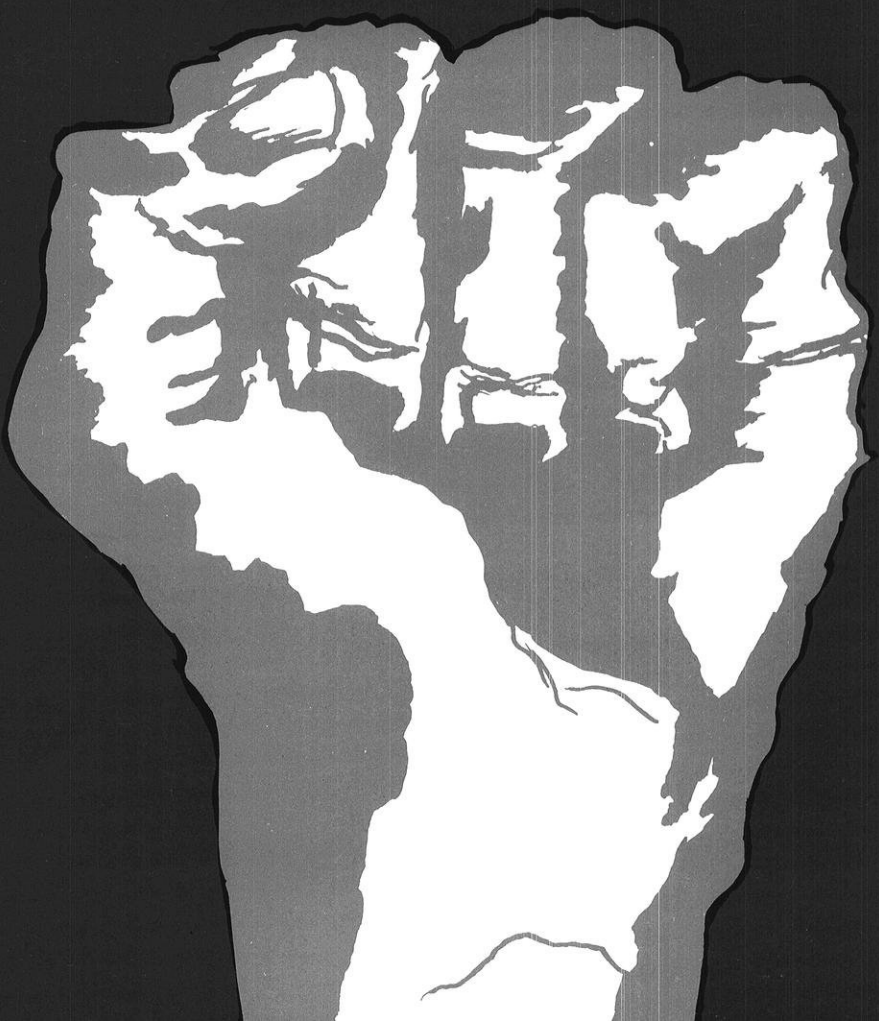
Wisconsin engineer. Vol. 74, No. 8 May 1970

L. 74, NO. 8

35 CENTS MAY, 1970

wisconsin engineer



If you want to grow with a growth company...

go with Westinghouse.

In the past five years, our sales have gone up fifty percent and profits have nearly tripled. Our goal is continued growth. Much of this growth will come from our commitment to improve the world we live in.

When you're in everything from computers to urban development, to medical science, to mass transit, to oceanography—the opportunities are boundless.

We need help. We need engineers who want to grow and contribute to society at the same time. Westinghouse believes the two are not mutually exclusive.

Talk with our campus recruiter about starting a growth career with Westinghouse, or write Luke Noggle, Westinghouse Education Center, Pittsburgh, Pennsylvania 15221.

An equal opportunity employer.

You can be sure...if it's Westinghouse

"We are drifting toward a catastrophe beyond comparison. We shall require a substantially new manner of thinking if mankind is to survive." – (Albert Einstein)

CONTENTS:

wisconsin engineer

Second Class Postage Paid at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act. of Oct. 3, 1917, authorized Oct. 21, 1918.
Published monthly from October to May inclusive by the Wisconsin Engineering Journal Assn., 308 Mechanical Engineering Bldg., Madison, Wis. 53706. Office Phone (608) 262-3494.

Editorial --

Parting Shots

After three abortive attempts at a proper editorial introduction, we've realized that there is not nor will be a fitting eulogy for the events of the past year. We've tried to say much in this magazine, things which we believe would enrich our existence and ease our minds on this planet, in this country. We've tried to reflect some disallusions and potential solutions which have been most intensely articulated by our peers, the human beings closest to us. As we exit, it looks as though Mother Earth and her beings will be soon to follow.

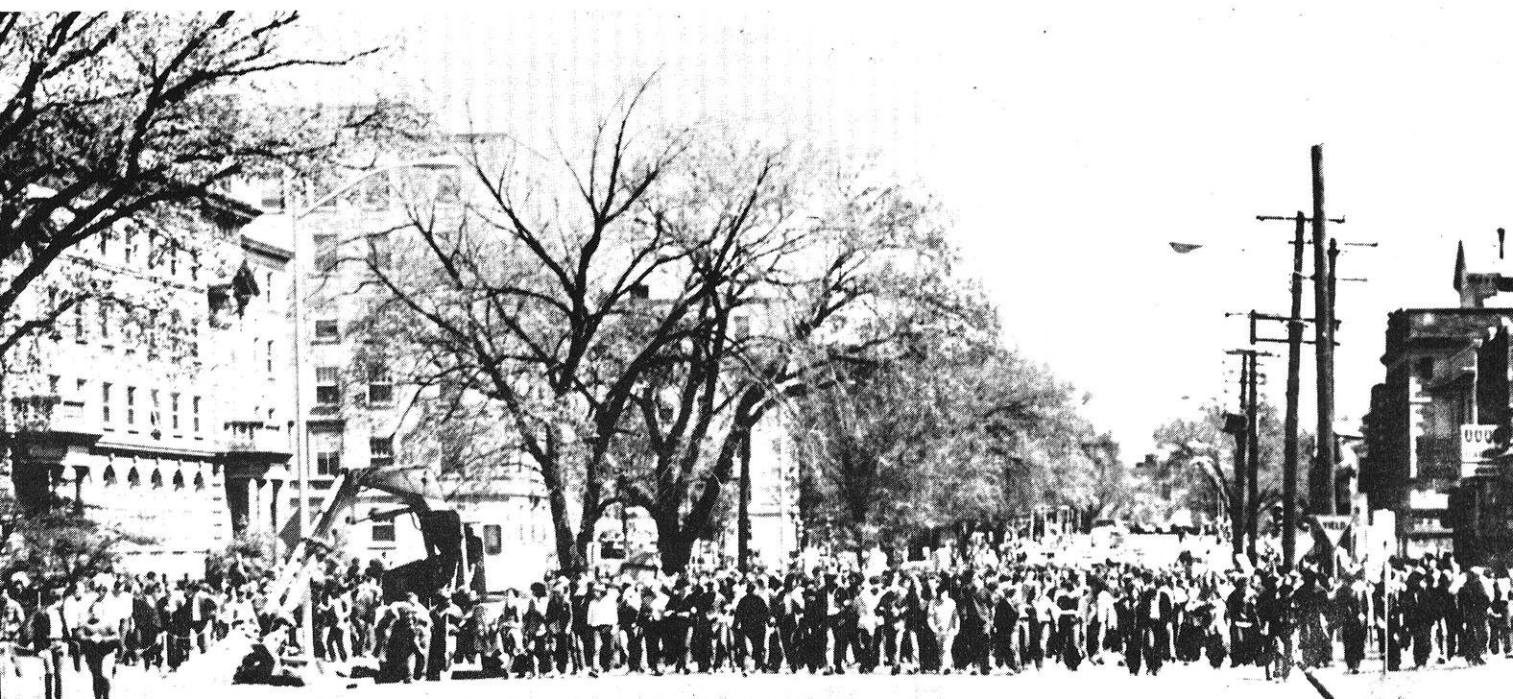
In the past years we, as young people, have seen our friends sent off to an ever expanding war. Many of them have come home in boxes. In the past months we have seen black people like Fred Hampton murdered in their beds. In the past weeks we have seen fellow students murdered on their own campuses. These social realities, coupled with the prevailing political and economic atmosphere, indicate that this country is speeding toward a fascism unquestionably superior to that of World War II Germany.

In our November Editorial we related the frustrations and desperations of those who marched on Washington November 15 (the President was watching the Purdue game). It was that march and many — many — before it which appealed to those in authority to halt their insane creations. We quoted a sign that read: "This is the last march — The Fire Next Time." The fire has come, the Empire is ablaze.

Experience — years of it for many of us — has demonstrated the absolute unresponsiveness of those with whom we have pleaded. Alienation from a dominant social, political, and economic system has led to the creation of a viable counter-culture. It is toward that culture which we, as a staff and as youth, *must* continue to work.

In the words of Crosby and Stills:

Horror grips us as we watch you die
All we can do is echo your anguished cries
Stare as all human feelings die
We are leaving, you don't need us.



China -- An Industrial Threat?

Michael P. Callahan

Communist China announced to the world, Saturday, April 25, 1970 that it had launched its first satellite into orbit. Former US Navy Secretary Dan Kimball was a worried man when this event was revealed to the world. As a matter of fact, he was worried in 1950 when he heard that a Chinese born scientist named Chien Hsueh-shen wanted to leave the United States for Communist China.

"I'd rather shoot that guy than let him out of the country," Kimball said. "He knows too much that is valuable to us. He's worth five divisions anywhere."

This was stated by Kimball in 1950 when Chien was one of the brightest stars in the constellation of scientists at the Jet Propulsion Laboratory of the California Institute of Technology. And as we have seen, Chien has lived up to Kimball's highest estimates of his ability. The master builder of China's rockets that did the job April 25, was Chien.

Chien's rockets are the backbone of a Chinese system of intercontinental ballistic missiles (ICBM) that US Defense Secretary Secretary Melvin Laird says will be pointed at the United States by 1975. Like many of Red China's leading scientists, Chien is a product of American education. He first studied at the Masschusetts Institute of Technology, then moved to Caltech at Pasadena in 1936. Granted a security clearance late in World War II, Chien, wore the wings of a colonel in the old U.S. Army Air Corps. He was sent to Germany after the war to study the rockets developed by Hitler's scientists. Chien returned to MIT as a professor, going back to China for a visit in 1947. He then moved to Caltech, where he headed the Jet Propulsion Laboratory.

Before us then, is a perfect example of the many Chinese scientists who have been a product of American technological education and development. Perhaps through no fault of our own, these scientists have returned to their homeland to aid in the technological advancement of their own culture. Yet, has this migration of American-educated Chinese scientists merited the concern of Melvin Laird who fears that ICBM's will be pointed at the United States by 1975? Have the Chinese advanced to such a technological status that their society now poses a major threat to the security of Southeast Asia and the world as well?

Statistical measurement of industrial and technological output is fraught with difficulties under the best of circumstances. When a country is undergoing great changes in economic organization and industrial structure, as in Red China, the problem of measurement becomes more complicated. And when the handicap of inadequate and inaccurate information is added, attempts at such analysis may well appear either heroic or quixotic to an outside observer, depending upon his temperament. It should not be surprising, therefore, that those who have approached the task of measuring China's industrial progress are cautious about the validity of their results, nor that the results of investigations always coincide.

No official statistical reports on the progress of the Red Chinese economy have been published since 1960, and figures relating to 1958 and 1959 are generally regarded as seriously inflated. For this reason, and because the Chinese themselves often use 1957 as a standard of comparison, this article in general sets the official 1957 figures against latest available estimates of output, as compiled by the Economic Intelligence Unit, Ltd., of London, England.

China proper covers 5.1 million sq. km.; if Inner Mongolia, Sikang and Singkiang are included the total is 9.6 million sq. km.. In 1958 only 10 per cent of the total area was cultivated. Pressure on agricultural land is now intense and the population very unevenly distributed; the eastern area, comprising the coastal plain and the great valleys of the Hwang Ho and Yangtze, is densely settled with more than 100 inhabitants per sq. km.. The four provinces of the Yellow River delta alone account for more than 150 million inhabitants. The mountainous regions of western and north-western China are sparsely populated, seldom having above 15 inhabitants per sq. km.

The population of mainland China was calculated at 596 million in the 1953 census, and the last figure published by the Chinese is 656 million for 1957, of whom 340 million were men and 316 million women. As late as 1965 Premier Chou and other officials were still referring to a population of about 650 million, but in the summer of 1966 the total was raised to 700 million, possibly still an underestimate. American experts put the total at 786.4 million in 1966, assuming a natural increase of 2.2 per cent per year over the past decade. The United Nations' estimate for 1967 is 720 million.

MINING, FUEL AND POWER

China has abundant mineral resources, particularly of iron ore, manganese, tungsten, copper, tin and bauxite, and is among the world's largest producers of antimony. Much work has been done on geological surveys in recent years and it appears that newly-found commercial deposits of a number of ores, etc., are being prepared for exploitation. During 1967, production of minerals is thought to have fallen substantially due to the effects of the cultural revolution. However, as the situation returns to normal, output could increase rapidly. The country has ample coal and much hydroelectric potential; petroleum, produced at Karamai and Yumen and a new field at Taching in the northeastern part of the country, is at least adequate to meet current requirements, which remain very small in relation to the size of the country.

Output of Selected Products

(100 tons)	1957	1967
Iron ore, mn. tons	16	35
Manganese	670	800
Antimony (Sb content)	...	13.2
Bauxite	150	340
Copper (ore content)	15	90
Lead (ore content)	40	100
Zinc (smelter)	40	100
Tin (smelter)	16.3	20
Mercury, flasks	17.1	20
Coal & lignite, mn. tons	130	250
Crude oil, mn tons	1.5	9
Phosphate rock	200	1,100
Pyrites (sulpher)	...	665
Salt, mn tons	8.3	14.3
Sulphur	...	120
Magnesite	670	880
Asbestos	29	170

Sources: Ten Great Years; Minerals Yearbook; and EIU estimates

MANUFACTURING AND INDUSTRY

In real terms the gross value of industrial output more than doubled during the first plan (1953-57) and the rapid rise continued through 1960, though growth in subsequent years was certainly less spectacular than official figures suggest. In 1952 industry contributed 40 per cent of the combined gross output value of industry and agriculture; by 1957 its contribution was over 55 per cent. During the 1950s it received the lion's share of investment in fixed capital, the object being, with Soviet financial and technical help, to establish the beginnings of a heavy industrial sector; the iron and steel and machinery industries and some branches of the chemical industry grew most quickly, while growth in textile, food and other consumer goods industries was leisurely. The 1960s brought a dramatic change in priorities. Industry became the servant of agriculture, and development in the past five years has been concentrated in those branches that satisfy the farmer's needs, both as a producer and as a consumer: fertilizers and other agricultural chemicals; agricultural tools and simple machines; electric pumping and irrigation equipment; natural and synthetic textiles; plastics; household goods. Until at least 1964 heavy industrial production lagged at less than capacity. There were, however, signs in 1965 and 1966 that major steel works, such as Anshan, were getting into their stride again.

It is claimed that in 1966 the gross value of industrial output was 20 per cent above that of 1965. It is fairly clear that during the year the great proletarian cultural revolution had little influence on the general activity. Industrial production, however, was badly affected in 1967 by labor troubles, and despite the gradual returns to normality in 1968, production has not recovered sufficiently to reach the level of the five preceding years.

Estimated Output of Selected Products

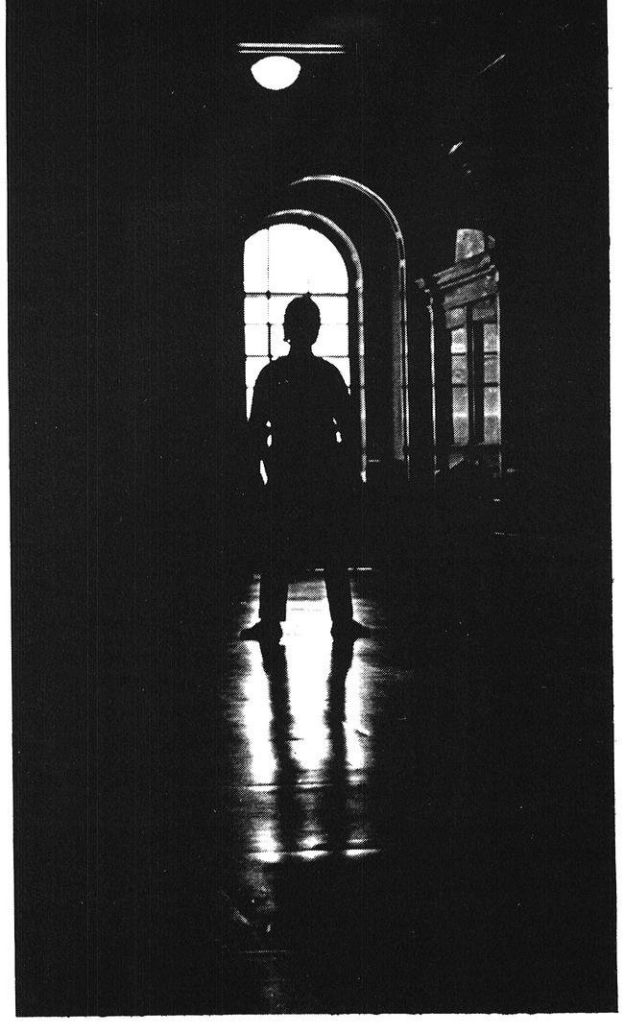
	1957	1967
Pig iron, mn tons	5.9	15.4
Crude steel, mn tons	5.4	12.1
Chemical fertilizer, mn tons	0.6	8.5
Cement, mn tons	6.9	10.0
Aluminum, (1000 tons)	20	90
Rayon staple fibers, (1000 tons)	—	16
Rayon filament yarn, (1000 tons)	0.2	20

At a sustained average annual GNP growth rate of 7.5 per cent, and a rate of 10 per cent for industrial growth, China could, and probably is becoming a leading world economic, industrial, and military power before the end of this century. As one can see from the previously mentioned tables, the backward culture of the Orient is moving forward to regain its past superiority. Some observers feel that China will probably surpass Japan's level of GNP in the early 1970's, barring severe ideological extremism.

Mao's ideology may be debated, and his practices terrifying, yet he has put the people of mainland China back on their feet. The economic, industrial, and technological slumber of a sleeping China has been rudely disturbed. And once awakened, this nation cannot be expected to return to its old inertia. A new era is now pushing Red China up on to the stage occupied by the industrial powers of Europe, the United States, and the Soviet Union. In October of 1964, China exploded its first A-bomb, using uranium 235; further tests were carried out in 1965 and 1966. The first Chinese H-bomb was exploded on June 17, 1967, followed by others, and of course, China's first satellite was launched April 25. China may be behind the United States and the Soviet Union in technological know-how, yet she is rapidly closing the gap. Whether US Defense Secretary Melvin Laird's fears that Chinese ICBM's will be pointed at the United States by 1975 remains to be seen. [***]

BRINGING THE WAR HOME

MASKS FOR ALL OCCASIONS



THE GUARD — student liason on his back
government liason to his right

ALL PHOTOS BY *JIM HABERMAN*

THE ASSAULT OF MONROE STREET

Your money and your life.

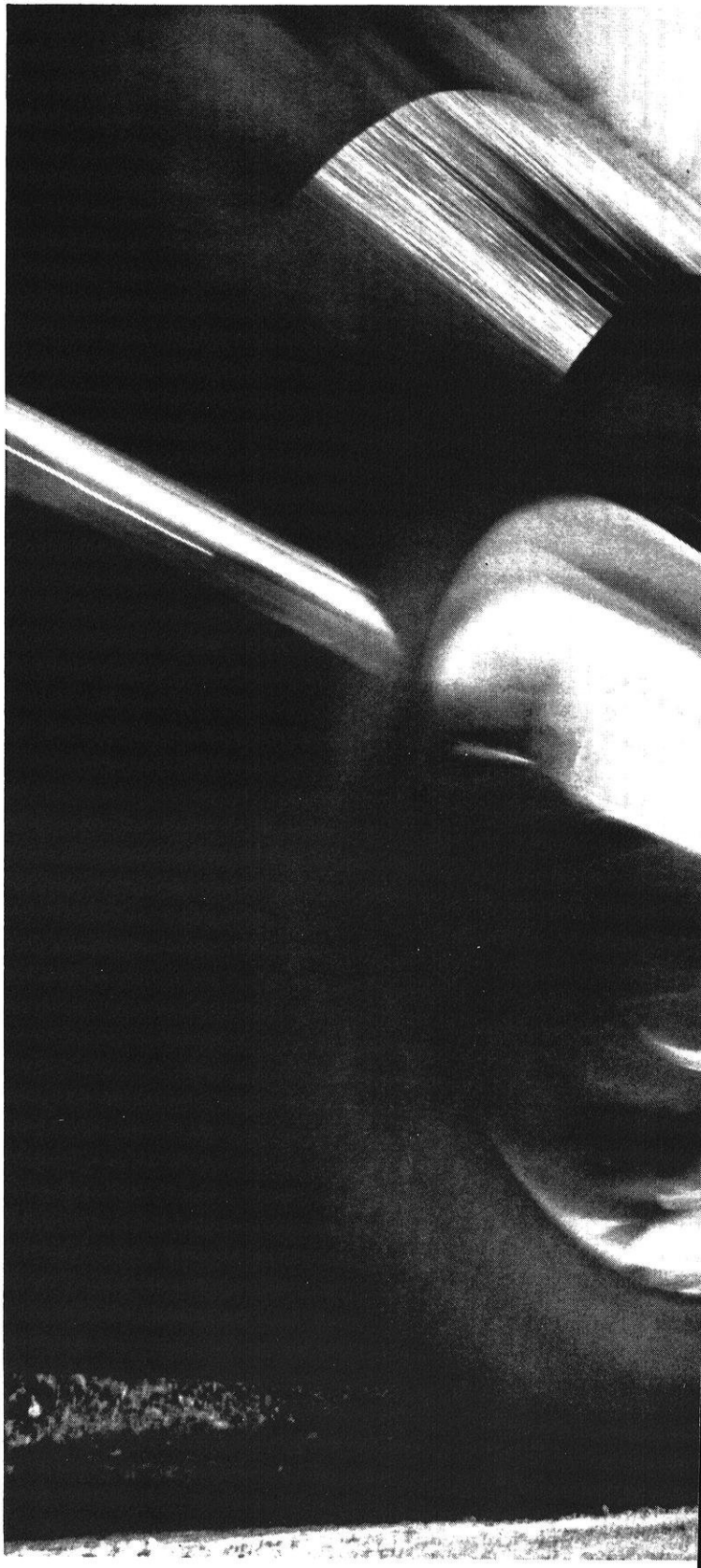


PHOTO: ERNEST BRAUN

You're living dangerously, and you love it.

You fought the professor all semester, and got an A in spite of it.

The girl you've been eyeing likes your style.

It's spring. That's dangerous.

But the one place where you shouldn't have to live quite on the edge is on the road. Now you don't, thanks to new safety features in cars . . . and the remarkable radial tire.

Radials are a marvelous invention in rubber and rayon cord. They last twice as long as regular tires, and even give you better gas mileage. On wet, slippery pavements, they grip like fly paper.

A point of interest—The Dynacor® rayon cord in radial tires is made by FMC Corporation, the same company that makes rayon for the "throwaway bikini" your date is working up courage to wear.

This same company that builds egg handling systems also builds fire engines.

Each day you see FMC products around and you've never known it.

FMC also makes petrochemicals, pumps, freeze dry equipment, practically anything dealing with food growing machinery and industrial chemicals, and more. We are one of the country's top 60 corporations.

FMC is a creative company that's making an impact on the American way of life. Perhaps you'd like to help. For more information, write for our descriptive brochure, "Careers with FMC." FMC Corporation, Box 760, San Jose, California 95106. We are an equal opportunity employer.

fmc CORPORATION ®

FMC CORPORATION

Putting ideas to work in Machinery, Chemicals, Defense, Fibers & Films

Reprinted from the **California Engineer**

Marxism and Technology

Bruce Gardner
Associate Editor
California Engineer

In 1844, when he was 26 years old, Karl Marx completed the first comprehensive statement of the revolutionary theory of social evolution which bears his name, and which was to form the center of his activity over the whole of his life. These writings, never published by Marx, rediscovered and published only in the early 1930's, came to be known as the "Economic and Philosophical Manuscripts." They form the foundation of all his work.

They concern us here because in them is elaborated a theory of the evolution of the human species in which the development of technology plays an integral and coherent role. The central theme of that work is the theory of "alienation" ("entfremdung"-estrangement), which together with the related concept of "objectification," is directly relevant to the theory of technology as a "property" of the human species, and of the role of technology in the life-process (life-course) of that species.

Man's alienation develops against the backdrop of his situation in a strange world, a world which is still strange to man and in which man is still a stranger, an alien. But if man is estranged from nature, he is also estranged from that bit of nature which is his own body; from human nature also: man is a stranger to himself as well. If the properties and possibilities of nature as man's "inorganic body" are as yet unknown to him, and undeveloped by him, so too are his own powers and capacities still a secret locked within him, his needs, and thus his human nature, still undeveloped. To think of the existence of primitive man – man uninformed by the activity of previous generations which was our legacy; having to inform himself – is to sense the overwhelming opacity of the life and the reality which he confronted, the reality of the object as obstacle.

And how does man begin to overcome his condition, how does he contrive to bring his light into this world of darkness? By none other than the identical process by which he brings to light his own powers; by working himself into the world and by inscribing himself in the world he has made, and to construct a world which is fit for man. The development of what we have come to call technology is part of the process by which the human species makes this world its own, its home (Latin oeco=household; Greek oikos=house; roots of ecology). Appropriation – man's appropriation of nature and of human nature – in the various and successive historical modes in which it has been accomplished – this is the real meaning of property – private appropriation – figures in Marx's discussion. Private property (privacy, private life, privitization), especially capital, its highest form, is the form of property corresponding to human alienation; to its socialized form with which Marx is primarily concerned – to the way in which (socially) alienated man appropriates his life. It is the economic manifestation, and the economic basis, of the mutually exclusive life of men under the conditions of scarcity, in the grip of the (social) struggle for existence.

Evolution of ecology

With the appearance of man, a whole new side of the evolutionary process gains sway[1]. Whereas previously it had been the province of the natural environment to shape and constrain the forms of life ("fitness" of life to its environs), with the coming of man, life developed the capacity to shape nature to fit its needs, and living activity became a prime mover in the transformation of matter. Even at the microbial level, life distinguishes itself from dead matter, inanimate and inert, by the incessant character of its activity, and by the sensuous ("responsive") character of its animation. "Inertia" reappears at the biotic level in the form of survival, endurance, the objective (and later, with man, also the subjective) project of life. As life gains potency in the world – as measured, for example, by the expansion of biomass – the relation of the organism to its surroundings is reversed and revolutionized. Natural selection at length gives rise to man, and thereby, to its own negation. In fact, the degree to which the operation of natural selection within a population has been suspended is a convenient index of its degree of socialization. However, though the phenomenon of socialization appears at the apex of many phyletic branches (for example, the insects) it comes to fruition only in the case of man[2]. In time the ecosphere of man grows to encompass the whole of the biosphere, and finally (as we now know) breaks forth out of its planetary confines into outer space.

Thus the human species advances and expands upon what has been the project of life since its inception, and, as the coming-into-consciousness – the self-consciousness – of that project, carries to a new level what had been heretofore a wholly blind tendency. The unprecedented biological success of life in the form of the human species is reflected in the so-called "population explosion" – the explosive growth of humanity as an alien fact, out of human control – which threatens to turn man's biological success over into its opposite: the extinction of humanity[3].

Technology and human ecology

Any theory which claims to be an ecological theory of man, a "human ecology," must take into account certain basic features of the human species, and explain them – especially technology – and it must comprehend the human species both in its likenesses and its differences from the other species which populate the earth. It must see man in his reality as a species among other species, and also as a singular and unique species – as the culmination of previous organic evolution and as the advent of a whole

new evolutionary stage. It must comprehend as well the unprecedented historical character of human species-being (species-becoming), historical in a sense which does not apply to previous species.

In the preceding section, we have attempted to suggest the outlines of the problem. The point to be made here is that Marx's theory fulfills this program; it does this and much more as well (but of course unconsciously, and hence also in some places implicitly, for Marx in his time could not have known of ecology in the way we know it today).

To begin this discussion, I quote Thorsten Veblen:

> "To Marx, the neo-Hegelian, history, including the economic development, is the life-history of the human species; and the main fact of this life-history, particularly in the economic aspect of it, is the growing volume of human life. This, in a manner of speaking, is the base-line of the whole analysis of the process of economic life, including the base of capitalist production with the rest. The growth of population is the first principle, the most substantial, most material factor in the process of economic life. . .it is a process of growth, of unfolding, of exfoliation. . ."[4]

Though it is questionable as to whether Marx can be described adequately as simply a "neo-Hegelian," and though this passage was meant in criticism, it falls unusually near the mark in characterizing Marx's position from the "ecological" side at least. Veblen goes on to characterize Marx's:

> "Hegelian point of departure, according to which goal of the life-history of the race in a large way controls the course of that life-history in all its phases, including the phase of capitalism. This goal or end, which controls the process of human development, is the complete realization of life in all its fullness, and the realization is to be reached by a process analogous to the three-phase dialectic, of thesis, anti-thesis, and synthesis, into which scheme the capitalist system, with its overflowing measure of misery and degradation, fits as the last and most dreadful phase of antithesis. Marx, as a Hegelian – that is to say, a romantic philosopher – is necessarily an optimist, and the evil (antithetical element) in life is to him a logically necessary evil, as the antithesis is a necessary phase of the dialectic, and it is a means to the consummation, as the antithesis is a means to the synthesis."[5]

In this passage Veblen does justice neither to Hegel nor to Marx in this sense: he imputes to them a teleological determinism which was foreign to both their thought, and a simple-minded schematism which they both surpassed (though more so in the case of Marx). It is doubtful that Hegel, let alone Marx, can be cast as one-sidedly "romantic" or "optimist." And Marx was certainly no "philosopher" in the usual sense. Marx was a revolutionary, and that makes all the difference in the world. He was also a scientist, satisfied with nothing but the most exhaustive empirical verification of his theories (which themselves derive finally not from any abstract scheme, but rather from the most scrupulous and detailed scrutiny of human society and history).

However, this quotation has enough merit to warrant its use to highlight the ideas to be presented in the course of this discussion. Marx's theory, as it emerges in the 1844 manuscripts, does indeed suggest a life-course of the human species which, taken abstractly, in its highest generality, describes the helical trajectory associated with the form of the negation of the negation, the dialectical triad.[6] (Figure 1.) That is, society develops through a phase of "primitive communism" which evolves to the point of self-dissolution (first negation) inaugurating the phase of "class-societies" (the cleavage of society against itself into classes). This disintegration of community proceeds – in a highly irregular and contradictory fashion; through a series of "fits and starts" (corresponding to the catastrophic collapse of successive phases of class society; the fall of the ancient Roman world, etc.) – right through to capitalism, the most extreme and total negation of community, the *last possible* form of class society, through which the process "curves back on itself" (re-turns) eventuating in the recovery of community (the second negation; negation of the first negation) – communist society – at a higher level which transcends the level at which society is subject to the forces and antagonisms which gave rise to the instability, and eventual decomposition, of the original (primitive) community. In this picture civil society (the process of civilization) evolves as the depository of the decay products of the dissolving "tribal" order, the realm of the individualization of men at the expense of community, of "the war of each against all," of egoism, that is, of social alienation (estrangement – the world of strangers).

Marxism–McLuhanism?

Interestingly enough, the abstract pattern of this movement parallels the one posited by Marshall McLuhan – viz.

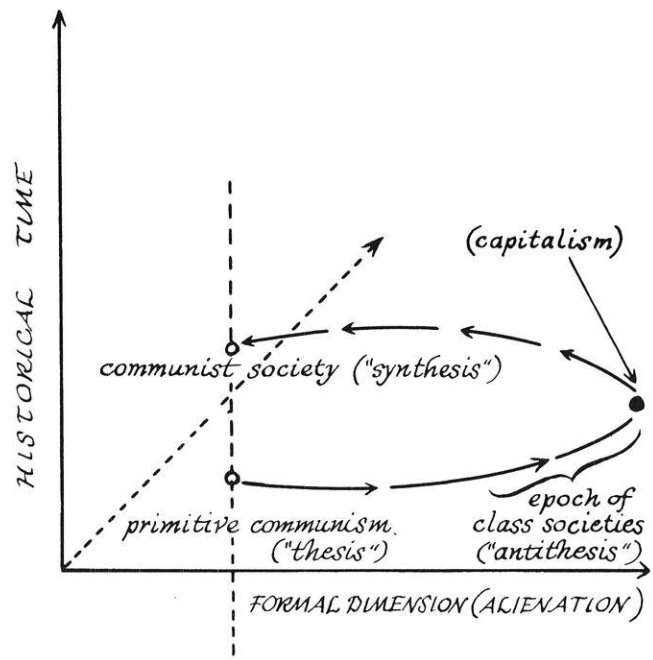


FIGURE 1.

from the tribal organization of society through the long arc of the break-up of that organization (culminating in the society based on "mechanical technology" – our own), to retribalization and the "global village" (associated with the society founded on electronic technology and automation). And the affinities of the two theories do not end here. McLuhan's theory is essentially a "technological theory of cultural evolution." Though McLuhan's theory is incredibly unsubtle and narrow, and leaves much to be desired (both because of McLuhan's own crochets and allegiances, and because any theory of "technological determinism" must), it will nevertheless be useful because of these affinities as an aid in bringing out and distinguishing Marx's theory of technology, otherwise wholly embedded in and wedded to his larger theory, and because (1)of its wide dissemination as a "popular philosophy" in this country (unlike Marxism) and (2) because it partakes of recent additions to the technical series which Marx, in his time, could only dimly foresee, and therefore could not use as bases for his arguments and predictions – specifically, electronic technology and automation (the electronic means of production).

The historicity of the human species is due at least in part to the "unfinished" and unspecialized ("universal") bodily morphology of man, particularly in the case of the human hand. In contradistinction to other animal species, whose "tool kit" is genetically fixed in the formation of the beak, paw, etc., and whose inherited, specialized instrumentality, through the specific mode of life it determines, determines to a large extent the specific mentality (the "quality of mind") of the species as well for man, the possibility of history is contained in the act of laying down one tool to pick up another. *Homo sapiens* is the species which can complete its evolution only by transcending its merely "organic" phase ("the accumulation of selected genetic changes or mutations"), that is, *Homo sapiens* can complete itself only through culture, the accumulation of extra-hereditary acquired characteristics; lore, science, etc., which are transmitted extragenetically, the growth of an extra-somatic and external heritage which is almost synonymous with "technology" (instrumentality and "technique" in the broader sense). The other species, in comparison to the human, though historical in a sense, seem to lead a historical existence which is "flattened-out," which lacks a whole dimension of historicity[7].

But if McLuhan is right, the bodily basis of man's history and man's technology goes much deeper than this. For McLuhan, technologies are "media," both because, as "instrumentalities" in the broadest sense, they are *mediations* between subject and object, and because they form active "environments" (or rather, sub-environments mediating between man and the natural one), *mediums* in which men experience their lives and which shape and process ("inform") the content of that life-experience in crucial ways. The alienation expressed in his phrase "the medium is the message" is the alien power of the man-made world over men, the inversion by which the content men intend to convey is deflected and distorted through the form, the medium which in transmitting it, transforms it. As media, they are both literally and figuratively "the extensions of man"; figuratively in the sense that they extend and amplify his powers, and extend and effectuate his subjective will into the objective realm, and literally in that they are necessarily modeled on the organic attachments, appendages, and faculties of the human body; they are "externalizations," "self-amputations," detachments (self-disattachments), "self-alienations" of the human body: "All media are extensions of some human faculty-psychic or physical[8]." Thus, "the wheel is an extension of the foot, the book is an extension of the eye, clohting (and housing) an extension of the skin, and electric circuitry, an extension of the central nervous system[9]" etc. And not only are these externalizations external reflections or projections of (parts of) the human body, but these reflections are produced historically in a coherent order; the technical series constitutes an intelligible sequence, a logical continuum[10]. Man begins by externalizing what is most external to him, and ends by externalizing what is most essential, most central (consciousness, the central nervous system):

"After three thousand years of explosion, by means of fragmentary and mechanical technologies, the Western world is imploding. During the mechanical ages, we extended our bodies in space. Today, after more than a century of electric technology, we have extended our central nervous system in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extensions of man – the technological simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media."[11]

Automation as the culmination

Automation represents the displacement of the function of the autonomic nervous system – the automatic regulation of man's individual metabolism without his conscious intervention or effort – into the realm of social metabolism; production; and the material life process of society (heretofore a contested and malignantly evolving realm) – the abolition of labor. Electronic means of communication – deployed like a nervous network across the surface of the globe – make the totality of man's simultaneous activity manifest to all of mankind (at least potentially). Thus decentralization and de-urbanization become practicable, since electronic means of production obviate the need for masses of workers concentrated in space, and make possible the unification and localization of production (abolition of the division of labor) to a growing extent, and since with electronic communication (picturephone, etc.) the attained level of culture can be maintained and advanced against all isolation and provincialization in a decentralized arrangement of social life.

With the consummation of the externalization of man in the form of electronic technology, man's historical project of his own self-creation (self-completion) draws to a close, or rather (with reference to figure 1) closes back upon itself. In the course of this process (not yet completed), man will have (scientifically) rediscovered and (externally) reduplicated the natural processes which created his bodily form, and have liberated the potentialities of that body in the process. By "building himself into the world" as a buffer against nature, he will have humanized nature in the process, and constituted the projection of himself which is technology and culture as his own environment. Thus his original estrangement from both nature and himself will have been superceded in a single movement, for in transforming nature to cor-*respond* to him – in producing a congruent world – he will have made himself manifest to himself, and in that very process unlocked all the plenitude

of his being.[12] Man "learns himself" and becomes familiar with himself by performing his own recapitulation. This recapitulation is the real content of history. And in this sense all of natural history (the building of the body[12] is but a rehearsal for human history. Thus hand in hand with the movement which I will call "the internalization of externity" (in part, the "knowledge movement," the digestion of reality) in history goes the parallel (but oppositely directed) movement of the "externalization of internity" (in the main, technology; the accumulation of capital defined as material culture in general, as the material remains of living activity – the "excretion" corresponding to the digestion and thus also capital seen as the archetypal form of "pollution").

What remains is to demonstrate with some quotes the connection of Marx's views with these ideas, concerning technology, concerning its role in the life-course of (proto) humanity, and concerning the human senses.

First, Marx's concept of "objectification." This refers mainly to the objectification – the making objective – of the *subjective* through labor, whether this be the labor of the poet, the artisan, or the industrial worker:

"The product of labor is labor which has been embodied in an object and turned into a physical thing; this product is an *objectification* of labor. The performance of work is at the same time its objectification."[13] Thus the whole world of wealth which man produced becomes "the objective being of man."[14] Marx's notion of objectification corresponds to the notions of externalization which we have discussed above. There are places where Marx sounds very much like McLuhan (or rather, where Marx makes McLuhan sound very much like him). For instance, in Capital Volume I (New World,1967,p.372) Marx writes:

"Darwin has aroused our interest in the history of natural technology, i.e., in the formation of the organs of plants and animals, as instruments of production for sustaining life. Does not the history of the productive organs of man, of organs that are the material basis of all social organization deserve equal attention?. . .Technology discloses man's mode of dealing with nature, the process of production by which he sustains his life, and by which also his social relations, and the mental conceptions that flow from them, are formed."

Marx on the senses

It is well known that McLuhan places particular stress on that side of the family of technology which comprises the means of communication, as opposed to the means of production, and upon the effects of these on the senses, in shifting "sense ratios" and thereby altering our perception of the world: "Each of our senses is a unique world."[15] Concerning the senses, Marx says:

"It is only when objective reality everywhere becomes for man in society the reality of human faculties, human reality, and thus the reality of his own faculties, that all *objects* become for him the *objectification of himself.* The objects then confirm and realize his individuality, they are *his own objects,* i.e., man himself becomes the object. *The manner in which these objects* becomes his own depends upon the *nature of the object* and the nature of the corresponding faculty; for its precisely the *determinate character* of this relation which constitutes the specific *real* mode of affirmation. The object is not the same for the *eye* as for the *ear* for the ear as for the eye. The *distinctive character* of each faculty is precisely its *characteristic* essence and thus also the characteristic mode of its objectification, of its *objectively real,* living *being.* It is therefore not only in thought, but through *all* the senses that man is affirmed in the objective world."

He goes on:

"Let us next consider the subjective aspect. Man's musical sense is awakened only by music. The most beautiful music has no meaning for the non-musical ear, is not an object for it, because my object can only be the confirmation of one of my own faculties. It can only be so for me in so far as my faculty exists for itself as a subjective capacity, because the meaning of an object for me extends only as far as the sense extends (only makes sense for the appropriate sense). For this reason,the senses of social man are *different* from those of the non-social man. It is only through the objectively deployed wealth of human being that the wealth of subjective *human* sensibility (a musical ear, an eye which is sensitive to beauty of form, in short, the senses which are capable of human satisfaction and which confirm themselves as human faculties) is cultivated and created. For it is not only the five senses, but also the

so-called spiritual senses, the practical senses (desiring, loving, etc.), in brief, human sensibility and the human character of the senses, which can only come into being through the existence of its object, through humanized nature. *The cultivation of the five senses is the work of all previous history.* Sense which is subservient to crude needs has only a restricted meaning. For a starving man the human form of food does not exist, but only its abstract character as food. It could just as well exist in the most crude form, and it is impossible to say in what way this feeding activity would differ from that of animals. The needy man, burdened with cares, has no appreciation of the most beautiful spectacle. The dealer in minerals sees only their commercial value, not their beauty or their particular characteristics; he has no minerological sense. Thus, the objectification of the human essence, both theoretically and practically, is necessary in order to *humanize* man's senses, and also to create the *human senses* corresponding to all the wealth of human and natural being. . .Just as society at its beginnings finds, through the development of private property with its wealth and poverty (both intellectual and material), the materials necessary for this *cultural development,* so the fully constituted society produces man in all the plenitude of his being, the wealthy man endowed with all the senses, as an enduring reality. . .It can be seen that the history of *industry* and industry as it *objectively* exists is an *open* book of the *human faculties,* and a human *psychology* that can be sensuously apprehended. . ."[16]

And if the hidden tendency of the movement of technology in the life-course of (proto) humanity – hidden within the long arc of alienation – is to *bring the world into accord with man,* it also has this meaning:

"If man derives all his knowledge from the sensible world and from his experience of the sensible world, then this is to say that the empirical world should be arranged in such a way that man experiences and assimilates there what is really human, that he experiences himself as man."[17]

"The eye has become a human eye when its object has become a human, social object, created by man and destined for him."[18] And finally:

"Communism (is) not flight or abstraction from, nor the loss of, *the objective world which men have created by the objectification of their faculties.* They are not an impoverished return to unnatural, primitive simplicity. They are rather the first real emergence, the genuine actualization, of man's nature as something real."[19]

"The positive supersession of private property, i.e., the *sensuous* appropriation of the human essence, and of human life, of objective man and of human *creations,* by and for man, should not be taken only in the sense of *immediate,* exclusive *enjoyment,* or only in the sense of *possession* or *having.* Man appropriates his manifold being in an all-sided way, and thus as a whole man. All his *human* relations to the world – seeing, hearing, smelling, tasting, touching, thinking, observing, feeling, desiring, acting, loving – in short, all the organs of his individuality, like the organs which are directly communal in form, are in their objective action (their *action in relation to the object*) the appropriation of this object, the appropriation of *human reality.* The way in which they react to the object is the confirmation of human reality. . .Private property has made us so stupid and partial that an object is only *ours* when we have it, when it exists for us as capital or when it is directly eaten, drunk, worn, inhabited, etc., in short, *utilized* in some way. . .Thus *all* the physical and intellectual senses have been replaced by the simple alienation of *all* these senses; the sense of having. The human being had to be reduced to this absolute poverty in order to be able to give birth to all his inner wealth. . .The supersession of private property is, therefore, the complete *emancipation* of all the human qualities and senses. It is such an emancipation because these qualities and senses have become *human,* from the subjective as well as the objective point of view.."[20]

The Course of prehistory

Within the history of alienation, we have passed from the domination of man by nature to the domination of man by man to the domination of nature by man[21] – and in this latter term lies a root of the theoretical anticipation of an ecological crisis, should capitalism achieve a sufficient (over-) development. At either end of this continuum, outside of alienation, we find the union of man and nature; namely, *(at first)* the undifferentiated unity of man and nature, their virtual *identity,* out of which they diverged, and *at last,* their reconvergence:

"The natural existence of man has here become his human existence and nature itself has become human for him. Thus (communist) society is the accomplished union of man with nature, the veritable resurrection of nature, the realized naturalism of man and the realized humanism of nature."[22]

At first men who, in society, have enclosed themselves against the natural environment in a social membrane of technology, which regulated their ever more selective interchange with a hostile nature, and which mitigates the "violence of things" and their own growing *neediness* (the subjective side of scarcity, lack, the negativity of the natural world which turns life against itself and forces it to prey upon itself, giving rise to the "struggle-for-existence"), are powerless to prevent the mass action cleavage of this society against itself into classes; the opening of this wound and fissure within society, and thereby the inauguration of their (social) alienation. In the manner of an electrostatic field surrounding a conductor,[23] the primary natural field of adversity induced the class systemasis, the class lines of force, within society; a secondary and cancelling field. But the social process is a much more organic and dynamic one than that described by electrostatics. Within this antagonistic structure, human development proceeds in the throes of a contradiction. The cycle of cultivation for some is driven by the counter-cycle of abasement for the rest, and hence this cultivation is itself deflected and deformed. But within this antagonism, this alienation – in which the expansion of wealth operates objectively in deflected and inverted form as an *end* rather than as a *means* (the inverted world in which man is nothing while the thing which he creates, wealth, is everything) – real wealth nevertheless continues to grow (though in this alienated form). At length, with the growth of the productive forces,[24] the world becomes enriched enough, through the accumulation of all the dead labour of the past, to support the full possibilities of life for all, and the lethality of nature is overcome (however, within the continuum of alienation, this is merely replaced with the *lethality of man*).

The end of prehistory

The revolution is essential to the turning point on the spiral. It "revolved" the inverted world, it is the inversion of the inversion (the negation of the negation) in which man places himself on his own feet again. The human

(CONTINUED ON PAGE 16)

DUCTILITY

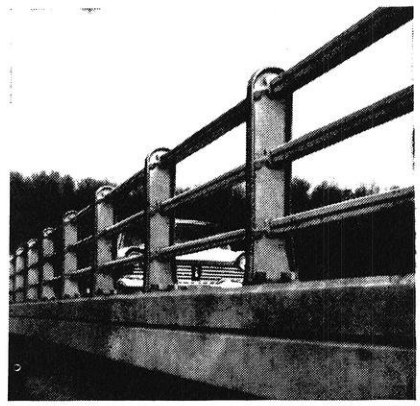
One of the outstanding properties of Malleable Iron Castings

Ductility is a property which provides Malleable iron with a vital safety margin for parts under stress.

A special heat conversion process transforms the material from brittle "white iron" to a tough, ductile metal with 10-18% elongation in two inches for ferritic grades, 2-10% for pearlitic malleables. Ductility is important for two reasons:

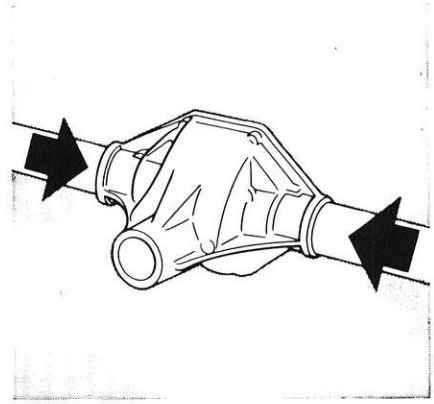
1. It guards against sudden failure of a material. Under a static overload, a ductile part will deform gradually, giving visual evidence that failure is occuring. Impact will create sudden deformation, but unless the overload is far above anticipated levels, the part will stay in one piece.

The faith which engineers place in Malleable castings for shock applications is typified by the bridge rail posts pictured at the right. More than 30 states now specify Malleable for these posts because tests show the material can absorb greater impact than lightweight metals.



2. A ductile material can be formed in presses, and Malleable castings are commomly punched, roll threaded, joined to other parts, or otherwise formed to meet design requirements.

A well-known application is the Malleable differential housing on an automobile. On many cars steel tubes are rammed into each of the side ports of the Malleable differential housing to create the axle housing. The Malleable expands slightly to accept the tubes . . . then holds them rigidly for the life of the automobile. Despite the anticipated road jolts, the only joining operation is a small puddle weld to maintain alignment of the tubes.



MALLEABLE FOUNDERS SOCIETY • UNION COMMERCE BUILDING
CLEVELAND, OHIO 44115

MALLEABLE FOUNDERS SOCIETY

Research opportunities in highway engineering

The Asphalt Institute suggests projects in five vital areas

Phenomenal advances in roadbuilding techniques during the past decade have made it clear that continued highway research is essential.

Here are five important areas of highway design and construction that America's roadbuilders need to know more about:

1. Rational pavement thickness design and materials evaluation. Research is needed in areas of Asphalt rheology, behavior mechanisms of individual and combined layers of pavement structure, stage construction and pavement strengthening by Asphalt overlays.

Traffic evaluation, essential for thickness design, requires improved procedures for predicting future amounts and loads.

Evaluation of climatic effects on the performance of the pavement structure also is an important area for research.

2. Materials specifications and construction quality-control. Needed are more scientific methods of writing specifications, particularly acceptance and rejection criteria. Additionally, faster methods for quality-control tests at construction sites are needed.

3. Drainage of pavement structures. More should be known about the need for sub-surface drainage of Asphalt pavement structures. Limited information indicates that untreated granular bases often accumulate moisture rather than facilitate drainage. Also, indications are that Full-Depth Asphalt bases resting directly on impermeable subgrades may not require sub-surface drainage.

4. Compaction and thickness measurements of pavements. The recent use of much thicker lifts in Asphalt pavement construction suggests the need for new studies to develop and refine rapid techniques for measuring compaction and layer thickness.

5. Conservation and beneficiation of aggregates. More study is needed on beneficiation of lower-quality base-course aggregates by mixing them with Asphalt.

For background information on Asphalt construction and technology, send in the coupon.

The Asphalt Institute
College Park, Maryland 20740

OFFER OPEN TO CIVIL ENGINEERING STUDENTS AND PROFESSORS

THE ASPHALT INSTITUTE
College Park, Maryland 20740

Gentlemen: Please send me your free library on Asphalt Construction and Technology.

Name_____ Class or rank_____

School_____

Address_____

City_____ State_____ Zip Code_____

(CONTINUED FROM PAGE 14)

appropriation of accumulated capital (the highest form of "wealth-for-itself" whose life-process – the autocatalysis of value – is the alienated life-process of humanity) proceeds through its negation as capital ("aufgehoben"). With the transformation of the natural field of adversity, the class division tends to resolve itself into the "classless society," the realized human community, which is communism; the wound heals. With this twist in the riddle which is the story of man, the spiral of history closes back on itself: *"Communism* is the *positive* abolition of *private property,* of *human self-alienation,* and thus the real *appropriation* of *human* nature through and for man. It is, therefore, the return of man himself as a *social,* i.e., really human, being, a complete and conscious return which assimilates all the wealth of previous development. Communism as a fully developed naturalism is humanism, and as a fully developed humanism is naturalism. It is the *definitive* resolution of the antagonism between man and nature, and between man and man. It is the true solution of the conflict between existence and essence, between objectification and self-affirmation, between freedom and necessity, between individual and species. It is the solution to the riddle of history and knows itself to be this solution."[25]

With communist society, human history, as such, only really *begins:*

"Communism is the phase of the negation of the negation and is, consequently, for the next stage of historical development, a real and necessary factor in the emancipation and rehabilitation of man. Communism is the necessary form and dynamic principle of the immediate future, but communism is not itself the goal of human development – the form of human society."[26]

[***]

FOOTNOTES

1. This is not to denigrate the rudiments of this process in prehominid organic evolution; the tiny micro-organisms which built the mighty cliffs of Dover, or the ancient marine plants which transformed the chemistry of the entire atmosphere; oxidized it and shut out the deadly ultra-violet rays, clearing the way for the invasion of the land. But with the coming of man, these effects have broken through to the cosmological scale. For example, Sagan and Shklovsky, in their **Intelligent Life in the Universe** (Delta, 1966), note that suddenly, over the last few decades, the earth's radio emission has increased by a factor of 10^6 due to the growth of radio and television broadcasting, the BMEWS, etc. The Earth has become a radio star. They go on: "In the example of radio emission of Earth, we have encountered for the first time, the cosmic implications of the biological activity of intelligent beings. . .An essential attribute of intelligent life is that sooner or later its activity will attain a cosmic character." (p. 256).
2. See Chardin. **The Future of Man.** (Harper and Row,1964) p. 40.
3. I am highly critical of the Paul Ehrlich-type of definitions of this problem but unfortunately, there is no place to discuss the issue here.
4. **"The Portable Veblen"** edited by Max Lerner (Viking, 1948) p. 295.
5. Ibid., p. 296.
6. **The Social Impact of Cybernetics.** Charles Dechert, Editor. p. 141, 149. In the course of this article, we will try to make clear some of the dialectical properties of this curvature of the space-time continuum of social evolution. See also ANARCHOS No. 3, Spring, 1969, p. 38 (the article in Anarchos is in many ways parallel and convergent with what I am trying to do in this one, though often in a much richer and more developed context.) The new outlook which is arising out of the comprehension of the powerful convergences of the deepest views of Marx, Freud, Chardin, and others (even McLuhan), and from the manifest relationships of these convergences to the upstart synthetic sciences such as ecology and cybernetics, represents in my view, the theoretical preparation and complement of the renewed revolutionary movement which is beginning to well up again in this country. In this context, the rapid spread of Marxist influence in the Left over the last few years, though usually in its most vulgar and ideological forms, is portentious, and prepares the ground for the more serious discussions which are sure to ensue. That some of the most advanced theoretical developments to date have issued from a group which feels its strongest affinity with the anarchist tradition is worthy of note. Though it is not likely to come to rest finally in that tradition, the critical appropriation of Marxism which Anarchos represents is likely to serve as one of the sources of the revolutionary theory of the coming American revolution, a theory which, like the revolutionary movement it seeks to guide and comprehend, is still in its infancy.
7. deChardin, Pierre Teilhard. op cit. p. 170 and **The Phenomenon of Man,** p. 162. The apparent collapse of this historical dimension of human being in advanced capitalist society is part of the sense Marcuse intended to convey by his term "One-Dimensional Man," and is the theme of his book by that title.
8. "The Medium is the Massage," by Marshall McLuhan and Quentin Fiore, p. 26.
9. Ibid., pgs. 31-44.
10. In the lineal, mechanical sense which McLuhan deplores? (Ibid., p. 45).
11. Understanding Media: The Extensions of Man by Marshall McLuhan, p. 19. For a discussion of Chardin related conception of the "totalization of the Noosphere" see his **Man's Place in Nature** (Harper and Row, 1966), Chapter V.
12. The relevance of Freudian conceptions, especially as presented by Norman O. Brown, to this "bodily" theory of technology, should be immediately apparent. Unfortunately, there is no room here to explore the deeper convergences of these theories. Here we must restrict ourselve to two representative quotations:
    (1) "the unconscious, in order to become conscious, must transform itself into external perceptions. . ."
    (2) ". . .sublimation (culture) negates the body of childhood and seeks to construct the lost body of childhood in the external world'. . .the entirety of culture is projection. . ."
    Life Against Death the Psycholanalytical Meaning of History) by Norman O. Brown (Vintage, 1959), Pgs. 148 and 170 respectively.
13. "Economic and Philosophical Manuscripts" in **Karl Marx, Early Writings** translated and edited by T. B. Bottomore (McGraw-Hill, 1964), p. 122.
14. Ibid., p. 160
15. "War and Peace in the Global Village" by Marshall McLuhan and Quentin Fiore. (Bantam, 1968), p. 10.
16. Op cit., pgs. 160-162.
17. From **The Holy Family** by Karl Marx and Frederick Engels.
18. **Karl Marx, Early Writings** p. 160.
19. **Karl Marx, Early Writings** (EPM) p. 213.
20. Ibid., pgs. 159-160.
21. For this information I am indebted to the editors of Anarchos in their polemical critique of Marxism and Leninism "Listen Marxist," and to certain publications of the Situationist International (particularly their pamphlet "The Totality for Kids").
22. **Karl Marx, Early Writings,** p. 157.
23. Berkeley Physics Course, Volume 2 "Electricity and Magnetism" by Edward Purcell (McGraw-Hill, 1965). The full quote reads: "Positive ions are drawn in one direction, negative ions in the opposite direction. . .They can go no further than the surface of the conductor. . .Piling up there, they begin themselves to create an electric field inside the body which tends to cancel the original field. And in fact, the movement goes on until the original field is precisely cancelled."
24. See "A Contribution to the Critique of Political Economy" by Karl Marx, (Charles Kerr and Company, 1904), pgs. 11-13 (Preface). Automation itself has a place in the "reunion" of man and nature, in that it represents the closing of the machine process back on itself (the essence of feedback), the exclosure of man from the productive process (the "realm of necessity"), and the lapse of the productive process into a cyclosis which joins it to the ecological cycloses of the pre-human natural world. This transition signifies the consolidation of the material life-process of society (the human outgrowth of nature; the human zone of nature) heretofore the active region of nature, the meristem of the biosphere, the growing edge of the world, exploding and expanding catastrophically, upsetting old ecological relations in the process of evolving and congealing new ones – as a stable part of the ecosystem (homeostatic steady state). It is impossible here to go into either the anticipations of automation in Marx – whether in his theory of the "organic composition" of capital, in certain passages of his "Grundrisse der Kritik der Politischen Oekonomie," or in other of the manuscripts and fragments which he left unpublished – or the passages wherein he seems to deny himself this possiblity. Marcuse translates some of these passages, particularly in the beginning of "One-Dimensional Man."
25. **Karl Marx, Early Writings** p. 155.
26. Ibid., p. 167.

Do you think we're living in the Plastic Age?

With all the plastic consumer products that are around these days, you might get the impression that plastics have become the basic material of our time. That simply isn't true. ☐ **The fact is that metals account for 85% of all manufacturing material used in industry today.** And more metal is used every year. ☐ **Die-cast zinc** and **galvanized steel** for example, are being used in greater quantities than ever. ☐ St. Joe supplies quality zinc — American industry puts it to work.

ST. JOE

Producers and Marketers of Lead, Zinc, Zinc Oxide, Iron Ore Pellets, Iron Oxide, Agricultural Limestone, Cadmium, Copper Concentrates, Silver and Sulphuric Acid.

ST. JOSEPH LEAD CO., 250 Park Avenue, New York, New York 10017

ZN-402

Even if you don't like the air you breathe, you can't stop breathing.

When was the last time you went out for a breath of fresh air and got it? How long has it been since the sky looked really blue?

Every day, our cities dump hundreds of thousands of tons of waste into the air. Carbon monoxide. Sulfur dioxide. Fluoride compounds. And plain old soot.

If something isn't done about air pollution in your lifetime, it may cut your lifetime short.

Air pollution can be controlled. The key is technology. Technology and the engineers who can make it work.

Engineers at General Electric are working on the problem from several directions.

Rapid transit is one. In many cities, the automobile causes more than half the air pollution. In some cities, as much as 90%. But engineers at GE are designing new equipment for rapid-transit systems, encouraging more people to leave their cars in the garage.

Another direction is nuclear power. General Electric's engineers designed the very first nuclear power plant ever licensed. A nuclear plant produces electricity without producing smoke. And as the need for new power plants continues to grow, that will make a big difference.

There are other ways General Electric is fighting air pollution. Maybe you'd like to help. We could use your help. But don't expect to come up with an overnight solution to the problem.

The solution will take a lot of people, a lot of talent and a lot of time. You'll breathe easier—once you get started.

GENERAL ELECTRIC

An equal opportunity employer