualities of people who disturbed it. The bodies which had to be brought into the fold and reformed and regulated to reach consensus were made the targets of research, programs, and strained efforts, a point I discuss in the next chapter in relation to the behavioral sciences and human relations. But by mounting the responsibility for change on those located as *different* by race and class and also sex or gender—that is, on those who were "measured by their distance from the WASP mainstream"[350]—demonstrates that the system, the technology that was being advocated, was, in homeostatic form, imagined already as white, male, straight, and middle-to-upper class. In effect, the cybernetic technology mirrored the tradition-based socio-cultural qualities of the scientists who designed it.

The point here is not to imbue human individuals or special interests that restores a sense of agency (discussed in Chapter One). That sense of agency would locate the power dynamics within this structural arrangement within the hands of an independent, isolated scientist/theorist, discovering in objective fashion a pre-existing "reality" to then appropriated cybernetic technology from the mechanical domain for social application. Rather the view here follows what feminist scholar Judith Butler articulates: "that there need not be a 'doer behind the deed,' [since] that the 'doer is variably constructed in and through the deed."[351] This view re-emphasizes a point made at the end of chapter two that implicates ways of reasoning: that a "cut" is made from within a plane of possible possibilities, an analytical move (or moves) that instantiates a series of exclusionary representational borders that, according to the Rationale, "divide[s] life into various phases in order to have manageable areas for

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[348] Tyler, "Urban Community," 18 (emphasis added).

[349] Tyler, "Major issues," 86.

[350] Matthew Frye Jacobson, *Whiteness of a Different Color* (Cambridge: Harvard University Press, 1998), 275.

[351] Judith Butler, *Gender Trouble* (New York: Routledge, 1999), p. 181.

investigation."[352] Such divisions create livable spaces for humans, including the doer, within an already existing regulatory system.

In sum, the elements existing in consonance with a theory of a modern and unified social system were a basic tenet of both the liberal consensus and cybernetic systems. Cybernetics targeted parts for a unified whole under a single mantle, governed by system stability, social consensus and cooperation. In this regard, cybernetics is social theory. The science of cybernetics had unwittingly or not embedded within its own self-understanding a set of self-authenticating ethnocentric cultural theses, also seen today in the complexity science practiced in the West (and not the "simple" science practiced by others). These cultural theses are, in part, what positions the postwar version of cybernetics as an Americanized re-invention (taken up in a later chapter). The materialist basis of its history and of modern society seemed to efface contemporary problems of race and class by favoring a social consensus to reach a unified cosmopolitan society. This view, however, as discussed in the next section, also marks a Judeo-Christian understanding of history.

A Judeo-Christian understanding of history

Earlier chapters detailed the sacred history of "America" embedded in cybernetic modernizing discourse. That discourse focused on a principle of motion embedded in the idea of a social system moving and developing across the unified arrow of time. In cybernetic and modernization parlance, entities move from past stages to pass through the current state onto a future goal state. Movement at the system level from stages "back then" to a future speaks again to a historicist account of progress. Again, "Because we are all in different stages of transition from the old to the new," the principle of motion across the arrow of time ("transition") was always "a forward movement toward a more effective conception" of a present state oriented to the future.[353]

The movement across secular time again suggests a Judeo-Christian sacred history. According to Bercovitch, "Sacred history unfolds in a series of stages or dispensations [...] the gradual conquest of the profane by the sacred."[354] A surpassing-the-previous-stage thesis occurs in the cybernetic discourse of "new," America's

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[352] Tyler, *Basic Principles*, 19.

[353] Frank, "Foreword," 191, 196.

[354] Sacvan Bercovitch, *The American Jeremiad* (Madison, WI: University of Wisconsin Press, 1978), 13, 178.

"break" from the old "traditions" into a higher and more "modern" stage. Cybernetics, according to Wiener, reflected how "the whole scale of phenomena has changed sufficiently since the beginning of modern history to preclude any easy transfer to the present time [those] notions derived from earlier stages."[355] Sacred and secular views of history here are fused within cybernetics under a sense of progress across a time series (historicism). The movement across time into reaching an American social system suggests how cybernetics aimed to cement national consensus (nationalism), and as Bercovitch noted about the American Puritan jeremiad, "Only in the United States has nationalism carried with it the Christian meaning of the sacred."[356] According to the science,

> in the long run [...] maximum entropy will appear to be the most enduring of all. But in the intermediate stages an organism or *a society of organisms* [take up] modes of activity in which the different parts work together, according to a more or less meaningful pattern.[357]

Such expressions link the science with ethics and with history. What is being expressed here scientifically is not only that social ethics and constraints are placed on human conduct ("work together," "meaningful pattern" as cooperation), but also a consensus history of a people, a sense of a sacred history that synthesizes, in Bercovitch's words, both "nationality and universality, civic and spiritual selfhood, secular and redemptive history, [and] the country's past and paradise to be."[358]

I will return to that future paradise (prophesy) in a moment. In the meantime, the correspondence between modernization, cybernetic discourse, and a Judeo-Christian sacred history merge under (and returns us to Bowker's) political and religious elements: the American jeremiad's *political theology*. Cybernetics was constructed during an era's rejection of a current state/status quo (the age of anxiety) that foretold of a national destiny (America's "potential") bound by prophesy, a future that begins with a romanticized and virtuous past. Wiener, for instance, lamented an abundance of authorities "false to the dearest part of our American traditions [...] They have succeeded in being un-American without being radical."[359] The absent "dear" traditions of America, the "true" ways of being

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[355] Wiener, *Human Use*, 45.

[356] Bercovitch, *Jeremiad*, 176.

[357] Wiener, *Human Use*, 38.

[358] Bercovitch, *Jeremiad*, 176.

[359] Wiener, *Human Use*, xxix.

American, a public lament about the current state of the social moral (and natural) order simultaneously expresses the hope of a return to true American ways and true American ways of being. Bercovitch calls such expressions "the persistence of the [nation's] founder's dream,"[360] and Andrew Murphy, another chronicler of the American jeremiad, pins their "connection to a larger, sacred story tied intimately to the particulars of the nations' origins," a "narrative of decline from founding virtues and a call for political reform."[361] A cybernetic system society reconciles the deplorable conditions of a society's current state under a vision for a better future, a modern future, and under an historical expression of improvement apparent in the cybernetic mechanism. According to *Cybernetics*,

> All of these devices in which an apparatus assumes a specific structure or function *on the basis of past experience* lead to a very interesting *new attitude* both in engineering and in biology. In engineering, devices of similar character can be used not only to play games and perform other purposive acts but to do so *with a continual improvement of performance on the basis of past experience*.[362]

Just as cybernetic machines improve upon themselves based on the past, so can cybernetic system societies improve and overcome their failings to reach a new social frontier.

Improvement leads to prophesy. The cybernetic reform of the present state across a time series to an improved future state occurs "with prophetic assurance, toward a resolution that incorporates (as it transforms) both the promise and the condemnation."[363] Prophesy, notes one scholar of the rhetoric of persuasion, holds that "the relief of agony requires a new synthesis [...] to be restored to grace [...and] must be transcendent," so whether "[i]n remolding or reformation lies the essential optimism of the prophetic judgment."[364] The cybernetic modernizing reform to reach a new moral and natural order was bound by the assurances of a future goal state. Since purpose occurred in the "machine, as in Darwin's nature," and according to Wiener, since "we build purpose into machines,"[365] humans also were ostensibly endowed with purpose, a sense of human agency for changing their own

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[360] Bercovitch, *Jeremiad*, 11.

[361] Andrew R. Murphy, *Prodigal Nation: Moral Decline and Divine Punishment from New England to 9/11*. Reprint (New York: Oxford University Press, 2011): 10.

[362] Wiener, *Cybernetics* (2nd edition), xii (emphasis added).

[363] Bercovitch, *Jeremiad*, 40.

[364] James Darsey, *The Prophetic Tradition and Radical Rhetoric in America* (New York: NYU Press, 1997), 25-27.

[365] Wiener, *Human Use*, 38.

circumstances to reach a purposeful goal state, and thus progress. Or, rather, not every human, since only scientists and engineers were trusted to dial up a social system's goal state, which holds also with an educational system's purpose that I detailed in the earlier chapter on the Rationale. In a socio-cybernetic system, a better future, a "purpose," is embedded within the historical "time series" and within this trajectory, as within the liberal social consensus, and also as within that longstanding prophetic tradition of the American jeremiad, the main object of consideration rested on that "symbol of America [as] the key to social control." That symbol "was a way of fusing the [Protestant] millenarian impulse [...] with the concept of gradual improvement." Those who wielded the symbol of the nation imagined themselves "as keepers of the dream,"[366] and the ideas of the American Dream and improvement occupy part of the science of cybernetics.

What cybernetics mirrored, or at least provided to a complex society under duress, was a sacred and prophetic view of history indicating one path to religious providence. The conclusions were thus inevitable: society must reform to reach and fulfill the prophecy of America's mission. Since the larger environmental structure had changed, as the integrated sciences of systems had discovered, so too, then, had humans better change. "We have modified our environment so radically," warned Wiener, "that we must now modify ourselves in order to exist in this new environment."[367] Articulated here is the call for a change in conduct, the social reform that domestic modernization required, and a style of reason that carved out how a Judeo-Christian apperception of "the problem" of being modern required a Judeo-Christina solution: a liberal Protestant Reform Ideology, similar to that described about Talcott Parsons.[368] "Let us hope that it is still possible," Wiener later concluded, "to reverse the tide of the moment and to create a future America in which man can live and can grow to be a human being in the fullest and richest sense of the word."[369]

Conclusion

A wider historical lens of redemption suggests the landscape of systems science and its extant background

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[366] Bercovitch, *Jeremiad*, 180.

[367] Wiener, *Cybernetics*, 160; *Human Use*, 46.

[368] Uta Gerhardt, *Talcott Parsons: An Intellectual Biography*. New York: Cambridge University Press, 2002).

[369] Wiener, *Human Use*, xxx.

of religion points to cybernetics as the tool to modernize society. This view, however, repositions cybernetics as a mode of cultural reproduction,[370] once the domain of theology. Ethics, politics, and science—these three converge under the cybernetic aperture because they are part of the historical view embedded within the social technology, and so remade society to help preserve society from that which threatened it.[371] Under "reform," cybernetics sought to "modernize" society by orienting it to modern ideas.

The endeavor of the mid-century domestic reform movement of modernization links both political liberty and religious liberty. Both are part of such pursuits observed in Protestant Reform ideology, since the self-regulatory and homeostatic features of cybernetics removes the need for centralized authority by having parts govern themselves and each other to stabilize the whole. Cybernetics compels the individual function to submit to a higher authority, a force more powerful than him or herself, with little to obscure the relationship between the individual subject and God, which, as historian Daniel Tröhler observes, obviates need for a Catholic church, priests, or religious rituals, so that only a direct line stands between God and "the inner soul of the faithful," a direct line that "mediates salvation."[372]

This linkage unsurprisingly connects how many later modernists detailed in Gilman's *Modernization* were children of religious figures. Modernists like Lucien Pye, David Apter, Parsons, Lasswell, Almond—and in education so too a modernist like Ralph Tyler—all were sons of missionaries, ministers, or priests.[373] These modernists, like Wiener, were "prophets crying in the wilderness [...] simultaneously lamenting a declension and celebrating a national dream [...] The American jeremiad obviated the separation of the world and the kingdom, and then invested the symbol of America with the attributes of the sacred."[374] The comparative reasoning contained in

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[370] Haraway, "A Cyborg Manifesto."

[371] A pressing need emerged to "be able to develop increasingly a better society, rather than the one that is torn apart by powerful forces of industrial change and social change." Tyler, "Major Issues," 58.

[372] Daniel Tröhler, *Languages of Education: Protestant Legacies, National Identities, and Global Aspirations*. New York: Routledge, 2011): 33, 134.

[373] Gilman, *Mandarins*, 70; Uta Gerhardt, *Talcott Parsons: An Intellectual Biography*. New York: Cambridge University Press, 2002): 68; Steinar Kvale, "The Church, the Factory and the Market as Metaphors for Psychology," in *Psychology at the Turn of the Millennium, Volume 2: Social, Developmental and Clinical Perspectives*, eds. Lars Backman and Claes von Hofsten (New York: Psychology Press, 2002): 409–36; Daniel Tröhler, *Languages of Education*, 103; Harry Edward Tyler, Sr., *The Nebraska Preacher's Kid* (Crete, NE: Doane College, 1983).

[374] Bercovitch, *Jeremiad*, 180, 179.

modernization synthesized the earthly and heavenly and also in how the end-goal or purpose of the "system" functions to draw operations to a more sacred and more perfect state,[375] in both the cultural and engineering senses of that term, that needed to be realized as part of America's mission. Purpose is the highest of ideals, from once upon a time in America's past, but then toward which the "symbol" was again compelled to "work" to reach the improvement and perfection of humankind.

What can be teased out in the advocacy of a system, and through cybernetics, is a religious dimension for American society, the *political theology* of the American jeremiad. In this, the technology that cybernetics presented to rebuild a nation and reach the perfection of humanity comes by folding bodies into a system of improved relationships that brings to all and each a greater sense of higher purpose. This technological re-purposing of the nation is the focus in the next chapters, the fourth and final liberal consensus component of reform.

[375] Rush Welter, "The Idea of Progress in America: An Essay in Ideas and Method," *Journal of the History of Ideas* 16, no. 3 (June 1, 1955): 408.

CHAPTER SIX

CYBERNETIC STRUCTURAL REFORM

The previous chapter laid out three of the four elements that comprised the liberal social consensus: a belief in capitalism, disapproval of class conflict (or, in converse, endorsing social harmony), and confidence in social unity. There I also explored how a modern American system was bound to a culturally transcendent—if not spiritual—sense of faith. This chapter picks up the last element of the liberal social consensus, that of a belief in reform, and focuses on the reform of educational structures to produce a harmonious modern social system. This chapter also continues to probe the appeal of the cybernetic aesthetic by locating the art in the science. Despite the mid-century prevalence of mathematics and rationality, mechanization and automation, analytical philosophy and logical positivism, and the vigorous pursuit of the physical sciences in the era of Big Science, the domestic modernization of social systems was organized around an aesthetic of harmony and symmetry.

To preview this chapter, first I recount how a comparative system of reasoning with double gestures generated a familiar set of contrasting elements—old and new, rural and urban, traditional and modern. The contrast between these elements fed the domestic modernization narrative and perceptions of dysfunctional social relations in America's "new" and dynamic modern system. The modernization narrative leads to the second section's exploration of the emerging field of human relations that cybernetically engineered more harmonious social relations. The third section considers the significance of curriculum as a message for stabilizing (human) relations between parts to stabilize the (social) system. The fourth section considers the academic impetus to bring those human relations under scientific investigation, which helps to explain in the fifth and sixth sections focus on the need to reform and modernize structures within the system. This chapter concludes where it started, on considering the historical background of the dysfunctional nation.

Origin Stories

Comparative reasoning between urban and rural, set upon the arrow of time, relied on another longstanding cultural thesis, that an idyllic agrarian past had existed in the immediate pre-modern, pre-cybernetic era. This changeover to a modern urban landscape from a "traditional" rural one disturbed the aesthetic symbol of a pastoral nation. That traditional era's pastoral order had managed social interactions well enough to produce an identifiable set of stable social patterns that embodied certain qualities. Educational scholars and others of the late 1940s, but

particularly those leaders across academic fields concerned with the direction of "the public," recounted the qualities of that idyllic scene. For example, curriculum scholar B. O. Smith of Champaign-Urbana noted this traditional era was "a static period" where "relative stability" prevailed in the social order and infrequent perturbations "to the basic structure of society [meant] fundamentally new personal adjustments [we]re infrequently called for."[376] To these scholars, like Ralph Tyler, the idyllic rural landscape was of a more "personal" era,[377] steeped in moral traditions, or like Wiener, who held that in any "small country community [...] it does not do for a man to have the habit of overreaching his neighbors," since "There are ways of making him feel the weight of public opinion."[378] To these social observers, social structures and functions had aligned at the time: "small towns seemed to acquire institutions and agencies which held each community together and made it a constructive and fortifying environment for the individual," noted Warren Seyfert of Chicago's Laboratory school at a 1947 summer Conference for Administrative Officers of Public and Private Schools.[379] The image of "The old picture of society which supplied social incentive, purpose, and a system of common sanctions" had preserved the "cohesive and directive forces of society."[380] Despite isolation and autonomy, "the older rural community provided a constructive educative environment" for all sorts of regulatory patterns to develop, and even if they "were not generally planned or even well understood [...] they were, nonetheless, effective."[381] And while *perfect* harmony may not have prevailed in those environments, to these social scientists, structures and functions aligned well-enough to engender a harmonious social order that preserved an already existing consensus.

That harmonious scene of traditional pastoral tranquility in the past, however, had eroded in the wake of now-modern realities. Many systems-oriented educational reformers who followed the vein of scientific naturalism (as opposed to those oriented to religion)[382] held that "the forces of science and technology" had gripped the nation

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[376] Smith, "Social Perspective," 12, 15, 16.

[377] Tyler, "Urban Community, 16.

[378] Wiener, *Cybernetics* (2nd edition), 160.

[379] Seyfert, "Characteristics," 71.

[380] Smith, "Social Perspective," 3.

[381] Tyler, "Urban Community," 19.

[382] Purcell, *The Crisis of Democratic Theory*.

and upended the traditional rural landscape and its social terrain. Such changes, argued Columbia University philosopher of education Kenneth Benne, forced social scientists to reconsider how "the slowly changing conditions of agrarian life, under which the patterns of human relationship[s], the moral and political ideas [...and] the doctrines and practices of education [...] were shaped, [and] have been rapidly replaced by an industrialized and urbanized environment."[383] Science and technology, occupying the frontiers of modern knowledge, eroded the social fabric of a now-displaced traditional era and as that image of the traditional natural environment eroded, so too had the traditional social patterns eroded, and so too had eroded the image of a nation's harmonious social order.

Any qualities that distinguished the image a "modern" urban industrial order were enabled by comparisons with that traditional rural social order. The most obvious quality distinguished in the modern industrial scene was its disordered pattern. The anesthetizing effects of mechanization upon the human subject, asserted Tyler, were different "from the rural community, not only in size, but also in kind," a consequence of over-commercialization and organizational complexity.[384] From a different vantage point, American historian Arthur Schlesinger, Jr., concluded how "[M]odern industrial economy, based on impersonality, interchangeability and speed, has worn away the old protective securities without creating new ones. It has failed to develop an organizational framework of its own within which self-realization on a large scale is possible."[385] Industrialization, and its corollary, the metaphorical *machine*, according to Tyler, "has made [the human subject's] body almost an anachronism, a thing to be fed and cared for but largely without functional significance."[386] Indeed, as other educational leaders noted, "Industrial man is afflicted with an utter loneliness [...] he is losing his sense of purpose."[387] Imposed "by modern living conditions"[388] and when compared to a traditional era, the qualities and patterns of a modern era generated an

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[383] Benne, "Curriculum Development," 562.

[384] Tyler, "Urban Community," 14-18.

[385] Schlesinger, *Vital Center*, 51. "The disintegration of our rational culture, with the decay of those ideas, conceptions, and beliefs up which our social and individual lives were organized, brings us face to face with the problem of treating society." Lawrence Frank, *Society as the Patient: Essays on Culture and Personality* (Piscataway, NJ: Rutgers University Press, 1948): 1.

[386] Tyler, "Urban Community," 15.

[387] Smith, "Social Perspective," 5.

[388] Seyfert, "Characteristics," 73.

"inadequacy [in] our culture as a molder of the necessary skills in group dynamic procedure[s]."[389] Tyler compared the qualities of a static traditional order to diagnose how the qualities and "major elements" of a dynamic modern order were "essentially different —[in] its central forces, its forms of organization, [and] its effects on its members."[390]

Adopting the pastoral image into an urban framework for the social sciences was not new, as Popkewitz has detailed.[391] This pastoral embrace, however, contributed to urbanizing the abstract relations of modernity to bring a different assemblage of considerations—patterns, complexity, communications—into diagnosing "the problems" of modern society. What vexed such systems-oriented reformers was how modern dynamic environments had generated an entirely new set of social patterns that destabilized human relationships. Unlike traditional life in agrarian America, "[t]he general tendency of modern life [was] to shield young people from realities [...] from the essential processes of living."[392] The modern world was indeed a "vast system of mechanical, rational, and impersonal arrangements,"[393] a result of the "impersonality implicit in any big system,"[394] the demands of which generated disharmony. Here's Tyler: "The most pernicious feature of urban stimulation [...] is its confusion. It seems to have no pattern, no unity of meaning."[395] Seyfert's 1947 address to public and private school administrators lamented how "we have formalized or narrowed our school groups to the point where they [the 'Values of Group Work'] have lost a large measure of their vitality." The loss of small group values produced personal behavioral patterns that were "highly selfish in character"—an ethical problem of the part's excessive orientation to itself—an

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[389] Herbert Thelen, "Engineering Research in Curriculum Building," *The Journal of Educational Research* 41, no. 8 (April 1, 1948): 593.

[390] Tyler, "Urban Community," 15.

[391] Thomas Popkewitz, *Cosmopolitanism and the Age of School Reform* (New York: Routledge, 2007), Ch. 5. Also see Barry Franklin, *Building the American Community* (Philadelphia: Falmer Press, 1986), Ch. 1.

[392] Seyfert, "Characteristics," 74.

[393] E.W. Burgess, in Tyler, "Urban Community," 15-16.

[394] *General Education in A Free Society*, 14.

[395] Tyler, "Urban Community," 15.

effect of "the urbanization of our lives."[396] "Corner gangs, special pressure groups, and foreign-language clubs"—these were the products of a changed American landscape, groups who held "no means of communication with one another. They tend to isolate their members from contact with the members of other groups," distorting relations between part to part and minimizing social integration, thereby dividing "an otherwise large and unwieldy body politic into unrelated or conflicting groups." Fractured human relationships affirmed the reality of a "confused complexity of urban social organization," a social structure from which the individual human subject (function) developed new patterns of "narrow loyalties to the particular groups [another function] to which he belongs rather than larger loyalties to mankind [a structural whole]."[397] In these new, narrower patterns, "the welfare of the community as a whole [is] lost sight of and [is] the concern of no one."[398] Modernity wrought social disharmony, in part because the modern constraints on human conduct had yet to be fully realized.

A science of relations to restructure social harmony

Social disharmony emerged as the central focus of the reform discourse appropriated by systems-oriented advocates. The reform discourse appropriated by this group of systems advocates, those tuned into the changing contours of the new sciences, thus suggested a problem: ameliorating disharmony to restore social harmony. The historical comparative-based "reading" of the change from traditional to modern, from simple to complex, from personal to impersonal, generated the dichotomies that fed the "discovery" of new patterns of a modern era. The new patterns suggested disharmony and misalignment between social "structures" and their "functions" who lacked the patterns of conduct in the comparison-generated discourse of the social sciences. To confront this disharmony, reform-oriented scholars again began finding the problem of misalignment in the social structure; again, "the restrictive environment posed by modern living conditions" distorted a function's capabilities. This misalignment thesis rested on "the basic misfit between our institutions and the conditions of our life," which generated a function without the full opportunity to optimize its potential.[399] Misalignment and "[i]nternal rearrangements which reduce

[396] Seyfert, "Characteristics," 76, 71.

[397] Tyler, "Urban Community," 14-18. Also see *General Education in A Free Society*, Ch. 1.

[398] Seyfert, "Characteristics," 71.

[399] Benne, "Curriculum Development," 562.

[...] effectiveness" of "minds, societies, and self-modifying communications networks" all "belong to the pathology of learning. Their eventual results are self-frustration and self-destruction. Pathological learning resembles what some moralists call 'sin'."[400] Initiating reform to correct the misalignment was thus pre-ordained: reform social structures to fix the function. But a return to "traditional" solutions would not suffice.

Reasoning about problems of social disharmony in this fashion guided solutions that could be found in the science of cybernetics. The developing field of "cybernetics as [the] 'science of relations'," but in particular as the science of "people's relations to people," helped these scholars reconsider the modern social (dis)order.[401] Reconceptualizing fields of research under the framework of a "system" allowed these scholars to use the multi-pronged cybernetic understanding of targeting relations of patterns and sets of relationships to target those troubled relations—personal, interpersonal, social, or even human—by scientifically creating, parsing, allocating, and regulating systems interconnections. "Research, in the whole human relations field including education, is a joint responsibility of research and action agencies in collaboration," argued Kenneth Benne of Columbia, and Urbana-Champaign's Smith suggested that "basic social processes are being increasingly regulated and integrated [...] based on exact social knowledge and insight"[402] extracted from a range of collaborative and interdisciplinary scientific research observed momentarily in the emerging behavioral sciences.

The appeal of cybernetics hinged on governing integrated human relationships within inhabitable social spaces. Cybernetic systems were and are "governing systems."[403] They render their parts "Governed."[404] What cybernetics engendered under the guise of a systems science was a capacity to intervene in perceived problems of social disharmony and by extension in the private domain by governing the (human) relations between the (human) parts in a (social) system to offer those constrained modes of human conduct we've been following, absent

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[400] Deutsch, "Natural and Social Sciences," 516.

[401] Murray Eden, "Cybernetics: Closing the Loop," in *The Study of Information: Interdisciplinary Messages*, edited by Fritz Machlup and Una Mansfield (New York: Wiley, 1983): 471, and on 409 is translated from Ampere: "Cybernétique. Les relations de peuple à peuple." See André-Marie Ampère, et al., *Essai sur la philosophie des sciences* (Paris, Bachelier, 1838), 140-141.

[402] Benne, "Curriculum Development," 576; Smith, "Social Perspective," 6.

[403] Nicolas Rashevsky, "Review of Cybernetics or Control and Communication in the Animal and the Machine, by Norbert Weiner," *American Journal of Sociology* 56, no. 2 (September 1, 1950): 199.

[404] John von Neumann, "Review of Cybernetics or Control and Communication in the Animal and the Machine, by Norbert Weiner," *Physics Today* 2, no. 5 (1949): 33–34.

interventions from the state. These cultural interventions used the research conclusions of different scientific studies to carefully configure the cultural linkages that guided the "best" set of social relations, reflecting the social ethics of a social system. The model of selecting a social domain for intervention for the purpose of governance, and not government (the state), reflects what Foucault calls *governmentality*.

Cybernetic discourse about reforming "the curriculum" focused on restoring social harmony by bringing human relations into focus as an object of scientific research. Basic social processes, those interactions between structures and functions, intensified as the focus of academic and scientific research (see the list organized around human relations in an upcoming section), and cybernetic research engendered comparative distinctions that helped to generate the rules and principles that could orient content and behavior (thought and action) about curriculum. Modern curriculum development, argued Benne, could be reconfigured cybernetically, understood "in terms of new patterns of relationship,"[405] so that any proposed "change in curriculum," suggested University of Chicago Group Dynamics theorist Herbert Thelen, meant "a change in the human relations structure," and movement away from the disharmonious "pattern of interpersonal forces among students, teachers, school officers, and community." The newfound modern rules and principles that guided a reformed curriculum were guided by "theory of human interaction in groups (group dynamics) [...] concerned with the forces and conditions in a group which determine the kinds and directions of change" curriculum specialist sought in social processes. This method of configuring relations, most critically, helped determine the "resistance to [that] change." A significant element to understanding modern curriculum development then was how "the actual planning and construction of a desired curriculum in a particular school, with particular personnel and community setting, is an engineering problem."[406]

Re-engineering a school's curriculum could thus re-engineer society and thus strengthen (or weaken) any threatened national goals based on scientific data and research conclusions from a study of "human relations" (cybernetics) that focused on the governance and management of spaces between human bodies. Engineering solutions by pulling the right levers, knobs, and gears to foster the "correct" connections between people and social groups helped to reform curriculum and re-organize schools to help restore a cultural thesis, if not an aesthetic symbol, of a great nation. to help structure a structure to fix the function. Restoring social harmony required

[405] Benne, "Curriculum Development," 574.

[406] Thelen, "Engineering," 578, 577.

structuring a structure to fix a function.

The agent of change to restructure structures

Curriculum reform discourse increasingly focused on using curriculum to reconfigure schools to reconfigure society. Curriculum was represented as a mechanism that regulated social processes, reconfigured as a message that goes out to schools via instructional programming circulating within a larger system. Curriculum could change both academic and social systems, affirmed Benne, based on an "assumption that curriculum development is a species of social and cultural change." Indeed, "curriculum change involves the reconstruction of the school as one among other social institutions. This aspect of curriculum development focuses upon the reeducation of school personnel, the remaking of patterns of relationship[s]" among all involved.[407] Because the scope of curriculum change included "the whole range of life—not just what can be brought into the classroom," that is, curriculum understood "as all of the learning which is planned and guided by the school, whether or not it is carried on in classes, on the playground, on in other segments of the pupils' lives"[408]—because of this new scope, curriculum was reconfigured from a cybernetic system perspective in terms of assessing human interactions to regulate various aspects of life's affairs.

Reasoning about the curriculum in a regulatory fashion steered what was to be the agent of change through the principles of systems. Change would come through organization, requiring reorganization of structures, processes, and communications. The information-based content circulating within a social structure (like curriculum within an educational system), as an agent of social change, could reaffirm proper social relations to reconcile social differences, thus preparing grounds for social reform. Schools were a site of planned change by planning people and reform of educational structures meant teaching diverse ways for functions (people) to think and act on themselves, stimulated by scientific research to explicate the inner workings of a person (a central example of this was restructuring individual agency under a new "character type" by structuring learning experiences, discussed in the next chapter). Educational reforms would help restore symmetry between structure and function to stabilize a modern nation, so that each part knows its place and role in the larger system and could "live together in a spirit of

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[407] Benne, "Curriculum Development," 561, 564.

[408] Seyfert, "Characteristics," 74; Tyler, "Learning Experiences," 59.

tolerance and harmony."[409] To be sure, according to Tyler, "The control of education" was "of paramount importance if education is really to save us from catastrophe [and] to make a better society."[410]

To review, we can see a system of reasoning assembling here. Comparisons generated a view of a modern urban environment that had evacuated the traditional "places where the young can achieve that fullness of opportunity which the city otherwise denies."[411] This view, as expressed by Tyler, charged schools with the task of administering a new set of social patterns to reach national ideals and to restore a sense of social harmony and (perceived) individual freedom by aligning structure and function, where the new "justification for teaching anything [was] the value of the new pattern of behavior for effective living" in a modern era.[412] Without teaching a new set of patterns, without teaching a robust sense of social harmony, Tyler affirmed, "the disintegrating forces of conflicting social environment [would] neutralize [...] 'The Responsibility of the School for the Improvement of American Life'."[413] Administering new patterns for a new era could restore the nation's high ideals of democracy, economic opportunity, and an enlightened society. Educational programming could help the purposeless human subject (function) with "the problem of getting any kind of meaning out of life" and address (structural) issues like "[d]elinquency [...] ultimately a social problem, a problem of general education," [414] under a generalized framework proposed in *General Education in A Free Society*: "General education is the sole means by which communities can protect themselves from the ill effects of overrapid change."[415] So while a system of reason generated problems, and while the solution was easy enough—call on the field of education—the question came as to *how* education and, in particular, *how* curriculum, would do it. Those concrete actions I shall return to in the next chapter.

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[409] Seyfert, "Characteristics," 76.

[410] Tyler, "Major Issues," 86.

[411] *General Education in A Free Society*, 22.

[412] Ralph Tyler, "Evolving a Functional Curriculum." *The American Journal of Nursing* 51, no. 12 (December 1, 1951): 736.

[413] Tyler, "Responsibility of the School," 405.

[414] Tyler, "Major Issues," 59.

[415] *General Education in A Free Society*, 266.

Bringing cybernetics into academic systems—structural reform through the science of Relations

We have so far explored a series of elements within cybernetic structural reform to produce a socially harmonious system. Comparison and double gestures generated contrasting elements (old and new, traditional and modern, etc.), which guided perceptions of dysfunctional social relations housed in America's "new" and dynamic modern social system. Cybernetic modernization would "right the ship" and put the nation on the "correct" path by harmonizing greater social relations, suggesting the contribution of using curriculum as a message to stabilize human relations(hips) between parts in a (social) system.

This section further explores other structural reforms needed for harmonizing greater social system relations. First it foregrounds reforms in higher education to bring human relations under scientific investigation into the social and behavioral sciences through cybernetic techniques. It then turns to consider the reform and modernization of other institutional structures—educational and otherwise—within the social system in the next section.

To understand efforts in higher education to scientifically study human relations, recall again the above definition of "cybernetics as [the] 'science of relations'," understood particularly as "people's relations to people." This systems-level view of relations gained traction across socially-oriented academic disciplines as a technology to change social relations and the science suggested how to steer a series of social reform actions to administer a harmonious social order. Since "man and society are part of matter and nature,"[416] and since cybernetics teased out the basic logic of human, social, and natural orders under a mutual understanding of "purposive" systems, cybernetics provided a guide to that "natural order," a "pre-established social harmony"[417] that was part of the natural order the Consensus Historians (discussed earlier) and other scholars assumed.

Many scholars increasingly understood the human domain as a cybernetic complex of "social relations." Educational reformers, American historians, or even social scientists across various fields could understand human "interaction as a system in the scientific sense and subject it to the same order of theoretical analysis which has been successfully applied to other types of systems in other sciences,"[418] thereby guiding human relations with "sufficient

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[416] Ibid., 79.

[417] Dorothy Gregg, and Elgin Williams, "The Dismal Science of Functionalism." *American Anthropologist* 50, no. 4 (October 12, 1948): 594.

[418] Parsons, The Social System, 3.

precision."[419] It was the power of this promise, that sense of potential that organized the 1948 AAAS Centennial Celebration discussed in an earlier chapter, that helped cybernetics gain cultural authority as a regulatory tool of reform and unity.

Adjusting social relations under this cybernetic view, was, in the end, an ethical endeavor. Reasoning about (social) relations gave direction to reforming human conduct under a (cybernetic) "systems" set of social ethics (the set of constraint on modern conduct we've been following). First, the social sciences oriented to systems had to act upon themselves as an object of (cybernetic) self-reflectivity before initiating efforts at social reforms.[420] Many social scientists and educators had to "perform" the reforms to demonstrate how ideas of professionalism required, in Tyler's view, "an ethical system that dedicates its members to values beyond the individual or the immediate group[, which] would mean that the objective, developing ethical values, would be given high priority."[421] As Macy Conference regular Lawrence Frank suggested, restraining one's conduct became critical to this professional performance, wherein "the idea of self-regulation, with goal-seeking behavior, be[came] applicable in the laboratory, in the clinic, especially for study of personality, as well as in the field for study of social orders and cultures."[422] Prescribing a cybernetic system prescribed an ethical set of relationships between human parts within a socially unified whole, between part to part, part to whole, and whole to part, in a full throated challenge to the disharmony of modernity that disturbed the nation's image.

Second, taking up the ethics-based cybernetic reform of the social sciences refocused academic activity. Reforming the social sciences around cybernetic principles meant also reconfiguring its processes, just as the "new curriculum" public education reforms would do later in the 1950s-60s. The gesture to "systems" pulled scholars away from overspecialization to push research to interdisciplinary work and "generalization." Concerns with

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[419] *General Education*, 152; Kenneth F. Herrold, "Evaluation and Research in Group Dynamics," *Educational and Psychological Measurement* 10, no. 3 (September 21, 1950): 492–504. Herrold called the field a "science of human relations." Also see Robert Casillo, "Lewis Mumford and the Organicist Concept in Social Thought," *Journal of the History of Ideas* 53, no. 1 (1992): 108.

[420] Jamie Cohen-Cole, *The Open Mind*; Bernard Dionysius Geoghegan, "The Cybernetic Apparatus: Media, Liberalism, and the Reform of the Human Sciences," Ph.D., Northwestern University, 2012.

[421] Ralph Tyler, "Evolving," 737.

[422] Frank, "Foreword," 191.

academic over-specialization in the professions rested on concerns with waning field of behaviorism,[423] but also because a narrower academic focus and specialized vocabulary necessary for understanding complexity and technological advances, a result of the division of labor in a complex society, displaced the generalized frame of a unified set of human relationships. If that generalized horizon fell from view, so too could social harmony (and return the nation to an age of anxiety). Such conclusions prompted an ethical call to move from specialized learning to generality, such as calls made in *General Education in a Free Society* (and a "General Theory for the Behavioral Sciences," and a later book, a *General Theory of Action*).[424] The changing contours of reforming the social sciences around reconfiguring relations described shortly were not merely academic, but also were prescriptive and centered on improving the moral conduct of human conduct.

Reforming academic structures

Attention to human relations thus brought cybernetic principles of regulating relations within a greater mechanical system into regulating people within a greater social system. As the field of human relations became more attractive, reforming social scientific activity at the academic level meant refocusing interdisciplinary research on regulating human relations. Academic departments across the nation increasingly re-organized around "cohorts," and these "generalized" cohorts, committees, and departments, all increasingly interdisciplinary and increasingly called the "behavioral sciences," all researched a common object—effective and ineffective social (human) relations and their administration.

Indeed, interdisciplinary "behavioral" sciences research targeted human bodies for research and strained efforts operated across various levels of human relations, bringing an assemblage of connections from cybernetics into the practices of social sciences and psychology. The reformulated interdisciplinary academic research groups developed rules and principles that guided policies and strategies for "lower level" social and cultural reconstruction, and, as we shall see in the next chapter, reforming curriculum. Topics for interdisciplinary research

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[423] Tyler, *Basic Principles*, 42.

[424] "The present system [...] in Harvard College affords rich opportunities for specialization and, therefore, for differentiation. But it is weak indeed in the opportunities it provides for the development of a common body of information and ideas which would be in some measure the General Education in a Free Society." *General Education in A Free Society*, 191-192; Miller, "Behavioral Sciences," 513–31; Talcott Parsons, and Edward Shils, eds. *Toward a General Theory of Action* (Cambridge: Harvard University Press, 1951).

at higher levels derived from, according to Tyler, "Any catalogue of recent social change[, which] includes data about such phenomena as unemployment, technological improvements in our modes of production, migrations between city and country, differential birth-rates, and increased concentration of wealth."[425] Tyler described how this research commonly "involve[d] teams of behavioral scientists" that subjected newly discovered social patterns to theoretical analysis from all types of domains across multiple levels: "studies of community change, studies of youth development, [in] factors influencing social attitudes, and the like"—all were included.[426] These research topics under a generalized approach overlapped with a systems-view of social ethics and with ideas of national unity, national ideals, and new research conclusions, and all could serve as policy guides to best plan for and then allocate the resources of a unified system in a results-oriented fashion. For example, Tyler's educational research findings suggested how "Educational administration is a more difficult job than [simply producing or distributing materials]. It involves relations within the school, teachers and pupils, and also relations with people outside, parents and other community members."[427] Networks of relations between humans across social levels were targeted for administration with a goal to restore a sense of social harmony, and that changeover was accomplished most effectively with the backing of scientific research, without the need for the state, reflecting again the governing aspect of these types of modern systems.

Reformulating research required reforming elements of academic institutions and a stark re-organization of social sciences toward human relations occurred across this period. Most scholarship of the Cold War human sciences focuses on the human relations reorientation of two prominent institutions—Harvard and Yale—yet those two were a mere ripple in the wave of academic reform that connected cybernetic principles to the practices of social/behavioral sciences, including different psychologies.[428] The reform of research groups at the academic level focused on human (or social) relations included:

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[425] Ralph Tyler, "Educational Adjustments Necessitated by Changing Ideological Concepts." *The Elementary School Journal* 42, no. 1 (1941): 17.

[426] Ralph W. Tyler, "Institutional Organization of the Behavioral Sciences," in *The Behavioral Sciences Today*, edited by Bernard Berelson (New York: Basic Books, 1963): 18. Behavioral scientists in schools of business examined domains, "such problems as the human relations of people at work, the influence of working conditions upon mental health and intellectual activity, factors influencing the reception and interpretation of communications, the relation between human desires and economic choices" and more.

[427] Tyler, "Major Issues," 59.

[428] For another assessment of this trend, see Miller and Rose, *Governing the Present*.

- The University of Chicago established the University's Committee on Education, Training, and Research in Race Relations (1944) and an Industrial Relations Center (1946).
- By 1948, Harvard University had organized an interdisciplinary Department of Social Relations. It also maintained a Laboratory of Social Relations.
- Both the University of California (1945) and Cornell University (1945) developed interdisciplinary industrial relations centers that "stud[ied] such problems as the human relations of people at work" and hired "psychologists, economists, psychiatrists, sociologists, and political scientists [to study] personal, psychological, social, and political factors which influence[d] the health, productivity, and attitudes of workers and managers."[429]
- The Institute of Human Relations had already formed at Yale (1930) and served as a model for other organizations.
- The University of Kansas formed its own Department of Human Relations (1948).[430]
- Kurt Lewin's cybernetic Research Center for Group Dynamics started at MIT (1945) and relocated to Michigan (1948) and still today "meets every term, usually with a theme such as 'Close Interpersonal Relations'."[431]
- Boston University organized the Human Relations Center in 1953.
- In 1954, Stanford University was chosen the site for the Center for Advanced Study in the Behavioral Sciences "in response to the expressed social need for an enlarged knowledge of man in his relations to society." Its first director was former Dean of the Social Sciences at the University of Chicago, Ralph Tyler.[432]
- June 1947 saw the first issue of the academic journal *Human Relations*.
- The book *Human Relations in Curriculum Change* emerged in 1947.[433]

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[429] Tyler, "Institutional Organization,": 18.

[430] "News and Announcements: Obituary," *American Sociological Review* 20, no. 4 (1955): 475–78. On the death of Hilden Gibson: "In 1948 he helped found and became the first chairman of the department of human relations at the University" of Kansas.

[431] "Research Center for Group Dynamics: History, http://www.rcgd.isr.umich.edu/history/.

[432] Barton, and McClelland, "Report of the Planning Group," 3. Peter Miller, and Nikolas Rose, "On Therapeutic Authority: Psychoanalytical Expertise Under Advanced Liberalism." *History of the Human Sciences* 7, no. 3 (1994): 29–64.

[433] Kenneth Benne, and Bozidar Muntyan, *Human Relations in Curriculum Change: Selected Readings with Special*

- In 1947, mathematical biologist Nicolas Rashevsky published his work on the *Mathematical Theory of Human Relations*.[434]

This human relations reorientation across academic structures suggested the influence of a "new" science of social relations (cybernetics). These scholars reformulated "cybernetics as [a] civilian science of technology and society"[435] to study a common problematic: the dynamics of relationships between parts from a generalized interdisciplinary systems-level view. Such research in higher education helped develop generalized technical knowledge to help administer the conduct of populations *sans* the baggage of academic jargon or specialized models. Here, cybernetic know-how erased those old and static categories of "traditional" society that inhibited domestic social modernization and the science of human relations was the ideal technology to tackle head-on the "serious conditions" that hindered the "pervasive processes of reeducation" because such research could generate a new set of social patterns in the changeover to a modern systems society. As Columbia's Benne recommended, since "human interdependence [...] and cooperation [are] a pressing demand, [and] communication, [so] essential to cooperation and reeducation [is] difficult and sometimes impossible to achieve," a generalized and interdisciplinary science appealed to scholars to help human subjects "confront each other across barriers of specialized occupation, class, creed, race and nation."[436]

To conclude this section, any outdated old traditional patterns were rapidly being replaced with new modern patterns. The push to reform society toward a new "system" of social relations sought to establish a different set of behavioral patterns. Where misalignment had intensified between social structures and functions, the field of human relations research led the social recovery effort to ensure neither contravened the new modern environment in which "America" found itself immersed. Scientific research increasingly operated as cybernetic research, which sought out the modern ethical set of human relations from different domains so that the gaps between a science and technology at the frontiers of knowledge and the current state of society could be exposed and closed.

Emphasis on Group Development. Bulletin No. 7 Circular Series A; No. 51. Springfield, IL, 1949.

[434] Nicolas Rashevsky, *Mathematical Theory of Human Relations: An Approach to a Mathematical Biology of Social Phenomena* (Principia Press, 1947).

[435] Mindell, et al., "From Communications Engineering," 89.

[436] Benne, "Curriculum Development," 563.

Bringing cybernetics into social institutions—theorizing educational structural reform

With efforts in higher education to bring human relations under scientific investigation. and with its own structural reform to align with that research underway, this final section focuses on cybernetically-oriented structural reforms in other areas. The increasingly interdisciplinary cybernetic research into modernizing human relations sought structural reform across several social institutions, and with higher-level structures in academia under way, achieving a vision of a systems society required also reforming lower-level social structures like public education.[437]

Again, theorists across curriculum had already understood that a modern American society had deviated from its idealist origins and social harmony. Cybernetics materialized as the science to restore the nation's highest ideals alongside that perception of social discord and close a cultural lag by "modernizing" a domestic sphere to regulate social patterns by following the underlying logic of systems so apparent in the natural world. Realizing that social modernization scheme required intervening in the public domain to administer structures to then reform and fix the function (a human). Reaching that modernization goal meant re-engineering social institutions.

Widespread interdisciplinary cybernetic research sought to allocate new patterns of human relations in line with the highest ideals of the nation to modernize social institutions. Aligning modernizing social institutions in line with a modern environment in the field of curriculum would administer new patterns (cybernetically) by re-organizing these institutions to uphold the nation's vision of a chosen people. This push for reform acknowledged differences between the actual state and the ideal state, again that "basic misfit between our institutions and the conditions of our [American] life." Such gaps, Kenneth Benne highlighted, generated the many personal and social pathologies that were most palpable by the frayed social bonds that researchers observed in

> personal maladjustment, in strained interpersonal relations in family, school and job, in the painful and unproductive anonymity and irresponsibility of the mass 'individual', in aggravated intergroup conflict, and in pervasive fear and anxiety among men as they face a future in which threat often outweighs promise.[438]

This deviation from America's potential and *promise* grew evident in social institutions out of whack with the modern world. Social structures themselves, Norbert Wiener argued, were operating ineffectively, suggesting how

> our press, our museums, our scientific laboratories, our universities, our libraries and textbooks, [all are] obliged to meet the needs of this process [of receiving and of using information] or fail in their purpose. To

[437] For example, "to bring about the new educational system, institutions already had to possess the values the system was intended to produce." Casillo, "Lewis Mumford," 107.

[438] Benne, "Curriculum Development," 562. Also, Tyler, "Major Issues," 87.

> live effectively is to live with adequate information. Thus, communication and control belong to the essence of man's inner life, even as they belong to his life in society.[439]

Fabricating new social structures was unnecessary. This was not a political revolution. Rather, the liberal consensus called for purifying and reforming the existing ones.

The reform to modernize outdated social structures like education and elsewhere required vertical and horizontal adjustments for greater alignment for greater structural harmony to bring greater social harmony. The application of cybernetic principles to align the part (function) and whole (structure) sought out reversibility when reforming structures to simplify a vast and complex set of modern social problems by aligning multiple points of contact (institutions) on a social grid.[440] "New methods and techniques" were needed in modern circumstances "for dealing with social conflicts,"[441] and for the science of human relations, the alignment of new methods and practices meant "the basic categories for the structural analysis of social systems, of culture systems, and of personality systems must be consonant with one another."[442] Reaching a measure of social accord through cybernetic research could then be used as evidence to better "understand and to use rational controls of social processes, like education, in a modern urban community" to compel new codes of conduct. Reaching social accord meant engineering popular opinion and perception management, triggering a need to "build an ideology more nearly in accord with the real nature of urban society."[443] The overall responsibility for changing a cultural ecology to build that political ideology was taken up by curriculum reformers at a 1947 conference, a focus of the next chapter which considers the reform of the function operating within the harmony-driven reforms of social structures explored in this chapter.

To review, many diagnosed society as dysfunctional which required changing social structures and functions. The focus here has rested on reforming the structures (the next chapter entertains functions). The last section detailed some of the structural reforms in higher education and its increasing reorientation to regulating

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[439] Wiener, *Human Use*, 18.

[440] Also "there is the problem of integrating the behavioral sciences with such fields as history or law or economics or political philosophy or humanistic studies. There is the problem of re-stating the rich insights of 'classical' writings on man's behavior—by social philosophers or social theorists—in the form of systematic propositions appropriate for scientific work. This merges into the general problem of bringing theory and research into greater harmony." Barton, and McClelland, "Report of the Planning Group,"19.

[441] Smith, "Social Perspective," 7.

[442] Edward Tolman, "A Psychological Model," in Parsons, *Toward a General Theory of Action*, 359.

[443] Tyler, "Urban Community," 15.

human relations to stabilize a social cybernetic system. The point here, however, is that educational reform was structural reform to distribute a national social order.

Conclusion

On one level, the above narrative that recounts how the human sciences focused on modernizing social structures recounts a greater cultural narrative. The story above recounts how the human sciences focused on an aesthetic of harmonizing human relations and structural symmetry to achieve social unity. Yet on another level, the above narrative—the diagnosis of misalignment, the allocation of new human relationships, the appropriation of cybernetic principles for systems alignment—recounts also a parallel narrative. That parallel narrative extends far beyond what was presented here, yet that greater parallel narrative has a direct connection to this broad background "story" of modernization, human relations, and cybernetics. This greater parallel narrative, taken up also within the cybernetic discourse and institutional reforms of the era, taps a familiar literary trope of another American cultural thesis explored in Leo Marx's classic, *The Machine in the Garden*.[444]

This greater parallel narrative expressed a longstanding cultural myth about the nation's idyllic origins. The narrative at the beginning of this chapter that detailed the changeover to the modern era from a traditional one discussed expressed a longstanding cultural myth about the nation's origins. As Marx developed in *The Machine in the Garden*, a long succession of American literary classics expressed a common American myth that located the nation within a bucolic rural landscape. Marx demonstrated how a literary trope that situated "America" in a pastoral setting has been and still is common to many American literary classics, surfacing in works stretching from Cotton Mather to Melville, Hawthorne, Thoreau, Emerson, Twain, and past F. Scott Fitzgerald. Marx's analysis unveiled how this narrative starts by representing a general image of nature as idyllic, as a *garden*. *The garden* representation in Marx's terminology exists as a peaceful rural setting and serves as the backdrop to America's Golden Age, the age of innocence, of simpler times. The literary representation of a garden represents the isolated rural countryside where urban Americans go to get right, so to speak, expressing a therapeutic image of nature steeped in Arcadianism.[445] The garden representation has circulated in educational discourse in the way that "we think first of

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[444] Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (New York: Oxford University Press, 1967).

[445] Donald Worster, *Nature's Economy: A History of Ecological Ideas*. 2nd ed. New York: Cambridge University Press, 1994.

the good that can be done for city youngsters by taking them to the country where the sun is brighter, the air fresher, and the environment simpler."[446]

The cultural narrative goes on to recount how the intrusion of technology disrupts the rich "garden" narrative of the nation's origins. Marx recounts how technology later disrupts the richly framed picture of the idyllic "garden." A *machine* intrudes into *the garden*. In this trope, a peaceful scene of harmony is disrupted: the whistle of a locomotive cuts through a quiet woodland setting; a river steamboat rushes past rafts and rowboats riding relaxed river currents. The intrusion of technology onto the natural landscape triggers in the subject seeing them an experience of both shock and awe. Marx takes that disruption and the visceral reaction to it to explain how American culture has historically reconciled the benefits of technology against the Arcadian image of America's rural origins.

The postwar modernization discourse surrounding social scientific reform embodied this same literary trope. That discourse recounted an image of harmonious human relations situated an idyllic rural scene interrupted by modern urban industrial conditions. That discourse was an embedded lesson in cultural mythology. And except for a handful of trivial outliers of troubled race relations south of the Mason-Dixon line (for black bodies), or in the Pacific Northwest (for yellow bodies), or the colonized North (red), or the desert Southwest (brown), and many "Other" occurrences—indeed, save for those "rare" instances, for the human sciences, stories of a near-perfect state of harmonious human relations and American consensus had always existed in the nation. That harmonious rural scene grew unceremoniously disharmonious with the intrusion of the modernizing forces of the 1940-1950's, and cybernetic technology, carrying the characteristics of industrial urban technology, carried the same characteristics as those observed about *the machine* in Marx's *garden*: the technology was fast, mysterious, and overwhelming.[447] The social science discourse surrounding cybernetics and domestic social modernization recounts a cultural narrative with the hallmarks of the trope detailed by Marx's book.

This trope contributed to the intelligibility of technology in the era, including cybernetics and the Tyler Rationale. Within the social science discourse detailed earlier resides the characteristics of what Marx called "The

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[446] Seyfert, "Characteristics," 73.

[447] "The process of urbanization has been rapid; most of it has taken place within the span of a generation. A phenomenon of such importance should be well understood, but it has grown with such velocity that we have only begun to grasp some of its major elements." Tyler, "Urban Community," 14.

Technological Sublime." Just as observed in the earlier chapter's discussion related to Bowker's article on "How to be Universal," cybernetics, as machine technology, embodies this sublime (described here by one observer) when first it

> promised to conquer nature in a process that annihilated space and time. Second, the rapid expansion of machine technologies ushered in a faith that history itself had become a process of rapid and limitless material progress. Third, the intellectual progress of inventors and engineers indicated the highest point of human achievement to date. And finally, there was a special relationship between technological improvement and the development of the American nation and its people's democratic aspirations. All these points, rephrased and emphasized by politicians, promoters, and journalists at all levels of society, coalesced in a popular ideology that [Leo] Marx referred to as 'the technological sublime.' [448]

The justification for cybernetics carried reform dimensions, deployed to modernize the nation, and thus carried another timeless American cultural thesis: a common image of nature, its natural order, and a common American response to an intrusion of technology. Cybernetics was indeed "ultra-rapid" to a rural landscape, and during an era of material consumerism and "historical progress," the achievements of science socially reconstructed and modernized that "rural" mode of being to still meet the nation's highest ideals, as I describe in further detail in the next chapter in the reforms of the function. Indeed, there has been more to the story of cybernetics, the Rationale, and this period than has been explicated in the literature, and the above is only one contribution to that endeavor.

[448] Jeffrey Meikle, "Leo Marx's 'The Machine in the Garden,'" *Technology and Culture* 44, no. 1 (2003): 152. Also see Mary Arensberg, *The American Sublime* (Albany, NY: SUNY Press, 1986); Christophe Den Tandt, *The Urban Sublime in American Literary Naturalism* (Urbana: University of Illinois Press, 1998); Rob Wilson, *American Sublime: The Genealogy of a Poetic Genre* (Madison, WI: Univ of Wisconsin Press, 1991).

CHAPTER SEVEN

CYBERNETIC FUNCTIONAL REFORM

"Yet aesthetic work is not self-expression but self-transcendence..."
General Education in a Free Society, 1945

Historical narratives typically trace Cold War-era educational reforms as building up to and then a consequence of the 1957 launch of *Sputnik*.[449] The Sputnik launch indeed triggered federal educational reforms in the later 1950s. I want to explore an alternate narrative about these reforms, however, one that sits anterior to and outside of a Cold War framework, and outside of other narratives that focus on politics (Hartman), technological and ideological social features (Rudolph), or interests (Evans, Urban).[450] I want to explore how a push for domestic social modernization rested in the historical background. This push quickened the calls that tilled fertile soil for the later era of the "new curriculum" reforms based in the principles of cybernetic processes

This chapter again pursues the last element of the liberal social consensus, that of reform. Instead of focusing on the reforms of structures, as was done in the last chapter, this chapter concentrates on the reforms of functions. Re-engineering a modern function (like human bodies) operating within those modernized structures (discussed in the last chapter) reforms activity down at the level of the personality. Below I first consider the engineering-based reforms proposed at the famous 1947 University of Chicago Conference on curriculum and how the proposals bridged cybernetics and curriculum to generate greater harmony in a system. Second, I explore how the proposed reforms looked to create a new kind of modern person, which extends into the third section's focus on the need to bring stress and pressure techniques into curriculum to ensure alignment between structure and function. The fourth section considers how cybernetic technologies were brought into the self, the characteristics of a new

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[449] Barry M. Franklin, and Carla C. Johnson, "What the Schools Teach: A Social History of the American Curriculum Since 1950," in *The SAGE Handbook of Curriculum and Instruction* (Thousand Oaks, CA: SAGE Publications, 2008): 460–77.

[450] Andrew Hartman, *Education and the Cold War: The Battle for the American School* (New York: Palgrave Macmillan, 2008); John L. Rudolph, Sci*entists in the Classroom: The Cold War Reconstruction of American Science Education* (New York: Palgrave Macmillan, 2002), 106-107; Ronald W. Evans, *The Hope for American School Reform: The Cold War Pursuit of Inquiry Learning in Social Studies* (New York: Springer, 2010). Wayne J. Urban, *More Than Science and Sputnik: The National Defense Education Act of 1958* (Tuscaloosa, AL: University of Alabama Press, 2010).

kind of modern person, and then to a new kind of citizen. The fifth section returns to consider broadly how the above helped make the Rationale intelligible, and the final section considers the intelligibility of the Sputnik era New Curriculum reforms that helped restore a functional system. And I begin with the 1947 Conference on Curriculum Theory.

Bridging cybernetics and curriculum theory—the 1947 Conference on Curriculum

The landmark 1947 Conference on Curriculum Theory at the University of Chicago heralded much of the changeover to cybernetics in curriculum. This conference assembled "some of education's finest scholars [...] to discuss one of education's most difficult problems" in modern curriculum theory and development, and a centerpiece of that "major effort" was "one of its most sophisticated statements," a book, *Toward Improved Curriculum Theory*, edited by conference organizers Virgil Herrick (UW-Madison) and Ralph Tyler (University of Chicago).[451] Based on conference discussions and presentations, the book considered how "the improvement of educational programs" needed bottom-up reform to generate an "adequate theory of curriculum." Cybernetics served as a guide to overhaul and re-align the field because both "[T]he advancement of knowledge in the fields of learning and human development" and "the study of society and its functioning" confirmed how the contemporary practices of curriculum theory and of development both misaligned with practices at the frontiers of science.[452] The book suggested how curriculum theory already entangled with "all of the specific problems of curriculum development," and vertical and horizontal re-alignment of curriculum would have to acknowledge the "general agreement" (consensus) that curriculum reform was anchored on three parts: that "society, man's accumulated knowledge and the individual must be considered."[453] Here indeed was the needed "ideology" (referenced in the last chapter) to place the rational control of curriculum theory and its development in accord with the real nature of a modern urban

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[451] Elliot W. Eisner, "Curriculum Theory and the Concept of Educational Milieu," *The High School Journal* 51, no. 3 (December 1, 1967): 132–46. Also see William F. Pinar, William M. Reynolds, Patrick Slattery, and Peter M. Taubaum, *Understanding Curriculum: An Introduction to the Study of Historical and Contemporary Curriculum Discourses*. New York: Peter Lang, 1995): 147-148; and a special issue of *Curriculum Inquiry*, "Curriculum Theorizing since 1947: Rhetoric or Progress?" *Curriculum Inquiry* 6, no. 4 (1977): 247-376; *Toward Improved Curriculum Theory. Papers Presented at the Conference on Curriculum Theory ... 1947*, edited by Virgil Herrick and Ralph W Tyler (Chicago: University of Chicago Press, 1950).

[452] Virgil Herrick, and Ralph Tyler, "Preface," in *Toward Improved Curriculum Theory*, edited by Virgil Herrick and Ralph W Tyler (Chicago: University of Chicago Press, 1950): iii.

[453] Virgil Herrick, and Ralph Tyler, "Looking Ahead": 121-122.

culture in a complex American system.

The conference's modern view was summarized in the book's lead chapter. Curriculum scholar B.O. Smith of Urbana-Champaign argued that curriculum theory required a new strategy to reform social structures by integrating both social institutions and the modern *persona* at each level of the modern "social-psychological" system.[454] As Smith reasoned, the human subject (a function) was a product of a larger system (a structure) and the private self, a function, emerged as a product of a public self, because "as the individual accepts membership in a group, he takes on the group's value system." Educational "efforts to change him, therefore, must take into account the social roots of his personality." Part of Smith's reasoning for a new direction for self-transcendence rested on the call in Kurt Lewin's field theory for a "psychological ecology." Curriculum had to structure a comprehensive systems environment to "sustain" an individual's "personality structure"—his or her human nature. The *persona* accepting the new constrains on human conduct, the new "standards of conduct—the basic elements of character" was governed under a (cybernetic) system of inter-relations between parts, "the people among whom the individual moves."[455] Consequently, restructuring the function's "character [can] be changed [...o]nly as [far as] the individual and his social group are caught in situations that stir fundamental moral ideas."[456] The psychological ecology and the individual student both needed a new set of ethical relationships, and reconfiguring "social" bonds would ensure consonance by aligning human parts within a unified social whole, thereby ensuring their regulation to reach a more harmonious social system, at least according to the nascent psychological order.

The modernization project, however, required a delicate touch. If executed poorly, the new "system" could damage the function's personality structure and amplify disharmony. A return to disharmony in the social environment or ecology would "be dangerous to the personal stability of the individual if the general social context were seriously contrary to the new norms."[457] Under those conditions, Smith continued, "The individual would find

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[454] See, for example, the title to the section "The Curriculum Must Be Designed to Build Social Patterns That Will Sustain the New Personalities" in Smith, "Social Perspective," 16.

[455] Ibid., 16.

[456] Ibid., 14, 13.

[457] Ibid., 16. Also see comments throughout *Basic Principles* that educational objectives must be *consistent* with social values, individual learning with the objectives, a teacher's theory of learning with individual learning, the learning environment with, and between individuals (pps. 33, 34, 41, 43, 77, 118).

his own personality threatened" and would then either conform to "more dominant social patterns or withdraw [...] from society."[458] Isolation and withdrawal were unacceptable since system-wide integration needed to increase, not decrease, so curriculum theorists had to thread cautiously the realignment needle. Consistency needed to govern the modernized cybernetic structural-functional re-alignment, but there was no magic formula to realize this end, for as another curriculum specialist noted, engineering such a strategy was at heart an "*art* of applying the basic scientific generalities to the solution of a particular social problem."[459]

The solution to the social modernization project felt to cybernetic social engineering.[460] In a sweeping gesture to the authority of the physical sciences, most notably the communications engineering of cybernetics, where governing processes operated so effectively, the "social engineering" solution would close gaps between the social order and the "modern" real world. Just as the field of mechanical engineering focused on ensuring the proper functioning of parts within a larger structure, the cybernetic pursuit of social engineering focused on evoking the proper functional behavior of a human subject within larger social structures, and, in turn, the function of those structures within a larger social system. Retooling social structures for system-wide harmonious relations used the human relations research discussed in the last chapter to target antiquated and static social "traditions" that limited the "potential" of people from reaching what today is called "equal opportunity." The openly racist South violated "the principle that educational opportunity must be provided for young people regardless of where they are born or what their racial or ethnic group is."[461] The technologically backward, poverty stricken rural areas educated "on limited local resources"[462]—such locations offered inadequate educational opportunity, the sites and spaces that

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[458] Ibid., 16.

[459] Thelen, "Engineering," 577 (original emphasis).

[460] Smith, "Social Perspective," 16; Thelen, "Engineering;" the entire issue of *Progressive Education* 26, no. 7, 1949; and the exchange between R W. Burhoe, "On the Need for Social Engineering," *Science (New York, N.Y.)* 104, no. 2690 (July 19, 1946): 62, and G. Evelyn Hutchinson, "Social Engineering," 166–67. For more recent reflections, see Nancy K. Bristow, *Making Men Moral: Social Engineering During the Great War* (The American Social Experience Series. New York: NYU Press, 1996); William Graebner, *The Engineering of Consent: Democracy and Authority in Twentieth-Century America* (Madison, WI: University of Wisconsin Press, 1987); John Jordan, M. *Machine-Age Ideology* (Chapel Hill: University of North Carolina Press, 1994); Mark Solovey, *Shaky Foundations*.

[461] Tyler, "Major Issues," 86.

[462] Ralph W. Tyler, "What the Schools Can Learn from the Training Programs of the Armed Forces," *The Elementary School Journal* 45, no. 9 (May 1, 1945): 496-497.

continued to deprive people of full "potentiality" and that perpetuated social discord. Reforming the material conditions of traditional and underdeveloped regions—social modernization—was part of the Liberal Consensus of the era, a thrust to re-engineer social unity organized under a cybernetic system of proper relations, the *purpose* of which fit well with America's mission: to reconcile the depravity of human misconduct, to evacuate selfish and boorish social behavior—again, an ethical problem of the part's excessive orientation to itself—and to help forestall human misery by rediscovering the poverty that plagued the period.[463] Re-engineering society would restore a greater sense of prosperity and harmony to the social body and body politic,[464] and economic productivity, political democracy, social reform, and personal fulfillment—all tenets of the liberal consensus—were topics of human relations research undertaken by the cybernetically-oriented human sciences in order to remake and regulate social relations. But was the field of curriculum up to the task?

The discourse for bringing more social technology in curriculum came on the heels of the 1947 conference. More engineering in curriculum would address the domestic deliverance from the cultural lag between the modern environment and the social system's sites of dysfunction, again the basic "assumption that curriculum development is a species of social and cultural change." Curriculum development according to Benne could be viewed as "part and parcel of the wider movement to reconstruct the social-political-economic institutional complex currently under way in American and World culture,"[465] and social institutions like schools needed to spearhead widespread curriculum reform to guide the function to heed that overarching environmental (structural) change. The starting point began with "the curriculum," the message that circulated within the modernized system society's educational structures. Thus, a new social "order," modern in outlook, harmonious in practice, reorganized *as a system*, could be engineered and a new modern society shed of its dysfunction. Relieving social dysfunction would re-establish a new "normal" and restore *homeostasis* by making functions amenable to change and manageable as parts in a system.

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[463] Science, in the eyes of Lawrence Frank, would free one from traditions and superstitions, "the misery and suffering of people hitherto." See Heims, *Cybernetics Group*, 65.

[464] Andrew Abbott, and James T. Sparrow, "HotWar, ColdWar: The Structures of Sociological Action, 1940-1955," in *Sociology in America: A History*, ed. by Craig Calhoun (Chicago: University of Chicago Press, 2007), 281–313.

[465] Benne, "Curriculum Development," 561.

Integrating the modern subject by reforming structures

The reform to modernize both functions and structures enhanced their integration into a purposive system. Cybernetic research into human relations primarily involved studies of small groups, functions within larger structures that themselves functioned within even larger structures and environment, all steeped in localized institutions, like that of family or community, church or school, or even relations between workers and management in a factory. Significantly, the focus of the scientific research rested not on the larger system of industrial capitalism, nor the class-based features of a planned system, nor even on social rank or religious traditions. The impetus for human relations research came about from a modern American "social system" and the reformulated set of social bonds needed to function well enough to eclipse traditional structures governed by race or class. As I noted in the last chapter, those particular structures were to be set aside in favor of localized institutions,[466] since modernizing the functions in local social and civic institutions further integrated the entire system to ensure the division of labor at lower tiers of diverse parts converged to feed a higher "purpose" of the overall system. In a social system/institution like a local school, for instance, Tyler opined that "The functional organization [...] should emphasize unity of purpose and diversity of methods. The typical staff organizations tend to isolate special groups so that they do not share common purposes [...] which tends further to divide the staff rather than to increase its co-operative effectiveness."[467] Such instances demonstrated how the organizational logic of community, schools, and even of curriculum could function more effectively under a science of harmonious relationships between part and whole that simultaneously revealed how each were sub-systems within a greater modern system built around cooperation, integration, and concord.[468] While I take up the reform of the individual in the next section, here I would like to take up the reforms of other functions within larger educational structures.

What guided the modernization of lower-order functions was a higher-order principle that systems must be purposive. Modernized functions within social institutions at different levels across vertical (geographic) spaces

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[466] See a similar diagnosis in the *fin de siecle* origins of American social science in Sklansky, *Soul's Economy*, 103, 191. Also see Miller, "A Look Back at the Systems Society."

[467] Tyler, "Urban Community," 18.

[468] "In a society too large for the direct contact of its members, these means [of communication for *homeostasis* include] the schools, and the church. Besides their intrinsic importance as means of communication, each of these serves other, secondary functions [but] these secondary aspects of the means of communication tend to encroach further and further on the primary ones." Wiener, *Cybernetics*, 187-188.

were understood cybernetically as systems guided by a *purpose*.[469] Organizing a system under a goal or purpose inscribed in local social institutions a notion of modernity. Purpose brought to education and curriculum "a concern for certain goals of knowledge and outlook and an insistence that these goals be sought after by many means,"[470] particularly because the function of a purposeful curriculum brought an "over-all logic, some strong, not easily broken frame within which both college and school may fulfill their at once diversifying and uniting tasks." That logic of purpose articulated how "The relation between issues in current cultural reconstruction and those in curriculum development [wa]s, of course, even closer than" how most viewed the situation.[471] Restructuring an educational system demanded for a general education in a free society a functionally organized sense of logic "strong enough to give goal and direction to this system—something much less clear at present,"[472] and enacting rational structural reforms to reach a systems society required designating within modern social institutions a sense of purpose,[473] which I take up in the last section that considers the complaints of education critic Arthur Bestor. So designated, and under a sense of purpose, the functions at lower levels of operations would align with the same designations at higher levels of operation.[474]

Modern systems, ubiquitous today, are purposive. Traditional social institutions, however, lacked purposive features. With no site left behind in the race to reform and integrate modern institutions, schools had to function purposefully to reach the image of a modernized systems society. In the modern conception of human relations, "the relation of the school and community is not a *static* condition,"[475] so attaining the goals designated by the highest level of a system required an overhaul of traditional institutions and their functions to accommodate the new "demands for change in a *dynamic* culture."[476] Again, local resistance to this dynamic view of modernity came from

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[469] Gregg, and Williams, "The Dismal Science," 594.

[470] *General Education in a Free Society*, 80.

[471] Benne, "Curriculum Development," 563.

[472] *General Education in a Free Society*, 40.

[473] Benne, "Curriculum Development," 565.

[474] Norbert Wiener, *Invention: The Care and Feeding of Ideas* (Cambridge: MIT Press, 1993), 154.

[475] Tyler, "Responsibility of the School," 400 (emphasis added).

[476] Benne, "Curriculum Development," 574 (emphasis added).

the Deep South, rural areas, people and cultures who maintained traditional and "static" characteristics.[477] Social engineers, by anticipating this resistance to change, tapped terms like "educability," or studied rural populations, or the impoverished, or First Nations people, and even sought the evaluation of students through school achievement tests, which functioned to unify disparate and remote groups under a single system. When low test results were found in "children of Negro background, Mexican background, and lower-class children in general," those assessment results, Tyler argued, often were wrongly "interpreted by the school administration as indicating very limited potentiality for education," and those interpretations wrongly reaffirmed traditional values of race or class, not modern "purposive" categories.[478] As such, the modernist integration was coupled to a moral view of a present "situation" and social engineering targeted anti-cosmopolitan and anti-modern populations—the *Anti-Intellectualism in American Life*[479]—for such positions were not part of a liberal social consensus that required unity and harmony. Reform meant pushing past these old folkways to modernize the functions within traditional social institutions under *purpose*.

Bringing pressure and stress techniques into "the curriculum"

Modernizing curriculum contributed to stabilizing modern educational structures. "Since communication is the fundamental tool of social action,"[480] and since curriculum could "be thought of solely as transmitting the cultural heritage" of a modern society, as Tyler suggested,[481] reforming traditional views of curriculum was the basis of change within school and education systems on up. In traditional eras, "small country[, ...] closely knit communities [held] a very considerable measure of homeostasis." Instability, however, grew within a modern "society too large for the direct contact of its members" because in part the consensus notion of a common social bond, that which stabilizes human relations in a "community extends only so far as there extends an effectual

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[477] Smith, "Social Perspective."

[478] Tyler, "Educability," *Elementary School Journal*, 211.

[479] Richard Hofstadter, *Anti-Intellectualism in American Life* (New York: Knopf, 1963). For a review of Hofstadter, see Singal, "Beyond Consensus," 978.

[480] Seyfert, "Characteristics," 77.

[481] Tyler, "Major Issues," 58.

transmission of [communal] information."[482] Curriculum thus had a burden to bear: just as the smooth flow of sending and receiving information (messages) stabilized a cybernetic system, the duties to reach social *homeostasis* thus fell to "the education provided by the schools." Indeed, just as Tyler argued, one of the "Problems of Administration" in a system needed "free communication throughout the system" to ensure harmony and consistency for all "working toward common ends, rather than being in competition and conflict,"[483] so too did that maxim apply to all other systems. Education stabilized social systems (*homeostasis*) through communicating messages (curriculum), whether in the classroom, on the playground, or other segments of a student's life, since, as systems-psychologist Daniel Prescott explained, expressing a longstanding idea, "Communication is the nervous system of the social organism."[484]

Modernizing curriculum reform thus used pressure and stress techniques. Since the social structures of the nation had to adapt to the demands of a changed and modern environment, so too did its functions (humans). To build strong social bonds, curriculum messages needed to change to make up for the problematic conduct of that not-yet-modern person who was resistant to change. Curriculum needed to heed the conclusions of human relations research, Benne theorized, to "recognize the values to the individual which can accrue most rapidly through the stimulation and control of group experience."[485] Harnessing group control over the individual better aligned human subjectivities to the environmental demands of the small group and, in turn, aligned that small group to the demands of the larger social structure, aligned under a higher value of "social purpose" that would help to bring harmony to the entire system society.[486] The school, then, but in particular the curriculum (both in content and in form, as we

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[482] Wiener, *Cybernetics*, 2nd ed., 161, 157-158. "[O]f all of these anti-homeostatic factors in society the control of the means of communication is the most effective and important."

[483] Tyler, "Major Issues," 59.

[484] Chicago Collaboration Center, *Child Growth*, 54. For other examples of this idea, see Laura Otis, "The Metaphoric Circuit: Organic and Technological Communication in the Nineteenth Century," *Journal of the History of Ideas* 63, no. 1 (2002): 105–28; Iwan Rhys Morus, "'The Nervous System of Britain': Space, Time and the Electric Telegraph in the Victorian Age," *The British Journal for the History of Science* 33, no. 4 (December 2000): 455–75.

[485] Seyfert, "Characteristics," 75.

[486] See Wiener's comments about how the "benefits [...] awarded for scientific creation should have the good of the community as their purpose even more than the good of the individual," in *Invention*, 154. Also "The Quest for National Purpose" during the 1950s in William Leuchtenburg, *A Troubled Feast: American Society Since 1945*, Updated edition (Glenview, IL: Scott, Foresman & Co., 1983): 103-118.

shall see), was a social agency in which social groups pressured persons to constrain his or her proper conduct to the purposeful whole.

Curriculum, however, could not go it alone. Pressure and stress techniques were coordinated among curriculum and other social agencies. Part of the reform of social structures also meant engineering a school's functional relationship to the urban environment. Other social and civic agencies had to coordinate their operations with schools to bring about the stimulation, stress, pressure, and control of group experiences upon the human subject. "Until we can get control by the social forces of the complete community, rather than by particular political groups or pressure groups, we shall have an inadequate educational program," Tyler argued.[487] Consequently, it was *the complete community* and its field of controlling techniques within a local school and its connection to the individual human body that procured a fundamental component of modernization, preserving the tradition-based social pressure techniques as a traditional closely-knit community had done it since the nation's rural origins, but now modernized and on a much broader scale.

Using the cybernetic science of relations to pressure people (functions) into changing preserved national ideals. Following Tyler's idea that such a science "is a possible contributor to social welfare," which could "provide [...] aids for use in the conduct of human affairs" to solve social problems,[488] society still could remove itself from the problems caused by both church and the state, or even the problems of McCarthyism, problems obviated by using the seemingly value-neutral science and technology.[489] Traditional culture could move past its "static" ways into a higher form of democracy, into a better dynamic "systems" society, and still be free to pursue democratic self-governance, of parts (functions) regulating themselves and others, still free to build a common humanity, all based on the aesthetics of harmony and symmetry. The science and its proposed transcendent self could still extend ideas Dewey offered about education in *The School and Society* that "enables [one] to see within his daily work all there is

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[487] Tyler, "Major Issues," 86.

[488] Tyler, *Basic Principles*, 54; Bernard Berelson, as quoted in Crowther-Heyck, "Patrons," 438.

[489] See a similar thesis in Theodore Porter, *Trust in Numbers* (Princeton, NJ: Princeton Univ Pr, 1995), and Carl Schmitt's critique of liberalism in "The Age of Neutralizations and Depolitizations," in *The Concept of the Political*, trans. M. Konzett and John P. McCormick (Chicago: University of Chicago Press, 2007).

in it of large and human significance."[490]

The reform of functions within educational and social structures preserved cultural thesis of progress. The reform of functions within educational and social structures would preserve a sense of progress in the nation through the science of relations by bringing a new social order re-formed out of "old social institutions."[491] A modern society could exist absent the devastating conflicts of an outmoded static system, as two world wars had already demonstrated. A modern society existed because science and technology suggested a new dynamic system existed conflict-free. Moreover, a modern American society, for the sake of its own survival, needed to catch up by closing the cultural lag. Restructuring American social structures, in the end, would also help to fix itself by fixing the function at the level of the self, which I take up next.

Making up People—reform into a modern self

Modernizing curriculum reform as bottom-up reform arrived by "making up people" (Hacking). With the subject and environment now under a singular framework of analysis, engineering the complete integration of both individual (part) and social environment (whole) would help reach a system the goal state of a harmonious "psychological ecology," since all earlier manners of bifurcation would merely restore the old threats. This reconstructed ecology, however, unavoidably changed a system's information flows and patterns, and since a harmonious system needed clear channels of communication, circular causation dictated that a change effected at the higher level of social structure demanded a change in messages circulating at the lower level of the "personality structure." That lower level is again where curriculum entered the formula. Curriculum had to change to accommodate the new "situation" and curriculum reform demanded structural reform, but also reform at the level of the self.

New identities were needed to accommodate the new complex patterns of the modern environment. B.O. Smith argued "New social realities require new types of men,"[492] because already, suggested a prominent sociologist, "A new type of human being [was] being created by the urban environment [...] not a new biological

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[490] Sklansky, *Soul's Economy*, 158-160.

[491] Ibid., 237.

[492] Smith, "Social Perspective," 15.

species but a new kind of personality."[493] "[N]ew character types" in schools were needed to receive the new messages that circulated and from these types, and "from the aggregate of these changed personalities would come social improvements."[494] The proposed curriculum changes planned for these personality types by offering strategies—technologies of the self—that would ensure all functions ratified the rules of conduct required by the nation's new social structure.

The new kind of person engineered by curriculum reforms hewed closely to an American view of liberal democracy. The static, change-resistant personality of the traditional era, such as those qualities seen in the passive learner, could be modernized by reforming the structure of the personality—the self—into a dynamic, cosmopolitan, flexible, and active—and eventually, *an activist*—personality.[495] These new personality structures proposed were generated by comparisons made during a Cold War and many reformers commonly associated the static, rigid, authoritarian personality with the authoritarian regimes of fascism and communism.[496] Those static political systems reflected an "evil machine" in the view of Weiner,[497] since those types of systems developed personality structures with little room for the autonomy of a Western liberal humanistic self, the sense of agency and independence preserved in the vision of a flexible dynamic *persona* required of American individualism. The Western liberal self, a function of "independence and self-direction, freedom, and self-discipline,"[498] was thus amenable to change and improvement, still allowing Americans to be an individual, yet still all to be the same.

The new curriculum that emerged to reform the modern *persona* applied technologies of the self. This curriculum was not fact-based, nor was it oriented toward other forms of academic content. Rather, the proposed curriculum emphasized the technological components of a system—process, not content, as I discuss shortly in the context of the "new curriculum"—technologies to be taken up by the self, since the modern human was now

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[493] Tyler, "Urban Community," 14 (quoting E. W. Burgess here).

[494] Smith, "Social Perspective," 15.

[495] Kurt Lewin, *A Dynamic Theory of Personality: Selected Papers* (New York: McGraw-Hill, 1947).

[496] Jamie Cohen-Cole, *The Open Mind*; Theodor Adorno, and Samuel H. Flowerman, *The Authoritarian Personality: Studies in Prejudice* (New York: Wiley, 1951). Also see "Rigidity and Learning: Two Patterns of Communicative Behavior," in Ch. 3, Wiener, *Human Use*.

[497] Hayles, *Posthuman*, 105.

[498] Tyler, *Basic Principles*, 36.

regarded as a system. The net effect of these "new" curricular proposals was how they integrated deeply the social structure (human relations) within the personality structure, the private self bonded to the public self, a message generated to regulate "part of the fabric of personality." For instance, as B.O. Smith expressed the idea, the technology of self-direction (*purpose*, or a purposive human system) oriented the individual to speak of "collective social goals" based on interdependence "as a people." The "whole-hearted purposing" individual was a goal-oriented individual, a path that adopted "the integration of group goals [other parts] into a system of social ends [the whole]." Other self-regulating processes were the result of an internalized *feedback* mechanism. Self-discipline offered constraints on patterns of personal conduct that kept the individual human system on track with a larger system's goals. Self-evaluation, part of the comparative reasoning conducive to cybernetics, allowed comparisons of one part's current state against the goal state of the whole to guide "various courses of social action."[499] Self-awareness aided systems integration, primarily "the need to relate one's self to something larger and beyond one's self."[500] These elements of an internalized feedback mechanisms were technologies of the self that directed the self of this new kind of human subject to learn how to restrain and govern one's conduct to better align with a larger system society, to draw the subject closer to the idea of harmonious relations in body and "mind." The central point of curriculum reform was that the function within a reformed structure had to learn to embody its own function.[501]

The new social circumstances affirmed why curriculum needed to modernize. In the epistemology being expressed here, thoroughgoing integration now extended instructional programming "into the community so as to help create the social patterns necessary to sustain the new personalities [and] only as this is accomplished can the new character types find an atmosphere in which they can survive."[502] Structuring a "psychological ecology" (Lewin) to govern personality structures again prescribed pressure and stress techniques to guarantee the functional

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[499] Smith, "Social Perspective," 11-13.

[500] Ibid., 10-12; Kenneth D. Benne and Grace Levit, "The Nature of Groups and Helping Groups Improve Their Operation," *Review of Educational Research* 23, no. 4 (1953): 302, 301. On self-awareness, see Smith, "Social Perspective," 13; and Tyler, *Basic Principles*, 7.

[501] Edward Jones-Imhotep, "Maintaining Humans," in *Cold War Social Science: Knowledge Production, Liberal Democracy, and Human Nature*, edited by Mark Solovey and Hamilton Cravens (New York: Palgrave Macmillan, 2012): 175–95.

[502] Smith, "Social Perspective," 16.

part's personal and ethical commitment to a nation-based system (the whole). This new kind of modern *persona* would be brought into the social fold through the complete community and its relationship to schools to regulated, again, as had been done previously throughout the rural nation, thereby repacking old wine in now-modernized bottles. If not, then curriculum would "not provide the student with modes of behavior that he needs to use to be a good citizen and a good and happy man."[503]

A New Kind of Citizen

The qualities of this new kind of citizen were based on regulatory principles that were again steeped in cultural ideals. In the older, traditional, and simpler frontier times, "it was not deemed essential that the school should devote major attention to developing a highly intelligent and broadly educated citizen."[504] That simple era, however, had passed. The purpose of modern education now had to teach children *how to function* as citizens, for the citizen as a subjectivity, as an identity, had a functional role to sustain a larger democratic structure. "Carrying on citizenship is the most important reason for public education," according to Tyler. "As society keeps moving forward, we need to have more and more education to understand problems that are much more complex than those that were dealt with in 1776".[505] The "reformed" view of curriculum and other social structures attempted to engineer the structures of a system based on the "dynamic" field and cybernetic relations helped to usher in a new cultural ideal of the flexible, dynamic citizen to replace the traditional one from a static era.

The cybernetic citizen, now a cybernetic persona of the state, was at stake under curriculum's vision of the science of relations. As part of the reason of state, many characteristics offered up of the modern model citizen modeled those traits based on the modern cybernetic model. Here's Tyler:

> The development of an intelligent person, one who is able to analyze problems, to think them through clearly, and to bring to bear on them a wide variety of information, who understands and cherishes significant and desirable social and personal values, who can formulate and carry out a plan of action, in the light of his knowledge and values is not the goal toward which schools and colleges are aiming in practice, yet it is an end essential for the adequate education of a competent citizenry. Furthermore, in a

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[503] Ralph Tyler, "How Can We Improve High-School Teaching?" *The School Review* 56, no. 7 (1948): 390.

[504] Tyler, "Educational Adjustments," 25.

[505] Special Collection Research Center, and University of Chicago Library. "Guide to the Ralph W. Tyler Papers 1932-1988," www.lib.uchicago.edu/e/scrc/findingaids/pdf/ICU.SPCL.TYLER.pdf (pp. 4-5). "From the standpoint of society, clearly, the broad education of a citizen is the most important job we face." Tyler, "Major Issues," 58. For more on the prevailing notions of citizenship at this time, see Cohen-Cole, *The Open Mind*.

world as complex as ours, a wide variety of special abilities and talents can be utilized.[506]

These citizenship characteristics mirror the characteristics of the cybernetic mechanism: information processing, understanding the relationships between part and whole, planning, problem solving, and carrying out a plan of action toward a goal (*purpose*) in a complex world.

The many prescriptions for the modern self and social institutions both involved establishing internal principles of self-limitation bound to a system. The cybernetic citizen-self was governed by the ideals of American democracy, "the attempt to combine liberty with loyalty, each limiting the other, and also each reinforcing the other."[507] Such democratic principles traveled across reformed social institutions, from schools to the military, to reflect the sameness of self. As Tyler suggested,

> The present need of the military service is not for unthinking automatons. In modern warfare men are often on their own; they must think for themselves; they must understand the reasons for things. These circumstances demand a great deal more self-discipline and a great deal more intelligence of the soldier and the sailor.[508]

The citizen-subject was a self-directed, purposeful, and adaptive function, aligned to a standardized structure. As influential psychologist Jerome Bruner would later point out, "The intellectual learning anywhere is the same, whether at the frontier of knowledge or in a third grade classroom,"[509] since the reformed classroom was standardized and structured as the frontier was.

No citizen-subject, however, could exist without *purpose*. Just as with other purposive systems, the human system found leading a purpose-less life would wander aimlessly, lost in a sea of chaotic events. Witness again how "Industrial man is [...] losing his sense of purpose."[510] The "systems" self again rejuvenated an older principle that bound personal satisfaction to the happiness of others, that timeless American value of self-transcendence, an updated mode of being now engineered for a system society. As the Harvard study on *General Education* prescribed, "The complete man must be a good man. Moral character arises from the molding of the native powers

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[506] R. W. Tyler, "Words That Do Not Educate," *School and Community* XXXIV (November 1948): 413.

[507] *General Education in A Free Society*, 77.

[508] Tyler, "Armed Forces." 498.

[509] Jerome Bruner, *The Process of Education* (New York: Vintage books, 1960), 14.

[510] Smith, "Social Perspective," 5.

to ideal aims. The final secular good is the dedication of the self to an ideal higher than the self—the devotion to truth and to one's neighbor."[511] This notion of self-transcendence in the human sciences bound the individual (part) to "the group" (other parts) or the community (whole) because the research of into human relations suggested as much, again a point that Ayn Rand would reject.

The social engineering thrust in curriculum reform reaffirmed a cultural thesis. Teaching system technologies to the self sought to create a new kind of person and engineering the individual's personality sought out human improvement. The function thus learned to both suppress and elevate different parts of the self in the change to a dynamic from static personality, allowing the function to internalize and embody its assigned duties.[512] Self-governance and self-control were two other such systems technologies of the self. Self-transcendence entailed integrating the student with a larger community, since that "ecology"—stable, solid, nurturing, and safe—sustained the restructured personality.[513] Group units brought to the individual an appropriate therapeutic environment—an ecology of pressure and stress—because an improved sense of self integrated with a group integrated with a social whole that provided overall harmony.[514] Thus, the curriculum reform "situation" was understood as ethical and had to be maintained by everyone—we've all got skin in this game, went the consensus argument, or, in a cybernetic view, in any system or "sort of machine, every element [...] has a singular and immutable function"[515] that had to be

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[511] *General Education in A Free Society*, 169.

[512] On personality structure, see Howard Brick, *Transcending Capitalism: Visions of a New Society in Modern American Thought* (Ithaca: Cornell University Press, 2006). On functions, technology, and systems, see Jones-Imhotep, "Maintaining Humans." On group activity, see Seyfert, "Characteristics," 72; Tyler, *Basic Principles*, 38; and "Major Issues," 58; and *General Education in A Free Society*, 77.

[513] See Seyfert, "Characteristics;" Smith, "Social Perspective"; Tyler, *Basic Principles*. To modernize, the goal of instructional programming should promote "organizations which provide for the wider participation of children and youth, participation in groups which cut across class lines, geographic boundaries, and economic prejudices" and that spur a consensus to transcend those "problems" that "atomistic organization of city life" promotes (18)." Tyler, "Urban Community," 18. "The danger of the urban environment is that it will develop "compartmentalism (19)" and isolation, not integration.

[514] On the focus on the group, see Calhoun and Van Antwerpen, "Orthodoxy," 402; Hamilton Cravens, "American Social Science and the Invention of Affirmative Action, 1920s-1970s," in *The Social Sciences Go to Washington*, edited by Hamilton Cravens (Piscataway, NJ: Rutgers University Press, 2004): 9–40; Henrika Kuklick, "Boundary Maintenance in American Sociology: Limitations to Academic 'Professionalization,'" *Journal of the History of the Behavioral Sciences* 16, no. 3 (1980): 201–19.

[515] Wiener, "Time, Communication," 215.

maintained for system stability—in order to govern relationships during a period of Hofstadter's "paranoid style" and McCarthyism's witch hunts, during a period of a sick society and not an integrating, but rather a "disintegrating culture," not one of which was a quality of "modern society."[516]

The Rationale

Engulfed by ultra-rapid technology, a palpable sense of crisis, the burden of closing a gap, a drive to save society—each contributed to the intelligibility of the Tyler Rationale. The rationalist reforms promulgated by the Rationale held out the promise of restoring a sense of harmony to a "modern" nation. The aesthetic of harmony offered by the Rationale is manifested in its push for *consistency* throughout its program, and the algorithmic procedures and particular personality structure it upholds reflects how the individual subjectivities it requires embody the characteristics of a nation.

Moreover, the landscape the Rationale projects parallels the landscape of the modern environment, granting further intelligibility to the Rationale. That landscape is not a small, static, isolated rural community in which traditional human relationships are pre-formed and pre-arranged. Rather, the setting of the Rationale's processes reflects a modern world of contingencies, an urbanized industrial American North of the 1940s in which a "strategy" is proposed for a dynamic personality to compose curriculum, a setting in which "Education is an active process. It involves the active efforts of the learner himself." The Rationale is encapsulated within an ecology of technology and scientific planning pursuing a cosmopolitan American ideal and its instruction set programs curriculum development toward a larger social system to reform and align social (the whole) and personality structures (the part) both. A central component of its instruction set fosters the expression of social values in the teachings of schools (where the "data" from the findings of social scientist is tapped as the Rationale's information source for curriculum). This way, the curriculum will exist in full harmony with educational evaluation, and

> various [learning] objectives [can] be examined to see that they are mutually consistent and that they permit some degree of integration and coherent unification in the mind and action of the student so that the maximum psychological benefit of learning can thus be derived.

Indeed, what drives the Rationale's reforms derive from ideas of "strengthening the positive social attitude in the community and making the school consistent with them," a direction different from "arbitrarily enforcing a

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[516] Frank, *Society as the Patient*, 10.

particular set of views held by a given group of teachers." From that initial direction "it is often possible to get a much greater degree of unity in the environment [...] of children and hence to increase the development of social attitudes with them."[517] Harmony travels from the reformed curriculum through the individual and school and modern social order within the Rationale's social message of alignment.

The curriculum reforms of the era

We can further appreciate other cybernetic curriculum reforms of the cybernetic era beyond just the Rationale. Between 1948-1957, a "dozen social studies curriculum guides and programs" published around (the diminishing) Life Adjustment curriculum were "virtually all organized in the manner" prescribed by the Rationale.[518] But the Progressive Education-based Life Adjustment "system" was steeped in traditional qualities because Life Adjustment maintained that a majority of students (60%) did not need the high expectations of a full curriculum.[519] The socially "incomplete" and unsustainable Life Adjustment curriculum model arose in the era of bourgeoning (cybernetic) social systems and failed to embody domestic modernization qualities, the educability and sameness of American consensus. Life Adjustment left too much untapped "potentiality," primarily because Life Adjustment was not organized around teaching process but taught content that fixed the learner to a fixed plan within a static system (and was therefore too similar to the five-year planning models of the communist nations). The Life Adjustment course of study was incompatible with a dynamic modern system, coming under intense criticism as it faded.

The ossifying Life Adjustment model was subject to the most vituperative attacks by historian Arthur Bestor. The first chapter of Bestor's *Educational Wastelands* reflected his central critique: there existed a "Vanishing Sense of Purpose in Education." In Bestor's second screed, *The Restoration of Learning*, Part I laid out the "Purposes of Education" and Part II lamented the "Aimlessness in Education."[520] Bestor argued overall that

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[517] Tyler, *Basic Principles*, 11, 41, 77.

[518] Thomas Fallace, "The Effects of Life Adjustment Education on the U.S. History Curriculum, 1948-1957," *The History Teacher* 44, no. 4 (2011): 578.

[519] Franklin and Johnson. "What the Schools Teach," 461.

[520] Arthur Bestor, *Educational Wastelands: The Retreat from Learning in Our Public School* (Urbana: University of Illinois Press, 1953); *The Restoration of Learning: A Program for Redeeming the Unfulfilled Promise of American Education* (New York: Alfred A. Knopf, 1955). "Unity of purpose is necessary for the success of any great undertaking. It is peculiarly essential for the success of a great national undertaking like American Public education"

"Progressive education became regressive education"—a part of the "anti-intellectual" pursuit in the nation's life—when it advanced no purpose and advanced "lesser aims, confused aims, no aims at all."[521] To reach the consonance between the part and whole in a modern social system, all parts have to be oriented to the operations of the whole, to be taught not content, but process, or what Bestor called "Disciplined Intelligence."

Bestor's idea of disciplined learning steered curriculum away from Life Adjustment's focus on the rote learning of academic content. Disciplined learning was based on "intellectual processes," cybernetic processes that later came be called Inquiry Learning, which meant that "To practice any profession successfully, one must know something about how the profession operates."[522] Disciplined Intelligence objected to coursework "which offered the 'content'" of an academic subject "without the intellectual discipline" *of the processes* that formed such content.[523] Bestor's argument parallels the same argument made in 1948 to scientists about the significance of cybernetic processes: scientists had long overlooked the "new" science of circular systems (cybernetics) by focusing too narrowly on measuring the "*products*" of older scientific linear systems that "neglected the dynamic *process* producing them."[524] It also parallels Wiener's concern that process should inform content:

> Our [news]papers have been making a great deal of American 'know-how' ever since we had the misfortune to discover the atomic bomb. [Yet t]here is one quality more important than 'know-how' and we cannot accuse the United States of any undue amount of it. This is 'knowwhat' *by which we determine not only how to accomplish our purposes, but what our purposes are to be*.[525]

Bestor similarly argued in education that a truly "integrated" curriculum would shun the mere "survey of accumulated facts" to favor instead "inquiry into the processes by which these [facts] were discovered." Only then

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(in *Wastelands*, 122).

[521] Bestor, *Wastelands*, 47. On the charge of anti-intellectualism, see the Appendix, pp. 197-206.

[522] Bestor, *Wastelands*, 167.

[523] Arthur Bestor, "Liberal Education and a Liberal Nation," *The American Scholar* 21, no. 2 (1952): 141.

[524] Frank, "Foreword," 191 (original emphasis). Also, "If we are to work towards a world in which those who work will be able to lead without damaging all they work for, we must see the job to be done as directed towards *processes and not towards identified persons or identified groups*, towards creating instead conditions within which unidentified individuals may act of their own free will." See Margaret Mead, *And Keep Your Powder Dry: An Anthropologist Looks at America* (New York: William Morrow & Co., 1942), 187 (original emphasis).

[525] Wiener, *Human Use*, 183 (emphasis added).

could disparate parts of an "'integrated' course [...] contribute greatly to unity of intellectual life."[526]

The push for systems unification governed other post-Rationale educational and curriculum reforms over the 1950s. Many changes occurred outside of a Sputnik-based Cold War historical framework. As curriculum historian Barry Franklin points out, the curriculum reforms in this post-1950s era began to push not content, but "structure" that taught the process-based concepts underlying a "system" that underpinned modern scientific research and intellectual disciplines. These processes were the same hot scholarly topics occurring at the same time as Talcott Parsons systems research or Weiner's series of books on cybernetics, as well as the focus on social "modernization" during an era bent on reducing errors, deviance, and deviants. Just as Bestor argued, teaching structure taught the intellectual processes and inquiry that formed academic content, processes that "referred to the generalizations, fundamental principles, key concepts, and research methodologies" that underpinned the behavioral-functional disciplines,[527] facilitated in the same way the Rationale forms curriculum through process. Teaching "factual" content such as "America good/Soviets bad" within a Cold War framework, even at a time of intense American nationalism, would still have opened the nation to the charge of teaching propaganda, rendering the United States' educational system no different than the Soviet's. The purpose of teaching *process* helped students "see" systems and to make visible why the dynamic, free-flowing, and democratic qualities of the U.S. social system was better than the static, authoritarian qualities developed by the Soviets. "If all students are helped to the full utilization of their intellectual powers," as Jerome Bruner stated (using a statement of logical conditions) in *The Process of Education* in 1960, then "we will have a better chance of surviving as a democracy in an age of enormous technological and social complexity."[528]

Systems unification reflected the harmonious realignment needed throughout an education system. Note that "What resulted led to efforts to makeover the classroom into something like a minor league extension of the research university,"[529] reflecting a greater push for alignment and harmony throughout an education system. Here

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[526] Bestor, *Wastelands*, 176-177.

[527] Franklin, and Johnson, "What the Schools Teach," 465. Teaching the process of structure "offered a way around traditional pedagogical practices that stressed factual learning and coverage in favor of the in-depth exploration of smaller, illustrative units of content that allowed for generalization."

[528] Bruner, *The Process*, 10.

[529] Evans, American School Reform, 2.

follows a brief sample of other process-based "new" curriculum reforms that reflect a cybernetic curriculum outside of a Sputnik/Cold War framework:

- In mathematics education, the New Math surfaced, ostensibly a reference to the "new mathematics"[530] and ergodic theory developed by Macy Conference permanent member and mathematician John von Neumann. The 1951 curriculum changes proposed by the University of Illinois Committee on School Mathematics (UICSM) proposed teaching systems-friendly concepts such as set theory in units structured around "Relations and Functions."[531]
- By 1956, scientists from the Physical Science Study Committee (PSSC), now in the classroom, looked to modernize science curriculum to teach the principles and dynamics of quantum physics, not the static and "closed system" Newtonian principles of classical mechanics.[532]
- "The report from the panel on Apparatus of Teaching" at the famous 1959 education reform meeting at Woods Hole discussed its hope "that the adoption and exploitation of a *systems approach* to educational design" would improve education through the "technical integrations of men and machines in the form of systems."[533]
- The Woods Hole meeting, also immersed in the behavioral sciences, proposed teaching structural functionalism as a cybernetic model in a nation-wide program like MACOS.[534]

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[530] Lynn Arthur Steen, "The Science of Patterns," *Science* 240, no. 4852 (April 29, 1988): 611–16; Also, "There is, for instance, the call for a 'new mathematics' to displace the Newtonian calculus, because it 'is unlikely that a mere repetition of the tricks which served us so well in physics will do so for the social phenomena too' (von Neumann & Morgenstern, 1964, p. 6)." See, Mirowski, *Machine Dreams*, 130.

[531] "University of Illinois Committee on School Curriculum" Accessed March 26, 2016, http://stern.buffalostate.edu/newmath/UICSM/UICSMdec.htm. A full set of documents and curriculum can be found at http://stern.buffalostate.edu/newmath/UICSM/uicsm.htm. For set theory, see Unit 5, "Relations and Functions", where the entire unit can be accessed at http://stern.buffalostate.edu/newmath/UICSM/UCISMUNIT5all.pdf.

[532] Rudolph, *Scientists*, Ch. 7.

[533] Evans, *American School Reform*, 81; Also, Rudolph, *Scientists*, 99.

[534] See Franklin and Johnson, "What the Schools Teach," 463-464; Rudolph, *Scientists*, Ch.4; John P. Ivens, "One Kind of Human Being," *European Education* 45, no. 3 (October 1, 2013): 16–34. Also, following the Fall 1957 launch of Sputnik I, a February 1958 Miller report, signed by Ralph Tyler and 14 others, pushed for increased federal funding for "processes" of the behavioral sciences. The committee assumed "a breakthrough in the control of the attitudes and beliefs of human beings through exceptionally effective educational [and other] techniques" that could be "a weapon of great power in Communist hands" without "effective countermeasures." Since the "behavioral science[s] directly prob[e] man's central nature," such countermeasures can "release[man] from the constriction of life by neurosis and feeblemindedness and [... limited] opportunity from inadequate education."

- By 1960, education was known as *The Process of Education*.
- In 1961, an introductory "1st grade math text published by the School Mathematics Study Group" pursued "Set Theories of the New Curriculum" in mathematics.[535]

These few examples highlight the shift in curricular reforms away from the content-based Life Adjustment model to a process-based inquiry model. The shift mirrors the same shift to the behavioral sciences away from behaviorism and to a mechanical system away from organicism. Under an organicist model, the part (a human student) operated within a larger "social" whole/organism, under which the student's "life" needed "adjustment.[536] But a system's view re-located that transcendent whole "system" into the interior of the human system (student), which then acted upon itself to govern itself under *purpose*, self-regulation (*feedback*), and self-understanding of the broad circulation of curricular messages to align his or her body to a larger system.

Conclusion

The liberal consensus reforms to modernize structures in the nation discussed in the last chapter required the reform of the function discussed in this chapter, much of which came through the curriculum reforms proposed by the 1947 Conference and the New Curriculum. Again, since "organization is the carrier of information," as one cybernetic scholar noted,[537] a re-engineered set of requirements and commitments were needed to reform people to be amenable to receiving the message (curriculum) circulating within the new system, since the old set of learning models were outdated. In these reforms were the series of commitments required of a function: part to self, part to part, and part to whole.

Among the "areas of basic research which can be applied to bettering human life" included "Man-Machine System Design" that "formulat[ed] procedures to coordinate man and machine in accomplishing an integrated purpose;" "A program for the study of processes such as concept formation, logical problem solving, thinking, and decision making, including the use of electronic computers to simulate the theoretical models of such functions;" and understanding "The role of man in the last half of this century [as] that of an information processor and decision maker. Heavy demands will be placed on human beings at various levels—not only top administrators—for correct, closely integrated, vital decisions." See James G. Miller, "National Support for Behavioral Science," *Behavioral Science* 3, no. 1 (January 1, 1958): 217-227. See also Solovey, *Shaky Foundations*.

[535] Jennifer Diaz, "Signs of In/Equality: A History of Representation and Reform in Elementary School Mathematics from the 1950s to the Present" (PhD dissertation, University of Wisconsin-Madison, 2014), chapter 3.

[536] See a similar account offered at the time in Evans, *American School Reform*, 15-16.

[537] Klir, "Relations," 158.

The part embodied its own function by appropriating technologies to the self, which included by acting on the self through a pre-determined self-direction that ran freely and without the cold heavy hand of the state. The function also learned to see the self as part of a set, as a member of a group, and was thus authorized to police the conduct of other functions through stress and pressure techniques to ensure obeisance toward greater social goals. Finally, the part to whole would always orient oneself to higher ideals, the larger social purposes, since the private self emerged because of the public self. These overall systems processes could then better align structures and function for a harmonious system society. Again, not one of these reforms needed the role of the state. But it did need culture, consensus, and a reformed sense of curriculum.

CHAPTER EIGHT

A CYBERNETIC STRATEGY ACROSS ACADEMIC LINES

This chapter broadens the historical focus to discuss current cybernetic operations in other select contemporary academic disciplines. The goal seeks to show a sense of sameness across different academic realms that use a solitary algorithm. Even though the cybernetic research "model" inspired by the Macy Conferences "died out as an independent discipline on its own," cybernetic principles have branched out "into the thought of all these different fields"—the human sciences, the humanities, the hard sciences—where "it [has] continued to flourish, although it was often not couched as cybernetics, or in cybernetic terms,"[538] demonstrating the continued strength of its cultural appeal.[539]Moreover, this research model still operates in domains considered atypical to a cybernetic bailiwick, where a cybernetic strategy still applies to different classes of problems. While cybernetics proper can be found in other areas not discussed below (such as ecology), this chapter examines those cybernetic operations overlooked in the social and educational sciences and the humanities, and then shifts focus to the nonhuman domain that includes electrical engineering and animal behavior. A return to the topic of the reform process suggests the challenges of a dynamic universe. Because thermodynamics and statistical mechanics prevails in the modern understanding of the natural world, chaos reigns. As Wiener pointed out, and as noted earlier in chapter five, in the long run [...] maximum entropy will appear to be the most enduring of all."[540] Materials, objects, humans, even higher-level orders of organization (like that of a society) exist under principles dominated by forces of entropy. Objects in the cosmology of a dynamic universe float around within a bubbling sea of chaos with no particular direction. The second law of thermodynamics convincingly states that energy is neither created nor destroyed and

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[538] N. Katherine Hayles, "*How We Became Posthuman*: Ten Years On An Interview with N. Katherine Hayles," *Paragraph* 33, no. 3 (2010): 318–30. Also Heims, *Cybernetics Group,* and "Introduction," in *The Human Use of Human Beings* ; R. Kline, "Where Are the Cyborgs in Cybernetics?," *Social Studies of Science* 39, no. 3 (June 1, 2009), 353; Thomas Rid, *Rise of the Machines: A Cybernetic History* (New York: W. W. Norton & Company, 2016), esp. Ch. 9, "Fall of the Machines."

[539] See R. Trappl, *Cybernetics: Theory and Applications* (Springer, 1983).

[540] Wiener, *Human Use*, 38.

under this framework changes in this universe comes about from the immediate presence of a field.[541] Again, as was discussed in an earlier chapter, and within a "situation," that which serves as the binding agent to keep organized wholes from disintegrating into the entropic soup is the (new) concept of "information" (Shannon). Moreover, in applying this modern conception of the physical world to the social realm, the doctrine of relativism reigns with no strong philosophical foundations for beliefs, and only provides rudderless purposes behind life.

This end result of entropy over the long run in a dynamic universe presents a seemingly insurmountable multivariant problem. The problem to overcome is how to preserve basic levels of human social organization: how to keep things together. On one hand, the systems-oriented reformers followed in the earlier chapters followed what Lorraine Daston calls "The Morality of Natural Orders,"[542] and had to account for this new entropic view of nature. Yet, on the other hand, a sense of order had to be maintained for harmonious human relations between groups—at all levels, from the family up to the local, national, and world stage. From this view, allowing things to fall apart into chaotic social situations was indefensible, since social chaos just perpetuates human misery. From still yet another stand point, traditional views and processes would no longer work, since both were and are steeped in energy mechanics (not information), steeped in a static picture of the natural world that was focused on products and forces working at a distance. Traditional solutions would fail under the new understanding of a chaotic universe.

Any solution to this multivariant problem thus requires at least a three-fold approach. A solution would have to account for the new view of nature, maintain sufficient amounts of organization to fend off human misery, and also restore social harmony. In short, any solution needed, as Tyler put it, working out a "general theory that [would] provide concepts and principles that have wide application [and that] can bring order out of what would otherwise be an impossible complexity."[543] That is a tall order.

A cybernetic approach to modernization and reform encompasses the elements of this tripartite approach. A cybernetic approach could and can accommodate the new view of the natural world as the basis for the social view. A cybernetic approach could and can re-organize a set of connections between parts to reset human relations to

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541 Alexandre Koyré, "The Significance of the Newtonian Synthesis," *The Journal of General Education* 4, no. 4 (July 1950): 256–68.

542 Lorraine Daston, "The Morality of Natural Orders: The Power of Medea II. Nature's Customs versus Nature's Laws," in *Tanner Lectures on Human Values* (Harvard, MA: University of Utah Press, 2002), 1–41.

543 "Dedication," *Behavioral Science*, 57.

bring a new social order. A cybernetic approach could and can ensure social harmony by re-organizing constrains on human conduct through social ethics while both modernizing and expelling the errors of the traditional. We can understand the solitary algorithm explored below as a cybernetic approach to resolve these problems.

An Algorithmic Solution

I would like to show how one cybernetic approach to resolve the problem of keeping things together proposed a single strategy of power to reach a single-purpose or goal. This strategy—a solitary algorithm common to fields across the human, animal, and mechanical divide—today continues to standardize research programs and academic institutions across widely different academic and geographic locations. This algorithm's strategy of power brings a sense of order and standardization to an otherwise impossible complexity through the concept of a *game*. Before I begin showing the breadth of this algorithm, let me discuss a few elements that help to structure the concept of a game. I do so by drawing on some of the elements of the theory of games summarized in economic historian Philip Mirowski's *Machine Dreams*[544] and based on von Neumann and Morgenstern's 1944 classic, *Theory of Games and Economic Behavior*. The five elements introduced here are the field, the situation, alternative possibilities, the rules, and the participant, and when taken together, all structure a game and the social ethics within it.

1. Through which one tries to reach a goal within the structure of a game there exists a *field*. Within this field are a variety of moves and alternative positions to stake out that will help to achieve that given goal. A variety of alternative possibilities exist in a field based on an understanding of a thermodynamically-oriented universe and these possible alternative moves are silently present in the prescriptions that describe how to reach a goal (as seen with the Tyler Rationale's four steps). Consequently, the structure of a model of a generic game presumes a complex sense of pure randomness, since a variety of possible moves exists to achieve a goal.
2. Within a field there exists *situations*. Each alternative possibility represents a different state or condition of order and organization, a statistical event unto itself. Again, as seen in the Rationale, anything gained by selecting one resulting state or condition may be sacrificed in another, leading to the idea that any choice or decision has consequences. Moreover, by selecting one possibility, a range of possible future options are

[544] Philip Mirowski, *Machine Dreams*; John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton, N.J: Princeton University Press., 1944).

increasingly narrowed by earlier selections, since subsequent sets of possible alternatives are pruned from preceding decisions.

3. The sense of pure randomness in a field can be brought under control by considering broadly in a game the *alternative possibilities* to reach a goal. The series of different possible choices drives the formulation of any decision relative to a goal, since each "move" in a game moves a strategic decision-making process from one defined "state" or "situation" to the next, a move always taken relative to that goal. The different consequences and available options within any random set of choices within this field need to be brought under order if the goal state is to be achieved.[545]
4. Then there are the *rules* of the game. According to the *Theory of Games*, "a set of rules [tells] each participant [...] how to behave in every possible situation of the game." The insight of *Games* was to then recast those "sets of rules [as] the 'strategies' of the game."[546] Any over-arching strategic formulation for how to behave, for which decision to make at each stage in the game *en route* to a larger end-stage, is made by calculating a series of possible choices while also accounting for the actions of other participants and forces in a field.
5. A *participant* in the game is therefore a part of a game's structure and rule set. *A generic participant*, or a set of generic participants, expresses preferences for states or situations relative to a desired goal, and a final decision or selection has to consider those preferences. Furthermore, no participant can be allowed to dominate another, nor the game itself as part of the rules of the game, all within a system with different levels of possible situations.[547]

Consequently, in the structured model of a game, the variability of possible states within a field occurs because of the dynamic universe, and the path to reaching a given goal is determined by the players of the game, whose preferences determine which situation is superior to another. In this way, a decisive strategy to reach a goal admits the consideration of all possible solutions from which to consider action.

The overall model presented here of the theory of a game offers an empty, hierarchical, rule-governed

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[545] See Mirowski, *Machine Dreams*, 132-140.

[546] von Neumann and Morgenstern, *Theory of Games*, 41, 44.

[547] Mirowski, *Machine Dreams*, 132.

structure. Participants reach a goal by forming *a strategy* as a series of steps through this structure. That structure is empty because, just as with Shannon's *Mathematical Theory of Communication* (discussed in an earlier chapter), the structure of a game is "designed to operate for each possible [selection or decision], not just the one which will actually be chosen since this is unknown at the time of design."[548] Moreover, as Mirowski notes, "the introduction [by von Neuman and Morgenstern] of the concept of a 'strategy' as a complete formal plan of play [is] independent of the information or interpretation imposed by either the player or his opponents."[549] The structure of a game thus can generate a general strategy of goal-seeking empty of historical, cultural, or geographic context.

The structure of the game, moreover, is hierarchical and rule-governed. As part of its structure, lower level parts (and participants, when one considers how societies can be involved in games) with their more basic computational processes and rudimentary operations can generate higher-level regularities. Those regularities can then lead to the formation of even higher levels of social organization that seek out a desired goal state (teleology) to be achieved.[550] This hierarchical and rule-governed understanding aids in the solution to the multivariant problem of chaos and entropy, since a solution to a goal can be standardized by organizing human understanding of the fundamental structure of a "mathematical theory of games of strategy."[551]

In sum, there is no content in a game—only structure. With this empty structure and its different elements in hand, we can now return to examine a cybernetic solution to the earlier problem of keeping things together, in this case, by keeping groups and social organizations together by prescribing the same strategy. Below explores how one single strategy of power, in the form of a solitary algorithm, is used across academic domains. Most critically, the generic term "strategy" can be recast as a "program."[552] Programming, after all, "may be defined as the construction of a schedule of actions by means of which an economy, organization or other complex of activities may move from one defined state to another."[553] The algorithmic program explored below procures how to reach a goal state across a

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[548] Shannon, *Communication*, 3.

[549] Mirowski, *Machine Dreams*, 130.

[550] Ibid., 144.

[551] von Neumann and Morgenstern, *Theory of Games*, 1.

[552] Mirowski, *Machine Dreams*, 134-135.

[553] Quoting American economist Tjalling Koopmans, in Mirowski, *Machine Dreams*, 260.

variety of historical, cultural, and geographic contexts. Before exploring this strategy in the nonhuman domain, we explore a set of examples in the human domain.

Programming Social Planning

A series of influential mid-20th century theory-based "how-to manuals" in the human domain continue to influence social science sub-disciplines through the scientific research model of "action research."[554] The overall strategy behind the action research (AR) model reflects its cybernetic inheritance, emerging out of social psychology and the Group Dynamics movement, much of which can be attributed to the work of Macy Conference regular Kurt Lewin (a regular at least until his premature death). The AR model proposes an algorithm as the overall strategy to achieve effective research. The schedule or three-stepped "strategy of action" in the AR model includes first setting up a future purpose (or "objectives"), then formulating future plans and then acting on those plans in the present, and then finally using a feedback mechanism that reaches back to guide behavior.[555] When applied to regulate human relations between social groups, this algorithm adjusts sets of populations in social domains from one state or situation to another, what Lewin called "Social Planning,"[556] and advances social scientific research into solving a perceived social problem.

AR responded to a series of problems with an algorithmic solution. One "problem" AR responded to was deteriorating relations between workers and owners of factories during the WWII era of industrial manufacturing. Another problem was that "those whose very job is the improvement of [those] inter-group relations [say] that perhaps the greatest obstacle to their work is their own lack of clarity of what ought to be done." Consequently, AR theorized that a first move should clarify what needs to be done when taking social action to address these problems.

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[554] Kurt Lewin, "Action Research," 34–46; For more on Action Research, see Thomas S. Popkewitz, "The Culture of Redemption and the Administration of Freedom as Research," *Review of Educational Research* 68, no. 1 (Spring 1998): 1–34; and Popkewitz, "Rethinking Decentralization and State/Civil Society Distinctions: The State as a Problematic of Governing," *Journal of Education Policy* 11, no. 1 (January 1, 1996): 27–51.

[555] "(i) The objective has to be clarified; (ii) The path to the goal and the available means have to be determined; (iii) A strategy of action has to be developed [...] The feedback has to be done so that a discrepancy between the desired and the actual direction leads "automatically" to a correction of actions or to a change of planning." Lewin, "Frontiers II," 147, 150.

[556] Ibid., 143–53.

That means first selecting a goal or *purpose* to direct clear scientific research into those troubled inter-group relations. Without first establishing purpose, which is one way of establishing "objective standards of achievement," the action researcher cannot "measure progress" and will continue to remain in a "fog" for how to plan later actions because a variety of random possible actions exist within an impossibly complex field in different situations. To tackle a social problem like troubled worker-management relations, it is "desirable to reach a certain objective" that the researcher should identify in advance to know what can "lead to social action."[557]

Once that goal state, the objective, is settled, the second move of AR instructs the scientific investigator to diagnose the current state of affairs from the point of view of a person in a situation. Two sub-stages are needed to assess a current situation: formulating a plan to conduct scientific research and then putting that plan into action. First, without a plan, "Exactly how to circumscribe [the selected] objective, and how to reach it is frequently not too clear," particularly if one does not know "the specific character of the situation at hand," since a social problem like relations between labor and management in an industrial setting differs vastly across geographic locations. A first sub-step develops a diagnostic plan for "fact-finding about the situation" that enables the scientific investigator to then develop a second sub-stage, a comprehensive "'overall plan' of how to reach the [selected] objective [and take] the first step of action" of improving the social situation. From the two-sub-stages of planning to then acting on that plan, AR's second move seeks to diagnose accurately the current state of a social situation to change it.[558]

AR's third and final move comes as "fact-finding about the result of the action." When the researcher checks the results in a third move, she or he evaluates whether the second move's plans and actions closed gaps between the current state and the goal state. This third move is feedback. If the feedback move finds difference between two states in the results, then that finding calls for "modifying again the [second move's] overall plan" and restarting the process to further close difference, because the entirety of action research seeks to "improve the action pattern" of the involved parties.[559] Those three steps, that algorithm, compose the core sequence of moves in the AR model.

We can see the cybernetic features of a game in the AR model. First, there inheres the cybernetic

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[557] Lewin, "Action Research," 35.

[558] Ibid., 36, 37.

[559] Ibid., 37-38, 42.

steersman, the *persona* who "chooses" the correct moves to carry out the steps of the algorithm, a social planner like Lewin, who, secondly, configures the right set of relations of other participants in a game within a field, the "players"/participants who employ the AR model. Third, by considering in advance those players' "self-interested" objectives, this *persona* strategizes a schedule of behavioral acts—this *persona* constrains the possibilities of human conduct—to reach a goal to establish what in economics is called a "payoff," the maximization of a particular social utility function. Finally, what this algorithm offers each participant is a series of rules for how to behave in every possible situation of the game. The goal, the alternative moves from the whole series of possible moves, and the participants, all occur within an empty system, as we shall see, since the AR model spread into other domains.

Moving on to other examples in other domains, the AR model gained popularity and circulated widely throughout the human sciences. AR granted its principles to the different classes of problems that different academic disciplines confronted. One such discipline was anthropology. University of Chicago anthropologist Solomon (Sol) Tax responded with an AR model of "action anthropology" to help solve the problem of "an Indian tribe or community which is in trouble" from facing the cultural pressures of outside social forces that disrupted and threatened that group's social harmony. Tax's anthropological version theorized that action research could "help the development of new knowledge" not only in general terms, but also through practical terms by generating new scientific knowledge about problems an anthropologist confronts.[560]

Tax's "how-to" manifesto on action anthropology laid out a strategy of action in three moves. As with Lewin's version of AR, Tax's first step of action anthropology consists of goal setting. The purpose of "action anthropology is an activity in which an anthropologist has two coordinate goals [...] He wants to help a group of people to solve a problem, *and* he wants to learn something in the process."[561] With these goals in hand, the action anthropologist's second move diagnoses the current state of a social problem from the point of view of the subject enmeshed in it. In this "situation," researching about a "group of people" confronting "a problem," like that of an indigenous community in trouble, comes by anthropologically assessing and "understand[ing] not simply the 'culture' and its personality characteristics, and the functional interrelations of institutions, but also the perceptions

[560] Sol Tax, "Action Anthropology," *América Indígena: Órgano Oficial Del Instituto Indigenista Interamericano*, XII, no. 2 (1952): 103–9. Also see Sol Tax, "Action Anthropology," *Current Anthropology* 16, no. 4 (December 1, 1975): 514–17.

[561] Ibid., 103 (original emphasis). Tax argued that "The basic problem that the action anthropologist deals with is community organization, and his chief tool is education."

by people of the alternatives which face them in changing situations." A clinical diagnosis about a current state from the subjective point of view—again, the characteristics facing a community under stress in different situations—helps the anthropologist to develop a plan "in the same way that diagnosis of a sickness often requires treatment," and then subsequently implementing that plan by acting on the diagnosed problem in the current state, "doing something about it and understanding it better."[562]

Having satisfied the first two moves of action research, action anthropology's third move—that of feedback—assesses the changes made upon the current state in relation to the goal state. A feedback loop again ensures that checking the results helps to modify the enacted research plan, which, recall, was one goal of action anthropology. But feeding information back also into a "community of scholars" allows the action anthropologist to meet the other goal, to learn "more from his trials than he puts into them in the way of knowledge. He cannot do his practical work unless he can create new knowledge."[563] New information garnered from this final move circulates back to improve two sites: not only the conditions of the pressured indigenous community, the site of research, but also the overall discipline of anthropology, both of which are a product of reconciling results against a goal state, and both of which start the research program anew. Today, action anthropology continues as a form of "applied anthropology" and "provides anthropologists with a number of effective action strategies that can be used to assist communities in reaching their goals within the context of self-determination."[564] Such a technology of self-determinism involves the regulation of the conduct of the academic researcher, since both a "community of scholars" and "community which is in trouble" exist as sites of intervention. As Tax noted, "the community in which it [action anthropology] works is not only its subject of study but also its object,"[565] and thereby action

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[562] Ibid., 104-105.

[563] Tax, "Action Anthropology," 106. Also see John Collier, "United States Indian Administration as a Laboratory of Ethnic Relations," *Social Research* 12, no. 3 (September 1, 1945): 265–303.

[564] John Van Willigen, *Applied Anthropology: An Introduction* (Greenwood Publishing Group, 2002), ix. Action anthropology today is organized around international societies and their respective academic journals. These professional organizations include The Society for Applied Anthropology and its related academic journal "Anthropology in Action" and the "Journal for Applied Anthropology in Policy and Practice;" the Association of Social Anthropologists' (and its journal *ASAonline*); the National Association for the Practice of Anthropology (NAPA) and its related "Annals of Anthropological Practice" (formerly NAPA Bulletin). The Washington Association of Professional Anthropologists is associated with the Consortium of Programs in Applied Anthropology.

[565] Tax, "Action Anthropology," 104.

anthropology's research strategy allows a self to act upon itself to govern itself in pursuit of a larger purpose.

We can pause to see how both Lewin's and Tax's use of the AR algorithm operates in an empty structure. Devoid of particularities, the algorithm accomplishes the standardization of operations through a process based on the complete set of all possible solutions according to the rules of a particular game. Through AR's extensive use, its model standardizes institutional behavior to bring order and organization to stabilize a much larger system through its content-less and empty structure across localized sites that now can harmonize with a much larger system. It also improves human relations. How? Because, in the words of von Neumann and Morgenstern, who penned the *Theory of Games*, "the procedure of the mathematical theory of games of strategy" works because of a "correspondence which exists between its concepts and those of social organizations," and just as no participant can dominate the rules of a game, so too does that dominance maxim hold with social organization. In short, the connection between "Games and Social Organizations"[566] is a direct path to an improved set of human relations throughout a domain.

Beyond the remote locations of worker-management relations on a factory floor or across sites of anthropological research, the principles of AR and its empty structure extended into other professional fields, such as education. Moving away from the broad conflict-plagued social situations that Lewin and Tax confronted, educational action research (EAR) was developed for use by those in smaller local institutions who "actually teach children or supervise teachers or administer school systems." Educational action researcher Stephen Corey proposed that "Any successful program of education depends to a great degree upon effective human relations" between parts: "teachers with pupils, teachers with teachers, administrators with teachers and parents, and teachers with parents. [Moreover, it] is in learning about such relationships that the scientific method has made little headway. The situations are exceedingly complex."[567] Corey maintained teaching, supervision, and administrative work could make greater headway by using EAR. Applying EAR could more effectively resolve "practical problems" of effective human relations "by using the methods of science" for "the elimination of future difficulties" to help boots-on-the-ground practitioners "improve their practices."[568]

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[566] von Neumann and Oskar Morgenstern, *Theory of Games*, 43.

[567] Stephen Corey, "Curriculum Development through Action Research," *Educational Leadership* 7, no. 3 (December 1949): 147–148.

[568] Stephen Corey, "Action Research in Education," *The Journal of Educational Research* 47, no. 5 (January 1, 1954): 375.

Corey's 1953 "how to" book on educational *Action Research to Improve School Practices* did just that.[569] The text instructed staff members to use the same three-stepped schedule of actions of the AR algorithm. The EAR version's first move of setting a goal state or purpose needed no mention since educational action research already "implies a goal" for educators to pursue and only the second and third move needed to detail "a procedure for reaching it." With an already implied goal state (the first move), EAR ramifies its second and third moves across a sub-set of "five 'elements of a design for action research.'"[570] Of the five elements in EAR, the first three complete a second move of diagnosing problems in a current state for developing a plan of action. One of these three elements diagnoses a current "problem area" in a teacher's classroom or school from the subjective point of view; a second identifies an educational problem within it; and then both contribute to a third, "the formulation of a [plan,] a procedure for reaching" and taking "action" on the identified pedagogical problem. Educational AR's final two elements complete the third move by serving as the feedback mechanism. There, a fourth element seeks to "determine the degree to which the goal has been achieved," reconciling difference between "the relation between the actions and the desired goal," and a fifth and final element is "The continuous re-testing" that checks the results of the action on the educational situation.[571]

EAR is still taught today. Nourished by numerous scholarly books and academic journals (including *Educational Action Research*) and its own established AERA Special Interest Group (SIG), EAR still resonates for practitioners in the classroom, in the school, and across a panoply of international educational settings. "It is widely accepted that teacher action research involves research that is undertaken by teachers in their own classrooms," where "The purpose of action research, in general, can be clustered into two key ideas." The first "involves teachers' 'sense of professional role and identity' [...] and the other is related to improving teaching quality and practices."[572]

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[569] Stephen Corey, *Action Research to Improve School Practices* (New York: Bureau of Publications, Teachers College, Columbia University, 1953).

[570] Susan Noffke, "The Social Context of Action Research: A Comparative and Historical Analysis," Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, March 27, 1989): 27.

[571] Corey, *Improve School Practices*, 40-41.

[572]Lisa M. Bell and Jill M. Aldridge, *Student Voice, Teacher Action Research and Classroom Improvement* (Springer, 2014), 14.

What we see in a solitary strategy—or in this case, an algorithm—that offers the same decision process to reach a goal or purpose is a mechanization and standardization of decision rules to reach a particular goal state. Curtailing the entropy of variability that leads to disintegration requires a directed system of instructions to reach a proper end.

Staying within the field of education but moving beyond the localized site of a classroom or school, and also traveling across geographic hemispheres, another AR application is the model of Participatory Action Research (PAR). As one of "four varieties of action research,"[573] PAR was taken up by Brazilian educator Paulo Freire. In an international context of a post-WWII "Third World" effort to fight colonialism in Latin America (and elsewhere), the poverty-stricken areas of rural Brazil were home to a problem, the "problem of humanization [...] humankind's central problem."[574] Dehumanized peasants lived under oppressive socio-economic conditions, and as part of a Catholic "action" movement, PAR responded to the poverty of the human condition by reimagining the entire discipline of education as

> a pedagogy which must be forged with, not for, the oppressed (whether individuals or peoples) in the incessant struggle to regain their humanity. This pedagogy makes oppression and its causes objects of reflection by the oppressed, and from that reflection will come their necessary engagement in the struggle for their liberation.[575]

Freire's PAR model, detailed in "Creating Alternative Research Methods," but recognizable to most in the go-to manual for critical pedagogy, *Pedagogy of the Oppressed*.[576] Cutting though *Pedagogy*'s rhetoric helps to clarify the PAR model to examine its curriculum forming process.

Freire's concern rested partially with a series of relationships, those "codes" to the moral order of a system. These relationships include regulating "a relation of mutual understanding and trust" between scholar and student; the spatiotemporal relationship of students to the curriculum "so that they [the student] can easily recognize the [concrete] situations [in which they live] (and thus their own relation to them)"; the relation between higher and

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[573] Isidor Chein, Stuart W. Cook, and John Harding, "The Field of Action Research," *American Psychologist* 3, no. 2 (1948): 45.

[574] *Pedagogy of the Oppressed: 30th Anniversary Edition* (New York: Bloomsbury Publishing USA, 2013), 43.

[575] Ibid., 48.

[576] Paulo Freire, "Creating Alternative Research Methods: Learning to Do It by Doing It," in *Creating Knowledge: A Monopoly? Participatory Research in Development. Participatory Research Network Series No. 1.*, edited by Budd Hall, Gillette, A, and Tandon, R. (New Delhi: Society for Participatory Research in Asia, 1982): 29-37; *Pedagogy of the Oppressed*.

lower parts of a new order, those "revolutionary leaders who do not act dialogically in their relations with the people[, who] have retained characteristics of the dominator[, and who] are not truly revolutionary [or are] totally misguided [and are] prisoners of their own sectarianism [and are] non-revolutionary."[577] Freire's modernizing solution to a world of improper relations sought to fix a familiar set of relationships: relations between a part to itself, to other parts, and to the organized whole. In the empty system we've been tracking here, the movements described below "freeze" and "unfreeze" situations—the subject and environment considered together—by incrementally moving sets of populations from one state or condition in one given domain to another, again, what Lewin called "Social Planning," by structing these situations in advance.

The first move of Freire's PAR also follows a pre-set purpose. According to Freire, "[T]he goal of the oppressed is to become fully human." To help the oppressed reach that goal "for their liberation," research must begin "transforming that [oppressive] reality" by initiating PAR's second move of diagnosing problems about a current state from the subjective point of view. A diagnosis of the current state of oppression helps the pedagogue devise an "educational plan, which transforms the untested feasibility into testing action" on that current state, since "[t]he starting point for organizing the program content of education or political action must be the present, existential, concrete situation." The researcher/investigator-*cum*-curriculum worker can then diagnose the current state of a social problem from the subjective point of view and begin formulating plans to act on it by "organizing the program content of [...] educational action" by organizing curriculum themes "as problems to be solved."[578]

The third move of Freire's PAR, feedback, assesses the changes made to the current state in relation to the goal state of liberation. "As they [the oppressed] discuss [in a learning environment] the world of culture, they express their level of awareness of [the] reality" of how their current state of oppression contrasts with their goal state of liberation. Awareness of difference between the two "comes to be perceived in an increasingly critical way. These aspects in turn involve many other themes" that develop within the curriculum, which feeds "back, dialogically, to the disjoined whole, which once more becomes a totality evoking a new analysis" and the entire purposive process renews.[579]

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[577] Freire, *Pedagogy*, 110, 114, 127.

[578] Freire, *Pedagogy*, 51, 52, 115, 112, 123.

[579] Ibid., 123-124, 112.

The critical pedagogy of the PAR curriculum model continues today to inspire international educational change. Despite over 1 million copies sold worldwide, two ironies remain behind *Pedagogy*'s use of cybernetics. The first is *Pedagogy*'s professed goal to help restore for the "the oppressed [the ability] to become fully human." Cybernetics, however, is the acme of anti-humanism[580] by stripping humans of their humanity (recall that there is no "I" in cybernetics, only the populational reasoning of set theory). The second irony is the direct correlation explored in this chapter between cybernetics and economic game theory, one that furthers the imperialist economic policies of capitalism. The use of *Pedagogy* to upend capitalism merely further embeds imperialist policies.

Similar to Freire's strategy of a curriculum-forming process is the Tyler Rationale, discussed in an earlier chapter. The first move determines the *purpose* for education (Step One in the Rationale). The second move consists of the sub-routines of planning (Step Two) and acting on the plan (Step Three) to change the current educational situation. The third move, evaluation (Step Four), consists of a feedback loop, which helps to modify the curriculum to improve its outcomes and move it closer to the goal state.

The Rationale demonstrates again how mathematical and scientific work imparts a sense of social ethics. One example of this in the Rationale's use of the Two-Dimensional Chart's "thinking machine," part of the Rationale's overall scheme to, as Kliebard put it, force "compromise" between the educational demands of "warring extremes."[581] Recall that no player can dominate another as part of the game. That rule sets up and confirms a generic sense of human relations under the rule of "fair play," a sense of social ethics between parts that forces a "fair" sense of cooperation. Moreover, in the sense of a game, at least one value from each player generally comes through in the payoff, so all participants to some degree win under a conception of compromise that preserves social integration and keeps a generic social group whole. The 2-D chart's operations did just that when its logical conditions required both behavior (acting) and knowledge (thinking) to formulate an objective that brought consensus to the warring extremes of progressivism/behaviorism (acting and doing) and the essentialist (knowledge and values) philosophies of education the Rationale describes in Step One. The empty structure of the game's system ensures each part within the overall organized whole is situated and oriented to a place, and holds a function within that whole, thereby ensuring homeostatic features of a greater system. Consequently, human relations are

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[580] Dupuy, "Antihumanism."

[581] Kliebard, "The Tyler Rationale," 59, 65.

improved through a spatial and temporal positioning within a larger organized whole within this overall strategy to make visible the part's own function in a larger overall structure that helps hold things together.

Move outside of the field of action research, and outside of education, consider this "empty" cybernetic strategy in other social sciences. One can see how this strategy operates today in the field of economics and the decision sciences. The *prospect theory* offered by behavioral economists Daniel Kahneman (who won a 2002 Nobel Prize for this work) and Amos Tversky (who passed before the award was given) responded to the problems they saw with the decision-making explanation offered by traditional economic models. What they sought was an "alternative account of choice under risk." Both prospect theory and traditional economic theory narrate to economic agents "how to" perform the decision-making process, where the first move of deciding finds an already purposeful "chooser" seeking to maximize his or her "utility."

Prospect theory's second and third moves, however, contrast to traditional economic theories of utility. After the first move, "Prospect theory distinguishes two [subsequent] phases in the choice process: an early phase of editing and a subsequent phase of evaluation." The cybernetic algorithm's second move of diagnosing and fact-finding about a situation corresponds to prospect theory's "editing phase." In diagnosing the current state, and when trying to understand the complicated probabilities of a current gamble or "prospect," the economic chooser "edits" down those complex probabilities into simpler, more understandable terms to generate a reference point from which to make a decision. Prospect theory's innovation affirmed how "the reference point [for a decision] was taken to be the status quo, or one's current assets," a subjective point of view ignored by traditional "objective" point of view held by conventional economic theories of utility.

Following the editing phase, prospect theory's third move, the evaluation phase (feedback), compares the current state against the goal state. In this final move, "the decision maker is assumed to evaluate each of the edited prospects, and to choose the prospect of highest value." The chooser in this third and final feedback stage may finally reconcile the "discrepanc[ies] between the reference point and the current asset position," discrepancies that can then be "corrected by the decision maker" to modify and improve future decision-making activity. In full cybernetic fashion, the findings of prospect theory can also feedforward for application to "a wider range of decision problems [and] be extended in several directions."

Critically, the prospect theory of decision-making "developed two themes" that evacuate a theory of agential decision-making, thereby leaving an empty structure. "The first theme concerns editing operations" of an *a*

priori script already running before humans appear to use it. That same script helped form the algorithm of procedures (the programming code) as well as "The second theme['s...] judgmental principles that govern" the "thinking" of those humans, which suggests again how the human body is merely a cybernetic channel for processing pre-programed coding and information.[582]

Moving beyond the human sciences shows how this same empty structure and model is replicated in rhetoric and speech communications. *The Art of Public Speaking*[583] is an undergraduate-level "how to" textbook widely adopted across campuses in the United States to help students appropriately respond to the problem of how to speak in a public setting. The first move of public speaking is to establish a goal-point, that of "determin[ing] the general purpose of [the] speech." After deciding that purpose and "choosing a topic" for a speech, the second move of planning and acting suggests that a student develop an overall plan for action (speaking) by diagnosing the current state through *fact finding* about a *situation*, "the time and place in which speech communication occurs." Fact-finding includes "Analyzing the audience (Ch. 6)," "Gathering Materials (Ch. 7)," and "Supporting Your Ideas" with research materials (Ch. 8). With that "data" in hand, next comes developing a *plan* to "Organize" the speech (Ch. 9), and acting on that plan comes in the latter part of the textbook: "Presenting the Speech (Chs. 12, 13, 14)." The third move, always comparative, tells students that "When you deliver your speech, keep an eye out for audience *feedback* and adjust your remarks in response," thereby adjusting the behavior of the part to the demands and needs of the larger organized whole.[584]

What should be clear by this point is that the basic three-step cybernetic model preserves and operates in different academic areas in the "human" domain. This model operates as a schedule of action, a general strategy of goal seeking empty of historical, cultural, or geographic context. The pre-programmed three-stepped moves detailed here result from a model perceived as an effective research method, if not a science, as the same strategy in a game-like situation used to respond to a diverse set of different problems across time and space. Whether in the fields of social psychology, anthropology, or even economics, these different disciplines appropriate the same "how-to"

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[582] Daniel Kahneman and Amos Tversky, "Prospect Theory: An Analysis of Decision under Risk," *Econometrica* 47, no. 2 (1979): 263, 274, 286, 275, 287, 288, 289. Also see Jonathan Baron, *Thinking and Deciding* (New York: Cambridge University Press, 1988): chapter 1.

[583] Stephen Lucas, *The Art of Public Speaking*, 12th ed. (New York, NY: McGraw-Hill, 2014).

[584] Ibid., 82, 76, 21, 116 (emphasis added). Also, see comments about feedback on pages 20, 106, 115.

model for apprehending the world.

Crossing Borders

Since cybernetics effaces borders, I would like to examine how disciplines operating in the "non-human" arena respond to problems using this same three-stepped "empty" model. We can find one example of this three-stepped algorithm—and the empty rule-governed structure—in the annals of computer science, communications, and electrical engineering (IEEE). There scientists analyzed an "Ant System" to demonstrate how a colony of ants responded to a problem using this same strategy described above. The larger research problem, one also "studied by ethologists[,] was to understand how almost blind animals like ants" collectively responded to a problem of how to attain a goal state. The goal state was to reach the status as a larger organized whole operating under the parameters of human social ethics, that of operating as a "Colony of Cooperating Agents," cooperating primarily by identifying and then optimizing different "shortest route paths from their colony to feeding sources and back," a peculiar problem given that this insect lacks the visual acuity to even see such a path.[585] The characteristics of this path interested those researching this problem. But what interests us is how they narrate the way in which the ants developed this path.

The narrative begins with one goal state already attained. That goal state is an already-laid "path along which ants are walking [...] from [a] food source to a nest [...] and vice versa." The narrative explains how a single wandering ant reached that path/goal state (the first move) by searching and re-searching and fact finding about the current state from the subjective point of view (the second move) to diagnose one goal state or condition, the location of a food source. During the second "diagnosing" move, as that ant aimlessly navigates a field for food, its "choice about which way to go is completely random." The possible directional alternatives are legion. But since that wandering ant also simultaneously communicates its location by expressing "some pheromone (in varying quantities) on the ground," when a second "researching" ant also diagnosing the current state randomly encounters the first ant's pheromone trail, the second ant "decide[s] with high probability to follow [that trail], thus reinforcing the trail with its own pheromone," thereby strengthening the relations between parts. The more pheromone on a trail, "the more attractive that trail becomes for being followed" by subsequent researching ants. The scientists "found

[585] M. Dorigo, V. Maniezzo, and A. Colorni, "Ant System: Optimization by a Colony of Cooperating Agents," *IEEE Transactions on Systems, Man, and Cybernetics, Part B: Cybernetics* 26, no. 1 (February 1996): 29, 30. Google scholar notes this article possesses over 10,000 citations.

that the medium used to communicate information among individual [ants] regarding paths, and used [also] to decide where to go, consists of [those] *pheromone trails*." The overall effect of that communication medium (pheromones as information) used in the second move culminates in a third move, "characterized by a positive feedback loop,"[586] where the greater goal state (establish a common colony trail) and the current state (finding a trail) aligned. When the two states finally aligned, the ants had finally brought order to an impossible complexity and reached an even higher purpose: that of a "Colony of Cooperating Agents." If a lower level insect can perform lower-order activities (like creating a common path) along the way to reaching a higher-order of social ethics, a higher-level organism like a human can too.

Other nonhuman cybernetic research similarly tested navigation strategies. One example is the goal place cells (GPCs) found in a rat's hippocampus. The "Outline of the model" proposed for this research example begins with the requisite parts of the three-step algorithm: a goal state, a current state, and the point of view of an actor/agent in a situation seeking to reconcile the two. The research already assumes the third and first moves are in hand, with a GPC already having determined the spatial difference (the third move) between its "current position [relative] to a goal" position (a first move) by reconciling spatial differences between nodes located in a hippocampus. With these two moves, the GPC had already understood the set of spatiotemporal relationships required of it to position itself in the right place for the greater functioning of the larger whole. The researchers were interested in modeling this navigation strategy (the second move) that would explain how the GPC responded to the problem of "calculat[ing] the distances [...] from the destination node to all other nodes" to explain overall GPC behavior. The proposed GPC navigation model that was tested had to simulate comprehensively the different ways in which the cell randomly "roamed in the [surrounding] environment" in its fact-finding mission about different states and conditions (the second move) to understand how the GPC effectively reconciled the differences between its current position and goal position (the third move). Only after "100 learning test simulations with different goal places and starting positions were performed" did the GPC later "[reach] the goal place." With this achievement, the researchers had finally modeled the hippocampus GPC's navigation strategy of diagnosing and fact-finding (the second move) to reconcile its current state (the third move) to "reach the goal" of finding its proper relation of a part

[586] Ibid., 29.

to a part and to the organized whole in an empty system.[587]

Another cybernetic research article also presented interest in spatiotemporal relations, just as is the field of human relations. Researchers found in "Food Protection in Rats," that "Robbing and dodging in rats involves one animal (the dodger) possessing a small piece of food, and another animal (the robber) attempting to acquire the food. The robber approaches the head of the dodger, and the dodger evades by swerving laterally away" in order to secure the piece of food. In this narrative, "dodgers gain and maintain a constant interanimal distance, with compensatory movements used to adjust [...] the dodge to the movements of the robber," a self-regulatory process of "constantly modifying the interanimal distance maintained" between two agents. The reason the dodger self-adjusts its behavior is because it seeks "to stabilize the interanimal distance" to regulate the spatial relations between part to part in a greater system. This self-adjustment reflects again the mark of social ethics, because "In other words, the organism"—in this case, the dodger—"compensate[s] for system disturbances"—in this case, the dysfunctional actions of the robber—by the dodger taking the responsibility to act on itself to uphold the commitment to stabilize the proper set of relations to stabilize and maintain a larger system.

The problem confronting these researchers, however, was this: how did the dodger know how to respond to the problem of robbing? According to their investigation, the dodger's first move again comes pre-established—the goal state is the secure possession of food. The second move of diagnosing and fact-finding about the current state comes from how the "defending rats gain and maintain a particular distance from the robber by varying their dodging behaviour." When executing "the dodge" away from the robber, researchers found that "the dodger" diagnoses the current state using "information about the behaviour of the robber [the second move] in order to make dodging decisions" (the third move) to reach the goal state (the first move) and hold on to the food,[588] which together allowed the researchers to narrate a solution to their problem. Moreover, "The experiment showed [...] that interanimal distance was being controlled by the dodger" to dampen the "system disturbances (the movement of the robber)," and thereby showed how robbers disturb what otherwise would be a harmoniously operating system.

Outside of living organisms like ants, rats, or humans, and moving onto machines, this empty three-step

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[587] Jumpei Matsumoto, et al., "A Computational Model of the Hippocampus That Represents Environmental Structure and Goal Location, and Guides Movement," *Biological Cybernetics* 105, no. 2 (August 2011): 146, 147.

[588] Heather Bell, and Sergio M. Pellis, "A Cybernetic Perspective on Food Protection in Rats: Simple Rules Can Generate Complex and Adaptable Behaviour," *Animal Behaviour* 82, no. 4 (October 2011): 1, 2.

algorithm arises also in the field of control theory. As a field that blends mathematics and engineering, "Control theory is a very powerful body of knowledge" that upholds "an impressive track record of successful application across aircraft, ships, satellite and missile guidance[, and a host of other applications,] and increasingly it lends its basic ideas to other disciplines." For our purposes, understand that "Control theory concerns itself with means by which to alter the future behavior of systems. For control theory to be successfully applied" as a response to a control problem, three familiar moves emerge. The first move establishes a goal state for a system, where "[T]here needs to be available: (i) a purposes or objective that is linked with the future state of the system." A second move diagnoses and fact-finds the conditions in the current state to help develop a plan for "(ii) a set of possible actions" to attain that goal state. The third requires "(iii) some means of choosing the correct actions (ii) that will result in the desired behavior (i) being produced" by reconciling gaps between the current state and the goal state.[589]

Control theory has wide applications. Since "everyone is interested in control in the sense of being able to achieve defined objectives within some time frame [...] Control theory applies to everyday situations, [and] the concepts of control theory are simple and application-independent." In short, the concepts of control theory operate in an empty system. "The universality of control theory means that it is best considered as applied to an abstract situation [...] possessed by all situations that need to be controlled. Such an abstract situation is called a system."[590]

Moreover, another example demonstrates the power of control theory (and how this three-step algorithmic model circulate seamlessly). Trained engineer-turned-psychologist William Glasser's *Control Theory*, a popular technique in the United States for responding to the problem of classroom management, demonstrates how this cybernetic model bridges human bodies and machines. *Control Theory* (and Glasser's *Reality Therapy*) is a method that explains how "a person goes through the process of comparing what she wants [a goal state] with what she is currently experiencing [a current state]." Indeed, when a subject is "comparing a Quality World picture (her wants or goals in any given situation…) with her current perception of reality," such a subject uses a "comparing place" to reconcile the difference between the two to reach a goal.[591] Also, "Since [engineering] control theory deals with

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[589] J.R. Leigh, *Control Theory*, 2nd edition (London: IEE, 2004): xx, 4-5.

[590] Leigh, *Control Theory*, 3, 4.

[591] Jonathan C. Erwin, *Inspiring the Best in Students* (Alexandria, Virginia: ASCD, 2010), 129-130. Also see William Glasser, *Control Theory: A New Explanation of How We Control Our Lives* (New York: Harper & Row, 1985); *Choice Theory: A New Psychology of Personal Freedom* (New York: Harper Collins, 2010). See also

structural properties, it requires system representations that have been stripped of all detail"—including humans stripped down to just bodies—"until the main property that remains is that of connectedness,"[592] and not a sense of humanity, suggesting again how the principles of governance, control and mastery inhere in such empty systems.[593]

To close out this chapter, we can see how today this same algorithmic model, this same strategy to reach a goal, is still distributed across different domains. Its three steps are preserved in the basic operations of the cybernetic apparatus that operates on both sides of an organic/inorganic line. Humans, animal cells, machines... this same algorithm applies to the different problems confronted by each, demonstrating a sense of sameness within an empty "game" across different frames of analysis absent historical, cultural, or geographic context.

The next chapter explores this scientific three-step algorithmic process outside of a scientific lens and seeks to align the algorithm to a different set of registers typically considered as beyond the realm of science proper. By conjoining scientific rhetoric with political and religious rhetoric in the next chapter, I hope to open new ways of apprehending the purpose or goal point of the purposeful strategy of *purpose* and to demonstrate how the fundamental operations of this three-step model not only embody cultural features embedded within its reasoning, but also how this algorithmic model teaches a mode of being in the world as a way for a self to act upon itself.

"Counseling from a feedback control theory point of view," in Richardson, Feedback Thought, 255-258.

[592] Leigh, *Control Theory*, 2.

[593] Dupuy, "Cybernetics Is Antihumanism."

CHAPTER NINE

CYBERNETIC ENCHANTMENT AND REDEMPTION

I like to think (and
the sooner the better!)
of a cybernetic meadow
where mammals and computers
live together in mutually
programming harmony
like pure water
touching clear sky.

Richard Brautigan
All Watched Over by Machines of Loving Grace[594]

This final chapter explores themes from earlier chapters to consider how science, politics, and religion helps cybernetic feedback systems elaborate a series of cultural theses to reform, redeem, and steer new human personality types to remake a society for the modern and dynamic Digital Age. These themes, when historicized, and when taken in aggregate, suggest the role of cybernetic technology in schooling plays a part in a greater modernization project. A series of cultural theses are explored below primarily in an American context. Yet considering the worldwide spread of cybernetics, they operate globally, cutting across political boundaries, and below relates the cybernetic apparatus to curriculum, the transnational "sciences of government,"[595] as well as cultural qualities of the American jeremiad, a broad set of Western cultural traits such as national exceptionalism, self-reflexivity, and self-control in humans (feedback), and even elements of salvation (as we have already seen). Another quality also expresses political features of Western democratic liberalism. I explore throughout how these cultural threads help form and integrate with cybernetic technology to elaborate various cultural arrangements that curriculum studies and curriculum history (among others) thread back into culture via a series of what Ian Hacking

[594] Alexis Madrigal, *Weekend Poem: All Watched Over by Machines of Loving Grace*, by Richard Brautigan, *The Atlantic*, September 17, 2011, https://www.theatlantic.com/technology/archive/2011/09/weekend-poem-all-watched-over-by-machines-of-loving-grace/245251/.

[595] Heilbron, Guilhot, and Jeanpierre, "Transnational History of the Social Sciences;" Popkewitz, *Cosmopolitanism*, Ch. 3.

calls "looping effects."[596]

This chapter, then, explores how cybernetic processes in curriculum operate as modern social theory. In the early 1990's, curriculum historian Herbert Kliebard, working through established scholarship, asserted how "The history of curriculum as a field of study [... is] concerned with persons and with society generally," reaffirming how such people and society are what "makes curriculum history necessarily social history in the sense that it [...] organiz[es] our understanding of curriculum issues by focusing on a range of interrelated elements."[597] Yet, this chapter, like the previous chapters, organizes an understanding of curriculum from a different vantagepoint: how people, society, and elements become interrelated in the first place. It explores how cybernetics and its interrelated processes operate in curriculum to modernize these persons and society, allowing scholars to reconceive the cybernetic "science of relations," not as "hegemonic relations," characterized by "relations of dominance and inequality,"[598] nor as "*cultural relations*," characterized by "a hermeneutic cosmology" that "emphasizes narration and dialogue," which overlooks how the cybernetic programming language or "code" (information theory) always already underwrites how "Discourse (narration and dialogue) operates [...] within such a [...] cultural frame."[599] Rather, below recasts the focus on relations as a form of social theory.

To preview, the first section explores how three concepts help systems to self-organize: productive power, redemption, and governmentality. It then turns to explore features of the modernization project by considering how structuring a structure, an ecology, maps the interior of people to fit within it. This section considers how cybernetic processes embody technoscientific, religious, and political domains intersect with curriculum processes. It concludes by bringing together these concepts and cultural theses to discuss cybernetics as a contemporary form of

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[596] Ian Hacking, "The Looping Effects of Human Kinds," in *Causal Cognition: A Multidisciplinary Debate*, ed. Dan Sperber, David Premack, and Ann James Premack (Oxford: Clarendon Press, 1995), 351–83; Joel Isaac, "Tangled Loops: Theory, History, and the Human Sciences in Modern America," *Modern Intellectual History* 6, no. 2 (2009): 397–424.

[597] Herbert M. Kliebard, "Constructing a History of the American Curriculum," in *Handbook of Research on Curriculum*, ed. Philip Jackson and American Educational Research Association (New York: Macmillan Pub. Co., 1992), 158.

[598] Michael W. Apple, *Ideology and Curriculum*, 3rd ed. (London: Routledge, 2004), 174.

[599] William Doll, *A Post-Modern Perspective on Curriculum* (New York: Teachers College Press, 1993), 180 (original emphasis).

governance, as a liberal democratic way of communicating control to steer human populations absent the heavy hand of the state.

Building a system

Understanding cybernetics as social theory first requires understanding how cybernetic systems are an inside-out, bottom-up phenomena, not outside-in top-down. In 1979, systems dynamics scholar and computer engineer Jay Forrester, working from the Sloan School of Management, wrote how "Engineering systems are designed from the inside outward, that is, from components into a functioning whole. Behavior of a system is a consequence of interaction of its parts, parts that themselves must be understood and interconnected."[600] Systems processes, just like the curriculum processes described throughout this dissertation organize this inside-out, bottom-up phenomena by composing components—human subjects—who then function in pre-constructed and pre-positioned roles distributed across a functional whole as a (social) system.

What I mean by this concept of a functional whole is what I call a "distribution system," which also can be understood through a metaphor that Foucault considers, "namely that of the ship." Describing modern schools or society either as a distribution system or as a ship describes "that activity of establishing a relation between the sailors who are to be taken care of and the ship, [the various parts of] which [are] to be taken care of, and the cargo which is to be brought safely to port, and all those eventualities like winds, rocks, storms and so on; this is what characterizes the government of a ship"[601] as well as what characterizes the government of a distribution system. Describing the interior operations of schooling or society either as a distribution system or as a ship (both functional wholes) describes how each component (like the human) has a pre-determined place and function designed for a purpose across a (social) structure, in which an overall stratified social organization holds a certain pattern of integrated personal, interpersonal, and coordinated relationships that function together as a whole. When systems processes are applied to humans, such relation-based processes narrate how—and where—people should be on that "ship," a form of social theory.

Curriculum' s contribution to assembling such a distribution system or ship occurs throughout this final

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[600] As quoted in Thomas Hughes, "Spread of the Systems Approach," in *Rescuing Prometheus* (New York: Pantheon, 2000), 141.

[601] Michel Foucault, "Governmentality," in *The Foucault Effect: Studies in Governmentality*, ed. Graham Burchell, Colin Gordon, and Peter Miller (Chicago: University of Chicago Press, 1991), 93-94.

chapter. To show how, I first outline three intersecting concepts that help assemble the inside-out, bottom-up phenomena. The concepts include composing parts, redemption and salvation, and governmentality. These concepts are introduced early on to show later on how curriculum "activates" their interaction to suggests how the behavior of a system or a ship can be steering through a sea of chaos and entropy.

Autopoietic System Processes

First, assembling a distribution system requires understanding how system processes compose their own parts. I have earlier drawn on Hacking's notion of *making up people*, and here I borrow a similar concept from feminist scholar Judith Butler. Butler's description of the formation of "subjects" teases out how a distribution system to composes its own parts. First, Butler notes how certain "systems of power produce the subjects they subsequently come to represent." In Butler's account, systems compose subjects by creating categories of people (Butler's central concerns rest on categories of sex or gender), categories which systems subsequently regulate and into which humans are then situated. Second, Butler notes how the "subjects regulated by such [system] structures are, by virtue of being subjected to them, formed, defined, and reproduced in accordance with the requirements of those structures." According to Butler, the composition of subjects and categories into which human bodies inhere must be consistent with the system's technology. Third, Butler notes a political problem in this entire production: that the "subject turns out to be discursively constituted by the very political system that is supposed to facilitate its emancipation."[602] Butler's account gets at one way systems are a bottom-up, inside-out approach (and the politics of such processes) because systems self-organize their own parts to regulate them.

Butler's account allows (at least) four implications relevant for curriculum studies. First, such an account disrupts the commonsense view in curriculum history that emphasizes certain subjects (Kliebard's persons, society, and elements), since those subjects are already composed by earlier system processes. Second, systems disrupt the subject/object duality common to some forms of pedagogical research. As action anthropologist Sol Tax explained (in the previous chapter), cybernetic processes already reach back to regard scholars—or any subjectivity—"not only [as a] subject[,] but also [as an] object"[603] of those processes, generating Hacking's "looping effect" in

[602] Judith Butler, *Gender Trouble* (New York: Routledge, 1999), 4-5.

[603] Tax, "Action Anthropology," 104.

academic research.

The third and fourth implications entangle. The third implicates how system processes always compose subjects so that they "fit," so that the subject and systems technology align and harmonize, which demands emancipating system subjects into pre-established future goal states. The subjects composed by systems technology, in order to demonstrate "fitness" in a future state, are consistently represented in the present state in a "negative" fashion, as different, so that they may be rendered into sameness by being given something in a "positive" fashion, thus reconciling the two states, all which can be understood in terms of filling a void, that is, in terms of what political scientist Barbara Cruikshank calls providing "solutions for the lack of something [...] a lack of power, of self-esteem, of coherent self-interest, or of political consciousness."[604] Human subjects and their agency are always narrated anterior to the earlier demands of the systems that govern them.

Fourth, the interaction of this negative and positive representation disrupts the commonsense notion of "systems of oppression."[605] Systems neither withhold nor subtract, which is an interpretation of systems through a negative view of power. Rather, systems, as Forrester's statement above noted, are produced "from the inside outward," which is a positive view of power. System create thought and action because they im-press: they pre-"script" subjects into already created livable positions in order to regulate them. Systems "steer" subjects, as I discuss shortly, restraining their conduct (as discussed later when discussing various technologies of the self), one way of dampening various levels of human activity "disruptive" to the demands of earlier systems processes.

Redemption and salvation

A second concept for assembling a distribution system is emancipation, briefly touched on above. Emancipation helps explain the "how" and "why" system technology appears to liberate people. French historian of the biological sciences, George Canguilhem, spoke to the interplay of the negative/positive representation just discussed. Canguilhem had by 1947 already analyzed how cybernetic systems adumbrate a cultural mode of being. "Why was it necessary to turn to [a] theory of mechanism," Canguilhem asked, "in order to explain the living organism?" He inquired into the "reason" how and why biological explanations began appropriating mechanical

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[604] Barbara Cruikshank, *The Will to Empower* (Ithaca, N.Y.: Cornell University Press, 1999), 3.

[605] Davey Shlasko, "Using the Five Faces of Oppression to Teach About Interlocking Systems of Oppression," *Equity & Excellence in Education* 48, no. 3 (July 3, 2015): 349–60.

processes "as if they were extensions of human behavior or life processes." In probing the cybernetic reorientation of biological theories of vitalism toward theories of mechanism, Canguilhem noted that in contrast to biology, "there is no way to distinguish between the normal and the pathological in physics and mechanics," concluding that "There are no monstrous machines. There is no mechanical pathology."[606]

The mechanomorphic metaphor of cybernetic systems is emancipatory, a mode of bootstrapping and raising up, demonstrating the significance behind the elements central to the cybernetic analogy (comparative reasoning). Humans in cybernetic reasoning are not being compared to a class of "simple" technology such as a handheld tool like a hammer, nor a mechanical device like a woodcutter's wedge, nor even more "complex" machinery of agricultural implements like a tractor and harrow. Rather, following Wiener, the cybernetic comparison situates humans alongside a class of high performance technology: "the modern ultra-rapid computing machine."[607] Redemption and salvation are at stake here, for in the end, the application of advanced modern technology to human activity seeks not to improve the machine nor the system. It seeks to improve the human.

Governmentality

A third concept for assembling parts on a ship—or at least for controlling them—is governmentality. The political "governing" features of systems technology returns us to how Butler's last two points entangle. First, Butler notes that system processes compose subjects with particular qualities: they are "reproduced with the requirements of those structures." A second denotes a political problem: systems processes compose human kinds to govern them. Human subjects are "constituted by the very political system that is supposed to facilitate its emancipation." These two points entangle in a political strategy because cybernetic systems were and are "governing systems" (see chapter six).[608] They render their parts "Governed."[609] Such systems operate through productive power and regulatory controls, not the negative power of oppression, allowing governing systems to compose their subjects to then steer

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[606] George Canguilhem, "Machine and Organism," in *Incorporations*, ed. Jonathan Crary and Sanford Kwinter, trans. Mark Cohen and Randall Cherry (New York, NY: Zone, 1992), 47, 63, 58.

[607] Wiener, *Cybernetics*, 36.

[608] Rashevsky, "review of *Cybernetics*", 199.

[609] von Neumann, "review of *Cybernetics*", 33–34.

them into preconstructed roles across a functional whole for a cybernetic steersman to manage a system's "ship" to steer it (the self) and its inhabitants (others) to a preordained goal state. The political strategy of systems constitutes human kinds who function according to the demands of governing technology.

These political strategies connect cybernetic technology to governmentality. Cybernetic systems technology links to a modern secularized "form of pastoral power, a government which defines itself as being 'of all and of each'."[610] All and each, a central principle followed throughout this chapter, is an alignment process that characterizes how parts on a ship are configured, primarily because such technological processes concentrate on configuring proper relations. The processes operate within and among the ship's inhabitants (human kinds), which is a way of aligning parts (each) and whole (all) to meet the demands of the technology. The governing of all and each composes within the technology a harmonious arrangement in the same way the Department of Education in the state of Pennsylvania developed and implemented a "Standards Aligned System (SAS) [as] a comprehensive, researched-based resource" ostensibly designed "to improve student achievement,"[611] ensuring that a principle of reversibility occurs throughout organized activity and an effect of these alignment processes is the distribution of human bodies in places with functions so that the technology remains in good working order. The technology thus individualizes (each) as it totalizes (all), ensuring inclusivity that no child is left behind as it simultaneously abjects.

Others in curriculum have observed such technology at work. Daniel Friedrich has already explored the role of historical consciousness as a pedagogical technology in the production of one human kind: the responsible citizen.[612] By describing the fabrication and social positioning of a responsible citizen, which aligns the "connection of individuality and collective belonging," Friedrich describes what I am calling the principle of alignment, one that links a kind of person to the social whole. According to Friedrich, "the constitution of [a] specific type of subjectivity uses her/his 'freedom' in reasonable ways to achieve the common good as it relates to the pursuit of

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[610] Colin Gordon, "Governmental Rationality," in *The Foucault Effect*, ed. Graham Burchell, Colin Gordon, and Peter Miller, (University Of Chicago Press, 1991), 12; Michel Foucault, "Omnes et Singulatim: Towards a Criticism of 'Political Reason,'" in *Tanner Lectures on Human Values* (Stanford University, 1979), 225–54, http://tannerlectures.utah.edu/lectures/documents/foucault81.pdf. Michel Foucault, "The Subject and Power," *Critical Inquiry* 8, no. 4 (1982): 777–95.

[611] "Pennsylvania Department of Education Standards Aligned System - SAS," accessed June 13, 2018, https://www.pdesas.org/.

[612] Daniel Friedrich, "Historical Consciousness as a Pedagogical Device in the Production of the Responsible Citizen," *Discourse* 31, no. 5 (December 1, 2010): 649–63.

her/his [individual] best interest," which is a way of synchronizing all and each in the systems view I am teasing out here. The identity of the individual is oriented, embodies, and aligns with the identity of the collective whole, which is an application of systems "alignment" technology across multiple spatiotemporal locations, whether geographically as a nation, or temporally in the cultural development of a collective peoples (or elsewhere). In either, the technology already situates people on a ship. While Friedrich locates such technologies in a particular form of awareness—historical consciousness in the citizen—I later pin down the same system-aligning processes to modern cybernetic feedback control.

These three concepts help make visible how system processes use a bottom-up approach to compose its own components—human subjects—who are then positioned and oriented into preconstructed roles distributed across a (social) system. We can also see how a social history approach to curriculum would merely examine anterior effects (persons and society), which some forms of research then subsequently subject to an economic class analysis, but which neglects earlier systems technology that narrates those oriented and distributed subjects, overlooking how a science of human relations helps curriculum articulate in advance the distribution of "classes" of people in a social system. Yet, is there more to schooling than the system-building endeavor?

A Greater Modernization Project

The above concepts and "bottom-up" processes suggest curriculum's role in a greater project of modernization and reform for the Digital Age. The use of cybernetic control technology in and across curriculum models observed in previous chapters—to make up human kinds for improvement and emancipation through techniques of all and each—suggests a particular Western post-war project to "modernize" and steer a free-floating ship.

If so, any such modernization project is not new. As Popkewitz points out, over "the late 19th and early 20th centuries [...] Modernization involved the democratization of the individual" and "the democratization of the individual was made into a public problem of administration." According to Popkewitz, "This project of constructing a self-governing, morally directed individual was largely conceptualized and given moral justification by the emerging social sciences and psychology."[613] In education, such modernizing projects have included the

[613] Thomas S. Popkewitz, "A Changing Terrain of Knowledge and Power: A Social Epistemology of Educational Research," *Educational Researcher* 26, no. 9 (1997): 19.

"Making of Citizens in the Long Nineteenth Century,"[614] and over the 20th century have included how "the human sciences and politics together turned the behavior and inner workings of individuals—in short, the self—into sites for ambitious scientific, medical, and political projects," undertaking "The Self as Project"[615] to remake society by remaking individual modes of living. The greater ambition to modernize humans has its own historical trajectory, in both Western and colonial contexts, and the cybernetic systems approach here appears as an extension of such projects.

While digital technology and applying theories of mechanism to vitalism might appear as "new" phenomena, the new modernization project discussed below harbors familiar "old" cultural features. For example, one cultural feature discussed below is how modernizing the individual and society occurs in a very Western democratic way. First, these politically emancipatory (and not repressive) elements of who, where, and how people should be distributed across systems are achieved by orienting or "steering" parts (human subjects) to the whole. The communication and control "steering" processes here are centripetal processes, just as Friedrich's research on citizenship denotes. Earlier chapters observed how systems stabilize themselves through "internal homeostasis" achieved through reflective and reflexive processes that reorient individual thought and action back to "The Vital Center," what postwar American historian Arthur Schlesinger, Jr. considered a liberal democratic system operating within an already constituted social whole. Each and all stabilizes society democratically.

Moreover, the modernization project embodies forms of democratic social theory and democratic governing principles by focusing on relations that designs freedom in those in-between spaces in democratic systems. For example, Lewin's action research (AR) shuns "the greatest kind of misunderstanding which identifies democracy with planlessness," preferring instead cultural practices that plans how "to steer [social] action" through "feedback systems, that is, systems which show some kind of self-regulation" for "social steering or self evaluation,"[616] and which, for Tyler planned "the development of an increasing degree of self-evaluation is in itself a

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[614] Daniel Tröhler, Thomas S. Popkewitz, and David F. Labaree, eds., *Schooling and the Making of Citizens in the Long Nineteenth Century: Comparative Visions* (New York: Routledge, 2011).

[615] Greg Eghigian, Andreas Killen, and Christine Leuenberger, "Introduction: The Self as Project: Politics and the Human Sciences in the Twentieth Century," *Osiris* 22, no. 1 (January 1, 2007): 1–25.

[616] Kurt Lewin, "Frontiers II," 153, 147.

major goal of democratic education."[617] "Today, more than ever before," Lewin wrote in 1947, the practices of social diagnosis, social planning, and self-evaluation within Western "democracy depends upon the development of efficient forms of democratic social management and upon the spreading of the skill in such management to the common man."[618]

Democratizing the individual, Lewin's "common man" (note the gender) speaks to a second cultural feature of the modernization project. Reforming the individual links to cultural theses like American exceptionalism, since focusing on relations administers freedom through Judeo-Christian practices that retain "themes of redemption and salvation."[619] Cybernetic feedback practices in today's classroom brings the practices of self-reflection necessary for enhanced self-understanding.[620] Teaching "Self-Regulation in the Classroom," framed as "Scientific Inquiry for Social Change," teaches students self-evaluation for judging one's self as (in)capable of democratic self-control.[621] The human subject must be composed within the modernization project according to the demands of the technology, which, in this case, is a political technology with religious themes within a Western liberal democracy.

The cultural features of the modernization project assist in the configuration of a distribution system. Modernizing curriculum, as the Rationale does, designs the interiors of "fabricated" persons to align those human subjects with greater forms of democratic technology outfitted on a ship. This alignment project helps compose the social whole (all) within the individual citizen (each), allowing an individual human system "to 'be seen' and 'to see' themselves as individuals who could act on their world," but also as a group, as a "citizen of a nation,"[622] aligning individuality and belonging in a fashion that allows humans to be positioned as subjects who are also objects of intervention. Reforming the individual subject improves a system by using a series of steps, an algorithm

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[617] Tyler, "Evaluation as a Function of Supervision," *The Elementary School Journal* 44, no. 5 (January 1, 1944): 266.

[618] Lewin, "Frontiers II," 153.

[619] Popkewitz, *Cosmopolitanism*, 32.

[620] Daniel Tröhler, "The 'Kingdom of God on Earth' and Early Chicago Pragmatism," *Educational Theory* 56, no. 1 (February 3, 2006): 89–105.

[621] C. Cybele Raver, "Low-Income Children's Self-Regulation in the Classroom: Scientific Inquiry for Social Change," *The American Psychologist* 67, no. 8 (November 2012): 681–89.

[622] Popkewitz, "Changing Terrain," 19.

in terms of the digital age, organized around a set point or *purpose* that reflects a cultural thesis of improving humanity in the same way Canguilhem described and which the Rationale prescribes. The "new" science of cybernetics, this science of relations, parallels an "old" set of Judeo-Christian social ethics of unity by fusing self-identity to national identity—all and each in the way Friedrich explores citizenship in curriculum—fusing both self- and national identities to a sense of improvement and progress, both tied to the cultural theses of the American jeremiad and American exceptionalism: America's mission.[623]

Three Levels of Alignment

Let me outline the remaining parts of the chapter. Lewin's call to spread "democratic social management [and] the skill in such management to the common man" indicates a greater modernizing endeavor. Below explores the spread of this "new" and modern cybernetic project across three levels: within the individual, the group, and the social whole. What is held in common across these sites, and what is explored below is the democratizing of social management techniques. Feedback and other cybernetic technology are coupled and aligned across these sites.

First, the spread of such techniques occurs at the level of the individual. The interior of a human subject is designed according to the demands of the technology. "It is the task of education," B.O. Smith argued in 1947, for example, "to help create the new personality type capable of participating in a society which is thus deliberately managed."[624] The individual, in light of modern democratic technocultural features, is designed through technologies of the self like self-control (feedback) to align humans with the technology situated on the ship, bringing synchronicity to those "lacking" individual human sub-systems through a principle of all and each, an individual designed as part of the new personality type outfitted for the modern era (discussed in Chapter 7).

Second, at the level of the group, which also operates under cybernetic feedback. The small group is remade under "the promise of social renewal"[625] that links to cultural theses like the American exceptionalism, the

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[623] Sacvan Bercovitch, "The Rites of Assent: Rhetoric, Ritual, and the Ideology of American Consensus," in *The American Self*, edited by Sam B. Girgus (Albuquerque: Univ. of New Mexico Pr, 1982): 11. "To begin with, the concept of representative selfhood took on a broad Anglo-American meaning [...] But the concept itself [...] was intended as a strategy of control. It was designed to keep self-assertion within cultural bounds […It] appealed to conscience and self-interest, only to make these synonymous with Protestant patriotism, and the Protestant cause inseparable from the rising glory of America."

[624] B.O. Smith, "Social Perspective," 16.

[625] Popkewitz, *Cosmopolitan*, 168.

Good Society, and self-improvement. Moreover, feedback technology synchronizes the individual, the group, and curriculum design models like the Rationale (Step Four) or feedback mechanisms in Lewin's AR. Finally, I conclude this chapter with greater governing technologies, demonstrating how the alignment extends into a modern international system, where, at that international level, cybernetic systems give the appearance of governing without seeming to govern. Indeed, at that global level, the use of cybernetic governance "is not restricted to national governance; it encompasses also the international system."[626] To access how those global systems are bottom-up inside-out requires starting at the level of the individual.

"All Watched Over by Machines of Loving Grace"

"New" cybernetic technology operates as a form of political technology, yet, as noted above, it overlaps with strains of Judeo-Christian social ethics. Such ethico-redemptive technological practices show at least three characteristics: first, that of all and each; second, emancipation; and third, technologies of the self. These three characteristics, which engage with an "ecological" approach explored below occur within modern curriculum practices.

A first characteristic of how technology and ethics mix is how modernizing processes orient the individual part (each) to the collective whole (all). The cybernetic "system of concepts for studying the organism and its relations with other organisms and with the inorganic environment"[627] is a way of mobilizing a particular set of elements and relationships into a whole. Each interaction, whether from part to part, part to whole, or whole to part, must not only carry the demands of systems technology that Butler referenced, but also a particular set of (ethical) commitments (like cooperation) needed for the cybernetic venture to succeed. Cybernetic operations are not described as scattered autonomous parts moving in distinctly haphazard directions, nor even as independently separate and free-floating processes. Rather, cybernetic descriptions, like those of an ant colony, narrates how divergent parts operate through participation, integration, and interdependence, to be organized, configured, and positioned under a "proper" set of interlocking (ethical) relations between parts (each) to reach a purposive end (all).

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[626] R. A. W. Rhodes, "The New Governance: Governing without Government," *Political Studies* 44, no. 4 (1996): 657.

[627] Barrett and Shepard, "Bibliography," 204.

Cybernetic processes steer parts to a collective whole, which steers subjects into a "citizenship" model, just like Fredrich's research discussed.

A second characteristic is how cybernetic modernization processes emancipate subjects in the sense that Canguilhem discussed. Such processes rely on Judeo-Christian social ethics that seek to improve human conduct. Historians of science have already detailed how Progressive Era scientific theories drew on religious discourse linked to the Social Gospel movement[628] and cybernetic configuration articulates that similar sense of Protestant social ethics those historians detailed. As Bercovitch noted in his discussion of the American jeremiad, "the American Puritans enlisted [both] the covenant of grace" and "[t]he promises they [the Puritans] inherited" to realize an "exemplary community in more or less direct contact with God concerning the people's welfare."[629] The path to "personal salvation, like the worldwide work of redemption, was a matter of growth [and] a process of 'living to God.'"[630] Under this emancipatory, redemptive view, the aggregate of individual moral conduct and good works filled a void to produce—and were produced by—a Good Society, "a mutual obligation" of communal and community relations that purged social ills and improved social conditions by ameliorating human suffering and obviating human sin, mirroring the general thrust of the Social Gospel movement.

Such ethico-redemptive processes are visible in cybernetics. For example, the cybernetic algorithm (discussed in the previous chapter) embodies a particular cultural vision of and for a unified nation observed in the American jeremiad. According to Bercovitch, the American jeremiad undertakes three steps. The first step draws on "a precedent from Scripture that sets out the communal norms," a step which establishes an ideal standard, a sense of optimism of a future goal state, just like the cybernetic algorithm's purpose or goal state. The American jeremiad's second step establishes "a series of condemnations" that has already evaluated how "the actual state of the community" has deviated from that ideal communal norm, just like the middle steps of the cybernetic algorithm.

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[628] Cross and Albury, "Organic Analogy," 165–92; Mitman, *State of Nature*. Robert M. Crunden, *Ministers of Reform*, Reprint edition (Urbana, Ill.: University of Illinois Press, 1985); J. Ronald Engel, *Sacred Sands*, (Middletown, Conn.: Scranton, Pa: Wesleyan, 1986); Clyde Griffin, "The Progressive Ethos," in *Development of an American Culture*, ed. Stanley Coben and Lorman Ratner (Englewood Cliffs, N.J: Prentice Hall, 1970), 120–49. Also see Richard Dawkins, *The Selfish Gene* (New York: Oxford University Press, 1976).

[629] Bercovitch, *Jeremiad*, 36.

[630] Ibid., 47, 48.

The third step, just like feedback in the cybernetic algorithm, reconciles the difference between the first two states, exhorting a return to the ideal future goal state under "a prophetic vision that unveils the promises, announces the good things to come, and [thus] explains away the gap between fact and ideal." This final step reconciles the difference between the actual state and goal state located within a cultural space in which "the ecclesiastical and the civic order were not really distinct" but aligned.[631]

Moreover, according to Bercovitch, the American jeremiad's recurring call for communal change and social reform echoes a longstanding cultural tradition. This tradition steers cultural appeals for community change based on a particular social positionality—belonging and individuality, all and each in a greater distribution system. As both Bercovitch and Early American intellectual historian Perry Miller argued, the American jeremiad projects a cultural image of an individualized subject standing alone in a wilderness positioned outside the gates of a community—the exceptional American—a subject who is anchored conceptually both in individualism (each) and in a sense of community (all), issuing judgements about the current state of affairs as an individual with one foot outside of the gates of a community while holding another foot inside those gates as a citizen, expressing the fulfillment of a unified national purpose: God's errand, America's mission.[632]

Weiner deployed similar ethico-redemptive Social Gospel directives. He articulated a generalized Protestant ethical framework oriented to social welfare by orienting the part to the whole to fill a void by nurturing the internal development of either "animals or human beings with what may be considered well-developed minds and souls."[633] Moreover, the cybernetic steersman's already-articulated viewpoint of apprehending all possible arrangements of system states helps to structure an appropriate future "ecology" in a future state to develop prosperity and grace lacking in any individual part, such as in Weiner's call for relieving human misery on the industrial production line (discussed in an earlier chapter), also consistent with the socio-economic reforms pursued during the Progressive Era. Finally, for Ross Ashby, cybernetics also emancipated by filling a void because it

> offers the hope of providing effective methods for the study, and control, of systems that are intrinsically extremely complex [...] In this way it offers the hope of providing the essential methods by which to attack the ills—psychological, social, economic—which at present are defeating us by their intrinsic

[631] Bercovitch, *Jeremiad*, 8, 16, 94.

[632] Bercovitch, *Jeremiad*, 180; Perry Miller, *Errand into the Wilderness* (Cambridge, MA: Belknap Press, 1956).

[633] Wiener, *Human Use*, 101.

complexity.[634]

A religious theme occurs across this singular technology: saving the morally impoverished individual (part) by properly configuring a social ecology (the whole), composing, as poet Richard Brautigan wrote, "a cybernetic ecology/where we are free of our labors/and joined back to nature,/returned to our mammal/brothers and sisters,/and all watched over/by machines of loving grace."[635] How this ecological discourse entangles with curriculum warrants greater attention.

Ecology and steering

The discourse of ecology in curriculum helps to make visible how redemption, alignment, and productive power come together to compose the internal operations at the level of the individual to align with the internal operations at the level of a ship. Consider how through two entangled elements: first, an external focus on a system or a ship, and second, how that external focus steers. To begin, the bulk of Lewin's two 1947 articles on AR deliberated how to steer a social system through "Social feedback processes and social management."[636] Here, steering relies on an "ecological" approach that explains how internal human qualities derive from external conditions. For example, Lewin's concept of "psychological ecology" sought "A proper understanding of th[e] relationship [...] between psychological and nonpsychological factors" to explain human change. Both internal and external factors are needed for an ecological model because "Any type of group life occurs in a setting of certain limitations to what is and what is not possible, what might or might not happen. The nonpsychological factors of climate, of communication, of the law of the country or the organization are a frequent part of these 'outside limitations'."[637] Lewin's AR model appropriated the ecological approach for understanding how change occurs in a "social field," which Lewin understands as a "total situation," the "the totality of [inside and outside] factors which determine group life."[638]

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[634] Ashby, *Cybernetics*, 5-6.

[635] Madrigal, *Weekend Poem*.

[636] Kurt Lewin, "Frontiers," 6.

[637] Kurt Lewin, "Psychological Ecology [1943]," in *The People, Place, and Space Reader*, ed. Jen Jack Gieseking et al. (New York: Routledge, 2014), 17.

[638] Lewin, "Frontiers," 9.

Under this ecological approach, however, and according to Lewin's AR model, what matters in changing humans is an external focus. "What counts," according to AR, "is the effect which the ["total"] situation" has on a group. According to the ecological enterprise, nothing internal to the external whole can "be changed as long as forces are not changed which determine the decisions of" the whole's mutually dependent functioning internal parts. "Thus," according to AR, "if we think of trying to [change group behavior] within a factory, a school system, or any other *organized institution*" like that of a ship, then one thinks about how adjusting the external conditions changes the group's internal composition. Consequently, when AR deliberates possible strategies to steer groups to social goals, its focus rests strategically on "assur[ing] that the [proposed] action has the desired effect of improving the course of the organisation [*sic*]," a concern that forecasts the results of steering by "action by its effect on the outside rather than the effect within the organization."[639] Under this view, steering external conditions to configure a proper human ecology plies the internal arrangements of its housed subjects.

Ecological concerns similarly motivate the Rationale's emphasis on the effects of steering for social outcomes. With "so many possible organizing principles" for any curriculum program, Step Three of the Rationale organizes elements and principles to structure curriculum into "some kind of coherent program" for schooling, an external emphasis necessary for creating different total "situations which will evoke or provide *within* the students the kinds of learning experiences desired" by organizing curriculum in a manner to evoke "the greatest cumulative effect from the various learning experiences used."[640] Indeed, what is at stake in Tyler's view is the social view: "The sheer existence of our society[, which] depends upon an educated citizenship [and] The only possibility [...] for an educated citizenship [...] is an efficient curriculum that produces the maximum cumulative effect"[641] within students. The Rationale's modernized algorithmic programming articulates how to plan who and where people are on a ship by configuring the ship's ecology, forecasting the results of the steering action by structuring external programming for the internal programming of people.

This first element of an external perspective and an "ecological" concern with future goal states suggests

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[639] Kurt Lewin, "Frontiers II," 146 (original emphasis), 148, 150.

[640] Tyler, *Basic Principles*, 97, 83, 65 (original emphasis), 103.

[641] Tyler, "Learning Experiences," 67.

more directly a second element: the democratic steering of a ship. Lewin's ecological focus entangled with his "basic research about social steering systems," generating the external approach: "What is missing [most] is a link which steers the action by its effect on the outside rather than by the effect within [any] organization."[642] Wiener tied steering to the cybernetics apparatus: "The word cybernetics is taken from the Greek *kybernetes*, meaning steersman [or helmsman...] designat[ing] a certain type of control mechanism [...] well represented by the steering engine of a ship,"[643] a concept of control that Lewin linked directly to "the [social] system which assures that the rudder of a ship follows every turn of the steering wheel at the captain's bridge."[644]

The Rationale narrates this same external perspective and an "ecological" focus to steer educational programming. For example, the Rationale's programming creates a stable ecology, and again, citing Brautigan, by "programming harmony/like pure water/touching clear sky" in a "a cybernetic meadow." [645] The Rationale programs an external ecology, "the degree of consistency of the environment," to ensure that any individual "student" within it "is not torn by contradictory patterns of human behavior," thereby filling a void by bringing internal consistency into the human "mind," since external educational objectives must be "mutually consistent [to] permit some degree of integration and coherent unification in the mind and action of the student."[646] Moreover, since individual belonging is narrated as part of a collective whole, an ecology of social disharmony generates an internal ecology of personal disharmony: "Children thrown into [the world's] bewildering confusion fail to develop into secure, competent, happy adults."[647] The Rationale steers curriculum to organize in school's an external stable structure—programming a harmonious social ecology—to fill a void in the individual, grounding a sense of normality and morality within a presumed greater psychological order to achieve for, and in, all and each a competent happy adulthood, thereby programming curriculum programming with a therapeutic approach to systematically reduce future incidences of social pathology that rescues the morally impoverished individual (part) through properly

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[642] Lewin, "Frontiers II," 150.

[643] Norbert Wiener, "Cybernetics," *Scientific American*, 14.

[644] Lewin, "Frontiers II," 148.

[645] Madrigal, *Weekend Poem*.

[646] Tyler, *Basic Principles*, 77, 33, 41.

[647] R. Tyler, "Love Is Not Enough. The University of Chicago Round Table Series #695. NBC Radio Discussion by Bruno Bettelheim, Ralph W. Tyler, and Ethel Verry.," July 22, 1951, 11.

configuring a social ecology (the whole).

Technologies of the Self

Returning to how cybernetic processes overlap with Judeo-Christian social ethics. A third characteristic is how systems technology fabricates subjectivities through technologies of the self. This third characteristic speaks directly to an element observed earlier in Butler's account: how subjectivities and human kinds are constituted—and modernized—to meet the demands of the technology, which here occurs in two ways. The first comes through the emphasis on homeostasis, which resonates with the principle of all and each. The second comes by bringing feedback technology into the personality structure as "self-control," a technology of the self, so that the technology of negative feedback control aligns throughout the distribution system.

First, the ethical expressions which stabilize any overarching "whole" social ecology are organized around the major emphasis of classical cybernetics: *homeostasis*. "The process by which we living beings resist the general stream of corruption and decay is known as homeostasis," Wiener explained,[648] and since homeostatic functioning stabilizes the integrity of a functioning whole, "whether for the individual or the race, [homeostasis] is something of which the very basis must sooner or later be reconsidered."[649] Articulating homeostasis suggested parts were condemned to a cooperative (again: ethics) orientation that subordinated their conduct to the greater whole, since, for example, selfish conduct on the part of the part discounts the greater emphasis on homeostasis. As Bercovitch noted about the American jeremiad, when social critics "contrasted selfishness and benevolence, or attacked self-seekers who undermined 'the common centre of gravity,' they reaffirmed the norms upon which their culture was continuing to thrive," affirming both a "cultural ideal and its disastrous alternative."[650] Wiener affirmed both when he observed how "it [...] seems improper to us to devote [the powers of the age of the machine] to vain or selfish purposes. There is a sin, which consists of using the magic of modern automatization to further personal profit or let loose the apocalyptic terrors of nuclear warfare."[651] Added to Wiener's evocative sense of crisis and anxiety was the

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[648] Wiener, *Human Use*, 95.

[649] Norbert Wiener, *God and Golem, Inc* (MIT Press, 1964), 82-83.

[650] Bercovitch, *Jeremiad*, 137.

[651] Wiener, *God and Golem*, 52.

expressed prohibition on "vain or selfish purposes" because both threaten the purpose and homeostasis of the greater system. Selfish interactions on the part of the part contravene the self-transcendence necessary to reach the overall "good" of social welfare. The Rationale is no outlier in this regard: it straightforwardly emphasizes "social rather than selfish attitudes" to preclude any "antisocial conditions in the school" that foster "The acceptance of certain cliques" or of other misaligned small groups in favor of a monolithic "logic of the social view."[652] In this, technology and social ethics blur.

Second, the subject is modernized according to the demands the technology by fusing personality structures and feedback technology. In the past, as one American historian explained, "layman [...] consulted ministers to understand the nature of man," yet by the postwar era, "they now turned to professional students of human nature"[653] from which cybernetic operations appeared to articulate new insights. Appropriating the cybernetic conception of negative feedback into an individual's "personality structure" (human nature) helped the self exercise power over the self, assisting system homeostasis. Feedback provided and provides a mechanism for individual parts to perform an ethical set of relationships to help sustain system stability.[654] Since parts are "coupled" (a form of articulating relations) to "form one machine"[655] (wherein, Winer asserted, "[t]he coupling of human beings into a larger communication system is the basis of social phenomena"[656]), different avenues exist for negative feedback to restrain wayward human conduct. Such avenues include the relationships between part to whole, part to part, or a part's relationship to itself.

For example, a part's relationship to itself, such as a sense of self-restraint or self-control, is one technology

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[652] Tyler, *Basic Principles*, 77, 77, 78 (also see also pps. 48, 54, 118, 121 for advocating social over selfish views).

[653] Graebner, *Engineering of Consent*, 28. Also, "The word *Seele* has been translated, with much misgiving, by 'mind.' We had thought to translate it by 'soul,' in the belief that the time was ripe for a reintroduction of the latter word into the technical English terminology of psychology. It seemed impossible that there should be any confusion of the psychological 'soul' deduced as it is from concrete behavior, with the 'soul' of theology, the properties of which cannot be derived from or tested by concrete behavior. But a sampling of opinion among American psychologists was against the use of this more accurate translation." See "Translators' Preface" in Lewin, *A Dynamic Theory of Personality* (New York: McGraw-Hill, 1947), vii.

[654] Wiener, *Human Use*, 96.

[655] Ashby, *Cybernetics*, 49.

[656] Wiener, "Time, Communication," 217.

of the self. The technology of self-control—negative feedback—fills a void by allowing individuals to express a sense of personal responsibility and leading a moral life,[657] without which the human subject continues to lack a sense of independence to reach the Judeo-Christian standard of self-reliance.[658] This way of bringing "right living" orients the part's relationship to itself to align with standards of individual conduct, but which simultaneously orients a part's relationship to relieve demands on the whole. Restraining any conflict-laden personality characteristic of excessive "ideology [or] cultural values" in a human subject is what ameliorates social strife, further linking self-control to the prescribed (ecologically harmonious) social relations of part to part that are prescribed for sound democratic theory. Lewin's widely-cited research, for example, explored how democratic structures can reduce tense human relations (part to part) "since the general degree of control or self-control which counteracts intermember aggression is stronger in democracy than in laissez-faire [situations]."[659]

Moreover, narrating self-control within the individual designs the individual through modern mechanical processes. Restraining the self moves the "special interests" of the self(ish individual) away from wickedness and aggression by submitting one's self to the higher authority of the community of the democratic elect (part to whole), which Tyler articulated as the communication and "control by the social forces of the complete community [... of] the total group."[660] Performing self-control is considered neither as fascistic, nor communist, nor repressive, but rather as democratic,[661] and so requires not rigidity, but rather the open and flexible mind that Jamie Cohen-Cole details in the human sciences during the Cold War era.[662] Wiener's broad emphasis on "the homeo-static function of science" denounced "the rigidity of the social application of science both in Russia" and in the United States under a steadfast "thesis [that was] neither pro- nor anticommunist but antirigidity," a "moral I [Wiener] have wished to

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[657] "[D]iscipline [too often] rests upon the fact that the adult leads the child. A constraint situation is established" that eventually damages the child, since "If, in such a situation, the sphere of power of the adult [...] should for any reason collapse, the structure of the level of reality on which the life of the child rests psychologically must also collapse." Lewin, *Dynamic Theory*, 176.

[658] Bercovitch, *Jeremiad*, xx.

[659] Lewin, "Frontiers I," 22.

[660] Tyler, "Major Issues," 86-87.

[661] Lewin, "Frontiers," 22.

[662] Cohen-Cole, *The Open Mind*.

stress,"[663] a thesis anchored in the democratic freedoms, liberties, and written into "new" cybernetic technology that a modern "America" provided.[664]

Designing technology within the individual personality structure aligns the individual to the structure of the small group. The small group then aligns to the structure of the whole, again reflecting a form of positionality for social harmony across a modernized ship. Because "feedback goes through us"[665] ("but also *between* the subject and the environment," blurring organic and inorganic material, again enabling the formation of the posthuman[666]), a part's relationship to other parts of a system (mechanical or biological) entangles further and the small group then becomes a subject that is also an object of reflection and improvement.

For example, in education, small group research had by 1948 already demonstrated that members (parts) within different democratic groups (a whole) occupied different roles. One such part, "the group productivity observer," served "as a feedback mechanism" for a larger whole (the group). Moreover, group feedback, the "self-evaluation of [group] process by the group[, has] been worthwhile in improving the functioning of groups."[667] Also, "social steering"—known better as "self-evaluation"[668]—harnessed modernized group processes to improve the ethics lacking in reckless members of the group. "Self-evaluation by the group trains the members" of the group, who then begin "to mature" developmentally as "productive group member[s]" through individual interactions with the group so that the overall ecology empowers the group to exercise control over itself not only as a subject, but also as an object, through the "ability to improve itself."[669] Such levels across systems are then also aligned to the feedback mechanisms of Step Four in Rationale's system, or feedback mechanisms in AR's system. The aggregate of improved small group relations (another part) inches all and each closer to the Good Society (another whole).

These three characteristics and systems-level configurations show how the modernization of subjects

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[663] Wiener, *God and Golem*, 83-84.

[664] John Higham, "Hanging Together: Divergent Unities in American History," *The Journal of American History* 61, no. 1 (1974): 25-26.

[665] Wiener, *God and Golem*, 62.

[666] Hayles, *Posthuman*, 2 (original emphasis).

[667] David H. Jenkins, "Feedback and Group Self-Evaluation," *Journal of Social Issues* 4, no. 2 (April 1, 1948): 60.

[668] Lewin, "Frontiers II," 147.

[669] Jenkins, "Self-Evaluation," 60.

indeed meets the demands of modern cybernetic technology, blurs political, theological, and social ethics, and forms a distribution system for steering. A regulatory strategy is narrated here, that of administering relationships between parts, including the relationship of the self to the self, coupled either by community bonds or by communications in cybernetic operations. That strategy, a technology, is taken up further in the next section in conjunction with greater political-economic elements that move up from down in human capillaries to a national and international level system.

Liberal Tension Systems

This final section further explores the form of systems technology and its modern processes links its form directly to the transnational "sciences of government" referenced earlier. One characteristic of cybernetic operations, characteristic also of the movement across steps within the American jeremiad, is the way in which systems self-stabilize by maintaining a constant state of tension. Oscillation or movement between two poles is what generates a tension system. Cybernetics is one example. It is organized around the two poles of order and freedom, such as those seen in Ashby's explanation of the regulation of variety (the ordering of freedom in Ashby's Law).[670] In the American jeremiad, its double gesture across two poles arrive as fear and hope.[671] The cybernetic tension between order and freedom corresponds to the American jeremiad's tension between fear and hope. In both systems, the tension generated between the two poles is central to the stabilization process and supports a sense of balance since both seek to include and exclude to smooth over internal perturbations central to the stability of a "ship" at whatever political level. In conjunction, both affirm the American Technological Sublime's focus (discussed in an earlier chapter) on technology, democratic freedom, and national exceptionalism.[672]

This bivalent characteristic of tension systems connects to another political aspect of the cybernetic

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[670] Ashby, *Cybernetics*, Ch. 7; Hayles, *Posthuman*, 100-101, 240-241; Eden Medina, "Designing Freedom, Regulating a Nation: Socialist Cybernetics in Allende's Chile," *Journal of Latin American Studies* 38, no. 3 (August 2006), esp. 585.

[671] Murphy, *Prodigal Nation*, 12-13, esp. "The Jeremiad's Rhetorical Power: Hope and Despair in Tension." Bercovitch labels the two poles as threat and hope. See Bercovitch, *Jeremiad*, Ch. 1.

[672] Nye, *American Technological Sublime*. See also Bernard Dionysius Geoghegan, "The Cybernetic Apparatus," Ch. 1. Much of this section relies on and extends Geoghagen's discussion of liberal technologies into one of liberal technologies of governance.

ensemble referenced earlier: a characteristic of Western democratic liberalism. Technology is implicated because it often echoes a political outlook within which it operates. One example is the mechanical clock, as historian of technology Otto Mayr has demonstrated. The clock metaphor, as Mayr writes, is part of a view of an "Authoritarian Conception of Order" typical to pre-Enlightenment Europe, as well as the conceptual approach that view of "authoritarian order" held toward technology. That view connected to "the attributes of God; the harmony of the universe; to joys of Paradise; temperance, the highest of the seven virtues; the truth of science; and the effectiveness of absolute monarchy."[673] In this authoritarian conception of order, the sense of regularity that technology like a mechanical clock brings, independent of any material or earthly difficulties, reflects both the steady march of time and the orderliness and divinity in the world, eternal attributes part and parcel of a mechanical metaphor prevalent in pre-Enlightenment Europe. The technology behind the mechanical clock, Mayr argues, mirrored that era's political outlook, in this case, of an authoritarian view of "nature" embodied by the rule of royalty, monarchy, and religious hierarchy. Under this view, the tidiness of clock technology in the mechanical domain paralleled the regularity of order in the social domain, both of which appeared to be maintained by a sense of centralized control under a single authority that stabilized either the mechanical universe or the social order.

That all changed. In Mayr's analysis, an "anti-authoritarian conception of order" and its aligned technologies displaced the pre-Enlightenment authoritarian conception of order and its aligned technologies.[674] Post-Enlightenment Western liberalism and its technology preserves an anti-authoritarian political outlook of autonomy and independence by holding in constant tension the twin poles of freedom and order, reflecting a sense of balance, providing one measure of its success in overcoming the authoritarian model. The balancing act between two poles contained in "the liberal conception of order" precluded and precludes the centralized control of authoritarianism because the built-in tension within the liberal order allows those elements contained within "liberal" technology to compete for autonomy and independence, authorizing those elements to automatically control "themselves without the need of outside help, that is, without the intervention of a higher authority."[675]

Cultural examples abound of this tension in the technologies aligned with such liberal strategies. For

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[673] Mayr, *Authority, Liberty*, 115.

[674] Ibid., 121.

[675] Ibid., 139.

instance, the U.S. Constitution's checks and balances occur through its separation of powers; a producer's supply regulates consumer demand in the marketplace (and vice-versa); stop-and-go traffic lights frustrate both rich and poor; cost-benefit analysis, the balance of trade, or the balance of Justice. For example, in Tyler's view, a tension system, "particularly in large systems [...] aim[s...] to provide flexibility in terms of local conditions, [which is] a high degree of decentralization at many points, at the same time preserving the values that come from a greater range of resources available in larger [centralized] units." The stabilizing/tension described here provides degrees of flexibility and decentralization (freedom) while preserving greater values (order). Such liberal technologies deploy opposing forces to stabilize themselves as systems. The effect is that these technologies can govern without seeming to govern.

Under this reckoning, the typical understanding of that notoriously vague word *technology* must expand beyond its typical use. Hardware, machinery—such terms are too simple a definition for the concept of technology. At a minimum, technology is "know-how," a methodology to control the world,[676] and that methodology extends to human technology to include structures and structuring phenomena, as well as to the different themes based in ideas about organization and, most significantly, systems.[677] The materiality that humans gather together to produce technology is equally important to the knowing techniques (*techno-logy*) and practices with which humans gather together those items, including harnessing the labor and efforts of other human bodies—"The Human Use of Human Beings," if you will. Modernizing the human body to be part technology, to be part technique, situates the human as a cyborg, a "cybernetic organism," part "technology," part "human," in the same way the Rationale uses a "thinking machine."

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[676] Segal, *Technological Utopianism*, 13-14. For the shifting terms and concepts of technology, see Leo Marx, "Technology: The Emergence of a Hazardous Concept." *Technology and Culture* 51, no. 3 (2010): 561–77; Eric Schatzberg, "*Technik* Comes to America: Changing Meanings of Technology before 1930." *Technology and Culture* 47, no. 3 (2006): 486–512.

[677] "It is necessary to add some elements to our definition of technology that go beyond the usual identification of technology with pieces of hardware and ways of manipulating them. The first of these is *organization* [and]…When technology is seen as a combination of devices, skills, and organizational structures, it becomes natural to think of it as a *system*." Rudi Volti, *Society and Technological Change*, 7th ed. (New York: Worth Publishers, 2014): 5 (original emphasis).

Governmentality: Liberal Technologies of Governance

This form of liberal technology suggests again governmentality. Pairing politics and technology and elevating a discussion of the double-gestured oscillation between the twin poles of order/fear and freedom/hope are what Foucault calls forms of liberal technologies of governance.[678] These technologies, like cybernetic technology, and like the organization of the American jeremiad, reflect a "governmental" rationality or governmentality, a way of reasoning that generates this form of technology. The rationality that expresses cybernetics preserves what Foucault describes as a central feature of liberalism: a principle of self-limitation.[679] Excesses of the state and even interventions by others are curtailed by constructing liberal technologies because systems mechanisms of balance, regulation, and *homeostasis* all promote system self-governance. They self-control, like human systems do. This technology of self-governance operates with enough freedom to reach a goal or purpose, but also preserves enough order to avoid disintegration or anarchy, liberalism's change-but-not-too-quickly strategy. The tension within such technologies are built to allow themselves to self-govern without the need of centralized authority. Contemporary modern liberalism designs systems for self-gover*nance* to keep govern*ment* at bay. This liberal conception reflects another part of the cultural *ensemble* of cybernetics as "governing systems".

Political scientists have recently come to appreciate how technology and systems like cybernetics operate as a governmental practice to govern and administer without the need of the state. For example, consider *Understanding Governance* by British political scientist Roderick Rhodes in the field of governance studies.[680] Operating in a British context, Rhodes notes that "'governance' has several distinct meanings," yet one relevant meaning is "The socio-cybernetic approach[, one that] highlights the limits to governing by a central actor, claiming there is no longer a single sovereign authority." [681] The socio-cybernetic approach to governing "sees governance as

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[678] "The form of governmental technology we call liberalism, that is to say, a technology of government whose objective is its own self-limitation insofar as it is pegged to the specificity of economic processes." Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège De France, 1978-1979* (New York: Picador, 2010), 20.

[679] "But what does 'the self-limitation of governmental reason' mean? What is this new type of rationality in the art of government, this new type of calculation that consists in saying and telling government: I accept, wish, plan, and calculate that all this should be left alone? I think that this is broadly what is called 'liberalism'." Ibid., 20.

[680] R. A. W. Rhodes, *Understanding Governance* (Philadelphia: Open University Press, 1997): 51, 47, 50-51.

[681] Ibid., 51.

a broader term than government with services provided by any permutation of government and the private and voluntary sectors."[682] Expanding the definition of governing into governance further allows Rhodes to argue how "*governance refers to self-organizing, interorganizational networks.*"[683] Moreover, while "Any stipulative definition is arbitrary [...] my definition incorporates significant elements of the other uses, most notably governance as the minimal state, as a socio-cybernetic system and as self-organizing networks."[684] Rhodes suggests in a later work (with political scientist Mark Bevir) that "there has been a shift from government of a unitary state to governance in and by networks. We develop the argument that people can engage in a practice only because they hold certain beliefs or concepts." Those certain beliefs—a governing rationality or governmentality, if you will—describe "particular sets of reasons that led the relevant individual to act."[685] This scholarship suggests how governance by systems is network governance that occurs in everyday life absent the need of centralized authority. Such governance occurs within "modern" self-organizing cybernetic systems like the Rationale and occurs in how systems articulate a set of beliefs and practices which mirror liberal technologies of governance and which are built into technologies of self-control that curriculum teaches.

What I seek behind putting together this entire discussion of adding technology to science, politics, and religion is to pull together a different reading of "the curriculum." The ensemble of cybernetics components demonstrates how algorithmic models articulate ways of reasoning that are not merely just "practical" applications to a set of different classes of problems across different academic domains. Systems models "perform" the same "work." The logic I am interrogating embodies politics, religion, and technoscience. Systems govern by articulating subjects modernized for distribution across social structures. Domains are selected for intervention and then managed. Politically, this occurs within the behavior oscillating between the twin poles of freedom and order; systems are small "l" liberal that stave off authoritarian control by governing without seeming to govern, rendering

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[682] Ibid., 51. "Interorganizational linkages are a defining characteristic of service delivery and I use the term network to describe the several interdependent actors involved in delivering services."

[683] Ibid., 15 (original emphasis).

[684] Ibid., 53.

[685] Mark Bevir, and R. A. W. Rhodes, *Interpreting British Governance* (New York: Routledge, 2003): 1,2; and *The State as Cultural Practice* (Oxford: OUP Oxford, 2010). For a bibliography on governance, see Bevir, *Governance: A Very Short Introduction* (Oxford: OUP Oxford, 2012): 121-126.

moribund the cold overbearing hand of centralized authority. Religiously, they embody a generalized Protestant theology and reasoning, for their governance "congregates" and reunites a fractured community's relationships by directing the parts of a system to a central nodal point similar to the American jeremiad. Scientifically, they embody a form of cybernetic reasoning, where the focus remains on the relational form ("a science of relations"[686]), familiarly known today with the modernizing effects of networks and nodes of the Information Age. The ensemble projects them all. As does the Rationale.

Conclusion

To conclude, I hope that I have opened up a different set of avenues for how curriculum studies and curriculum history can take a different approach to understand the role of cybernetics, systems, and processes in education. Science, politics and religion indeed converge in the cybernetic approach, expressing a series of cultural theses when used in education. These theses occur across various political-theological-technoscientific domains. Processes shape "the curriculum" as a message, moving humans into predetermined positions to perform prescribed activities in certain roles to help things hang together. For example, current research labeled Positive Behavioral Interventions and Supports (PBIS) is sponsored by the U.S. Department of Education operating in over 25,000 school across the United States. This research targets student self-regulation (feedback), demonstrating a prevailing and persistent belief for how "schools, districts, and states [can] build systems capacity [...that] improves social, emotional and academic outcomes for all students,"[687] as a way to build equity and inclusion. A focus on such processes, and not academic content, opens up different ways to understand how processes become content, not as any sort of academic content or hidden curriculum, but instead as a different understanding of how constructing curriculum occurs across various levels, but rather in the way that systems processes work on the surface to bring something lacking in the human domain in a modernized way—as the improved human, the thinking machine, the cyborg.

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[686] Eden, "Closing the Loop," 471.

[687] "PBIS.Org Home Page," accessed February 16, 2018, https://www.pbis.org/.

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