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WISCONSIN ACADEMY REVIEW

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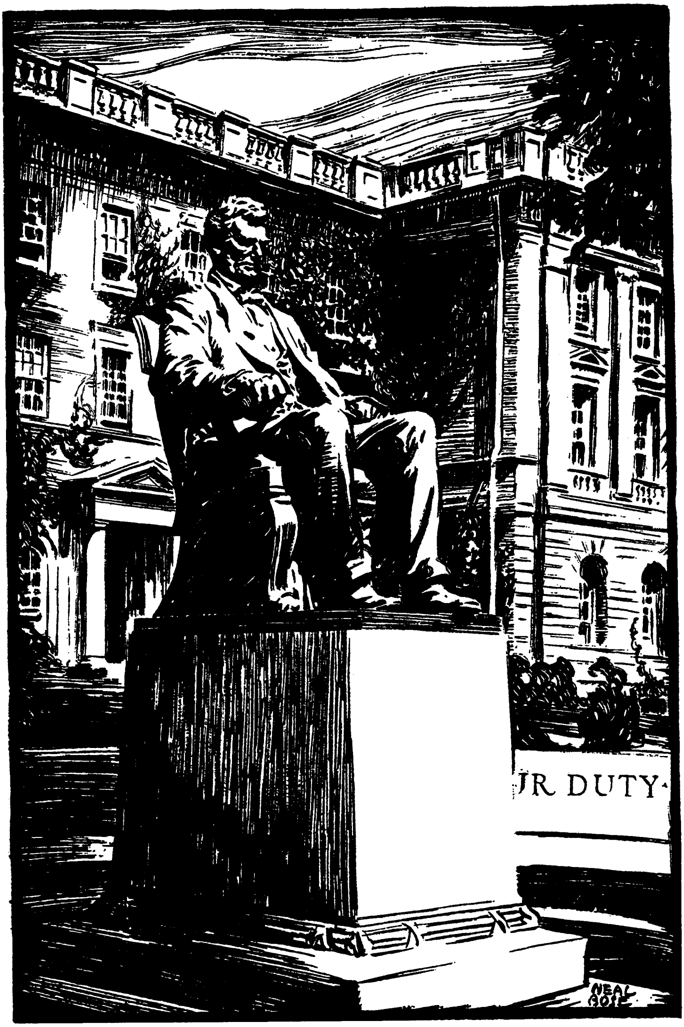

SUMMER

1959

JUNIOR ACADEMY

OF SCIENCE ISSUE

WISCONSIN ACADEMY REVIEW

Vol. 6 Summer, 1959 No. 3

CONTENTS

WISCONSIN ACADEMY REVIEW

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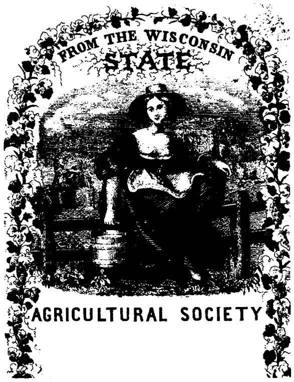


ADDRESS AT WISCONSIN STATE FAIR
September 30, 1859

Abraham Lincoln

Editor's Note: For the Academy's contribution to the Sesquicentennial of Abraham Lincoln's birth, we are republishing his address presented 100 years ago in Wisconsin as it appeared in the TRANSACTIONS of the Wisconsin State Agricultural Society, Vol. V, dated 1860. Attention is called to Lincoln's ethical principles which later were so important during his Presidency--and also to his advocacy of agricultural research and education. In fact, this document was a harbinger of the Morrill Act establishing the Land Grant system of higher education which he signed in 1862, for which a significant Centennial Celebration is being planned in 1962.

ANNUAL ADDRESS.

BY HON. ABRAM LINCOLN, OF ILLINOIS.

DELIVERED AT MILWAUKEE, SEPT. 30, 1859

Members of the Agricultural Society and Citizens of Wisconsin:

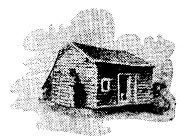
Agricultural Fairs are becoming an institution of the country; they are useful in more ways than one; they bring us together, and thereby make us better acquainted, and better friends than we otherwise would be. From the first appearance of man upon the earth, down to very recent times, the words "*stranger*" and "*enemy*" were *quite* or *almost* synonymous. Long after civilized nations had defined robbery and murder as high crimes, and had affixed severe punishments to them, when practiced among and upon their own people respectively, it was deemed no offence, but even meritorious, to rob, and murder, and enslave *strangers*, whether as nations or as individuals. Even yet, this has not totally disappeared. The man of the highest moral cultivation. in spite of all which abstract principle can do, likes him whom he *does* know, much better than him whom he does *not* know. To correct the evils, great and small, which spring from want of sympathy, and from positive enmity, among *strangers*, as nations, or as individuals, is one of the highest functions of civilization. To this end our Agricultural Fairs contribute in no small degree. They render more pleasant, and more strong, and more durable, the bond of social and political union among us. Again, if, as Pope declares, "happiness is our being's end and aim," our Fairs contribute much to that end and aim, as occasions of recreation—as holidays. Constituted as man is, he has positive need of occasional recreation; and whatever can give him this, associated with virtue and advantage, and free from vice and disadvantage, is a positive good. Such recreation our Fairs afford. They are a present pleasure, to be followed by no pain, as a consequence; they are a present pleasure, making the future more pleasant.

But the chief use of Agricultural Fairs is to aid in improving the great calling of *Agriculture*, in all its departments, and minute divisions; to make mutual exchange of agricultural discovery, information, and knowledge; so that, at the end, *all* may know everything, which may have been known to but *one*, or to but *few*, at the beginning; to bring together, especially, all which is supposed to not be generally known, because of recent discovery or invention.

And not only to bring together, and to impart all which has been *accidentally* discovered or invented upon ordinary motive; but, by exciting emulation, for premiums, and for the pride and honor of success—of triumph, in some sort—to stimulate that discovery and invention into extraordinary activity. In this, these Fairs are kindred to the patent clause in the Constitution of the United States; and to the department, and practical system, based upon that clause.

One feature, I believe, of every Fair, is a regular *Address*. The Agricultural Society of the young, prosperous, and soon to be, great State of Wisconsin, has done me the high honor of selecting me to make that address upon this occasion—an honor for which I make my profound and grateful acknowledgement.

I presume I am not expected to employ the time assigned me in the mere flattery of the farmers, as a class. My opinion of them is that, in proportion to numbers, they are neither better nor worse than other people. In the nature of things they are more numerous than any other class; and I believe there really are more attempts at flattering them than any other; the reason of which I cannot perceive, unless it be that they can cast



more votes than any other. On reflection, I am not quite sure that there is not cause of suspicion against you, in selecting me, in some sort a politician, and in no sort a farmer, to address you.

But farmers, being the most numerous class, it follows that their interest is the largest interest. It also follows that that interest is most worthy of all to be cherished and cultivated—that if there be inevitable conflict between that interest and any other, that other should yield.

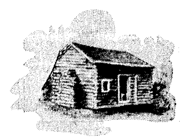
Again, I suppose it is not expected of me to impart to you much specific information on Agriculture. You have no reason to believe, and do not believe, that I possess it—if that were what you seek in this address, any one of your own number, or class, would be more able to furnish it.

You, perhaps, do expect me to give some general interest to the occasion; and to make some general suggestions, on practical matters. I shall attempt nothing more. And in such suggestions by me, quite likely very little will be new to you, and a large part of the rest possibly already known to be erroneous.

My first suggestion is an inquiry as to the effect of greater *thoroughness* in all the departments of Agriculture than now prevails in the North-West—perhaps I might say in America. To speak entirely within bounds, it is known that fifty bushels of wheat, or one hundred bushels of Indian corn can be produced from an acre. Less than a year ago I saw it stated that a man, by extraordinary care and labor, had produced of wheat what was equal to two hundred bushels from an acre. But take fifty of wheat, and one hundred of corn, to be the possibility, and compare it with the actual crops of the country.—Many years ago I saw it stated in a Patent Office Report that eighteen bushels was the average crop throughout the United States; and this year an intelligent farmer of Illinois, assured me that he did not believe the land harvested in that State this season, had yielded more than an average of eight bushels to the acre; much was cut, and then abandoned as not worth threshing; and much was abandoned as not worth cutting. As to Indian corn, and indeed, most other crops, the case has not been much better. For the last four years I do not believe the ground planted with corn in Illinois, has produced an average of twenty bushels to the acre. It is true, that heretofore we have had better crops, with no better cultivation; but I believe it is also true that the soil has never been pushed up to one-half of its capacity.

What would be the effect upon the farming interest, to push the soil up to something near its full capacity? Unquestionably it will take more labor to produce *fifty* bushels from an acre, than it will to produce *ten* bushels, from the same acre. But it will take more labor to produce fifty bushels from *one* acre, than from *five?* Unquestionably, thorough cultivation will require more labor to the *acre;* but will it require more to the *bushel?* If it should require just as *much* to the bushel, there are some *probable*, and several *certain* advantages in favor of the thorough practice. It is probable it would develop those unknown causes, which of late years have cut down our crops below their former average. It is almost certain, I think, that in the deeper plowing, analysis of the soils, experiments with manures, and varieties of seeds, observance of seasons, and the like, these cases would be found. It is certain that thorough cultivation would spare half, or more than half the cost of land, simply because the same product would be got from half, or from less than half the quantity of land. This proposition is self-evident, and can be made no plainer by repetitions or illustrations. The cost of land is a great item, even in new countries; and constantly grows greater and greater, in comparison with other items, as the country grows older.

It also would spare the making and maintaining of inclosures—the same, whether these inclosures should be hedges, ditches or fences. This again, is a heavy item—heavy at first, and heavy in its continual demand for repairs. I remember once being greatly astonished by an apparently authentic exhibition



of the proportion the cost of an inclosure bears to all the other expenses of the farmer; though I cannot remember exactly what that proportion was. Any farmer, if he will, can ascertain it in his own case, for himself.

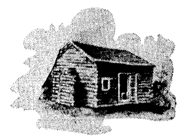
Again, a great amount of "locomotion" is spared by thorough cultivation. Take fifty bushels of wheat, ready for the harvest, standing upon a *single* acre, and it can be harvested in any of the known ways, with less than half the labor which would be required if it were spread over *five* acres. This would be true, if cut by the old hand sickle; true, to a greater extent, if by the scythe and cradle; and to a still greater extent, if by the machines now in use. These machines are chiefly valuable, as a means of substituting auimal power for the power of men in this branch of farm work. In the highest degree of perfection yet reached in applying the horse power to harvesting, fully nine-tenths of the power is expended by the animal in carrying himself and dragging the machine over the field, leaving certainly not more than one-tenth to be applied directly to the only end of the whole operation—the gathering in of the grain, and clipping of the straw. When grain is very thin on the ground, it is always more or less intermingled with weeds, chess and the like, and a large part of the power is expended in cutting these. It is plain that when the crop is very thick upon the ground, a larger proportion of the power is directly applied to gathering in and cutting it; and the smaller, to that which is totally useless as an end. And what I have said of harvesting is true, in a greater or less degree of mowing, plowing, gathering in of crops generally, and, indeed, of almost all farm work.

The effect of thorough cultivation upon the farmer's own mind, and, in reaction through his mind, back upon his business, is perhaps quite equal to any other of its effects. Every man is proud of what he does *well;* and no man is proud of that he does *not* well. With the former, his heart is in his work; and he will do twice as much of it with less fatigue. The latter performs a little imperfectly, looks at it in disgust, turns from it, and imagines himself exceedingly tired. The little he has done, comes to nothing, for want of finishing.

The man who produces a good full crop will scarcely ever let any part of it go to waste. He will keep up the enclosure about it, and allow neither man nor beast to trespass upon it. He will gather it in due season and store it in perfect security. Thus he labors with satisfaction, and saves himself the whole fruit of his labor. The other, starting with no purpose for a full crop, labors less, and with less satisfaction; allows his fence to fall, and cattle to trespass; gathers not in due season, or not all. Thus the labor he has performed, is wasted away, little by little, till in the end, he derives scarcely anything from it.

The ambition for broad acres leads to poor farming, even with men of energy. I scarcely ever knew a mammoth farm to sustain itself; much less to return a profit upon the outlay. I have more than once known a man to spend a respectable fortune upon one; fail and leave it; and then some man of modest aims, get a small fraction of the ground, and make a good living upon it. Mammoth farms are like tools or weapons, which are too heavy to be handled. Ere long they are thrown aside at a great loss.

The successful application of *steam power* to farm work, is a *desideratum*—especially a steam plow. It is not enough that a machine operated by steam, will really plow. To be successful, it must, all things considered, plow *better* than can be done with animal power. It must do all the work as well, and *cheaper:* or more *rapidly*, so as to get through more perfectly *in season;* or in some way afford an advantage over plowing with animals, else it is no success. I have never seen a machine intended for a steam plow. Much praise and admiration are bestowed upon some of them; and they may be, for aught I know, already successful; but I have not perceived the demonstration of it. I have thought a good deal, in an abstract way about a steam plow. That one which shall be so contrived as to apply the larger proportion of its power to the cutting

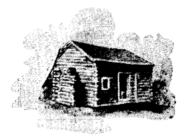


and turning the soil, and the smallest, to the moving itself over the field, will be the best one. A very small stationary engine would draw a large gang of plows through the ground from a short distance to itself; but when it is not stationary, but has to move along like a horse, dragging the plows after it, it must have additional power to carry itself; and the difficulty grows by what is intended to overcome it; for what adds power also adds size, and weight to the machine, thus increasing again, the demand for power. Suppose you should construct the machine so as to cut a succession of short furrows, say a rod in length, transversely to the course the machine is locomoting, something like the shuttle in weaving. In such case the whole machine would move north only the width of a furrow, while in length the furrow would be a rod from east to west. In such case, a very large proportion of the power, would be applied to the actual plowing. But in this, too, there would be difficulty, which would be the getting of the plow *into*, and *out of*, the ground, at the end of all these short furrows.

I believe, however, ingenious men will, if they have not already, overcome the difficulty I have suggested. But there is still another, about which I am less sanguine. It is the supply of *fuel*, and especially *water*, to make steam. Such supply is clearly practicable, but can the expense of it be borne? Steamboats live upon the water, and find their fuel at stated places. Steam mills, and other stationary steam machinery, have their stationary supplies of fuel and water. Railroad locomotives have their regular wood and water stations. But the steam plow is less fortunate. It does not live upon the water; and if it be once at a water station, it will work away from it, and when it gets away cannot return, without leaving its work, at a great expense of its time and strength. It will occur that a wagon and horse team might be employed to supply it with fuel and water; but this, too, is expensive; and the question recurs, "can the expense be borne?" When this is added to all other expenses, will not plowing cost more than in the old way?

It is to be hoped that the steam plow will be finally successfull, and if it shall be, "*thorough cultivation*"—putting the soil to the top of its capacity—producing the largest crop possible from a given quantity of ground—will be most favorable for it. Doing a large amount of work upon a small quantity of ground it will be, as nearly as possible, stationary while working, and as free as possible from locomotion; thus expending its strength as much as possible upon its work, and as little as possible in traveling. Our thanks, and something more substantial than thanks, are due to every man engaged in the effort to produce a successful steam plow. Even the unsuccessful will bring something to light which in the hands of others will contribute to the final success. I have not pointed out difficulties, in order to discourage, but in order that, being seen, they may be the more readily overcome.

The world is agreed that *labor* is the source from which human wants are mainly supplied. There is no dispute upon this point. From this point, however, men immediately diverge. Much disputation is maintained as to the best way of applying and controlling the labor element. By some it is assumed that labor is available only in connection with capital—that nobody labors, unless somebody else owning capital, somehow, by the use of it, induces him to do it. Having assumed this, they proceed to consider whether it is best that capital shall *hire* laborers, and thus induce them to work by their own consent, or *buy* them, and drive them to it, without their consent. Having proceeded so far, they naturally conclude that all laborers are naturally either *hired* laborers or *slaves*. They further assume that whoever is once a *hired* laborer, is fatally fixed in that condition for life; and thence again, that his condition is as bad as, or worse, than that of a slave. This is the "*mud-sill*" theory. But another class of reasoners hold the opinion that there is no *such* relation between capital and labor, as assumed; and that there is no such thing as a freeman being fatally fixed for life, in the condition of a hired laborer, that both these assumptions are false, and all inferences from them groundless. They

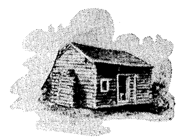


hold that labor is prior to, and independent of, capital; that, in fact, capital is the fruit of labor, and could never have existed if labor had not first existed—that labor can exist without capital, but that capital could never have existed without labor. Hence they hold that labor is the superior— greatly the superior of capital.

They do not deny that there is, and probably always will be, *a* relation between labor and capital. The error, as they hold, is in assuming that the *whole* labor of the world exists within that relation. A few men own capital; and that few avoid labor themselves, and with their capital, hire or buy another few to labor for them. A large majority belong to neither class—neither work for others, nor have others working for them.—Even in all our slave States, except South Carolina, a majority of the whole people of all colors, are neither slaves nor masters. In these free States, a large majority are neither hirers nor hired. Men, with their families—wives, sons, and daughters—work for themselves, on their farms, in their houses and in their shops, taking the whole product to themselves, and asking no favors of capital on the one hand, nor of hirelings or slaves on the other. It is not forgotton that a considerable number of persons mingle their own labor with capital; that is, labor with their own hands, and also buy slaves or hire freemen to labor for them; but this is only a mixed, and not a distinct class. No principle stated is disturbed by the existence of this mixed class. Again, as has already been said, the opponents of the "*mud-sill*" theory insist that there is not, of necessity, any such thing as the free hired laborer being fixed to that condition for life. There is demonstration for saying this. Many independent men, in this assembly, doubtless a few years ago were hired laborers. And their case is almost if not quite the general rule.

The prudent, penniless beginner in the world, labors for wages awhile, saves a surplus with which to buy tools or land, for himself; then labors on his own account another while, and at length hires another new beginner to help him. This say its advocates, is *free* labor—the just and generous, and prosperous system, which opens the way for all—gives hope to all, and energy, and progress, and improvement of condition to all. If any continue through life in the condition of the hired laborer, it is not the fault of the system, but because of either a dependent nature which prefers it, or improvidence, folly, or singular misfortune. I have said this much about the elements of labor generally; as introductory to the consideration of a new phase which that element is in process of assuming. The old general rule was that *educated* people did not perform manual labor. They managed to eat their bread, leaving the toil of producing it to the uneducated. This was not an insupportable evil to the working bees, so long as the class of drones remained very small. But *now*, especially in these free States, nearly all are educated—quite too nearly all, to leave the labor of the uneducated, in any wise adequate to the support of the whole. It follows from this that henceforth educated people must labor. Otherwise, education itself would become a positive and intolerable evil. No country can sustain, in idleness, more than a small per centage of its numbers. The great majority must labor at something productive. From these premises the problem springs—"How can *labor* and *education* be the most satisfactorily combined?"

By the "*mud-sill*" theory it is assumed that labor and education are incompatible; and any practical combination of them impossible. According to that theory, a blind horse upon a tread.mill, is a perfect illustration of what a laborer should be —all the better for being blind, that he could not kick understandingly. According to that theory, the education of laborers, is not only useless, but pernicious and dangerous. In fact, it is, in some sort, deemed a misfortune that laborers should have heads at all. Those same heads are regarded as explosive materials, only to be safely kept in damp places, as far as possible from that peculiar sort of fire which ignites them. A Yankee who could invent a strong *handed* man without a head would receive the everlasting gratitude of the "*mud-sill*" advocates.



But free labor says "no!" Free labor argues, that as the Author of man makes every individual with one head and one pair of hands, it was probably intended that heads and hands should co-operate as friends; and that that particular head, should direct and control that pair of hands. As each man has one mouth to be fed, and one pair of hands to furnish food, it was probably intended that that particular pair of hands should feed that particular mouth—that each head is the natural guardian, director and protector of the hands and mouth inseparbly connected with it; and that being so, every head should be cultivated, and improved, by whatever will add to its capacity for performing its charge. In one word free labor insits on universal education.

I have so far stated the opposite theories of "*mud-sill*" and "free labor" without declaring any preference of my own between them. On an occasion like this I ought not to declare any. I suppose, however, I shall not be mistaken, in assuming as a fact, that the people of Wisconsin prefer free labor, with its natural companion, education.

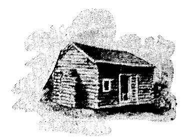
This leads to the further reflection, that no other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought, as agriculture. I know nothing so pleasant to the mind, as the discovery of anything that is at once *new* and *valuable*—nothing that so lightens and sweetens toil, as the hopeful pursuit of such discovery. And how vast, and how varied a field is agriculture, for such discovery. The mind, already trained to thought, in the country school, or higher school, cannot fail to find there an exhaustless source of enjoyment. Every blade of grass is a study; and to produce two, where there was but one, is both a profit and a pleasure. And not grass alone; but soils, seeds, and seasons—hedges, ditches, and fences, draining, drouths, and irrigation—plowing, hoeing, and harrowing—reaping, mowing, and threshing—saving crops, pests of crops, diseases of crops, and what will prevent or cure them—implements, utensils, and machines, their relative merits, and to improve them

—hogs, horses, and cattle—sheep, goats, and poultry—trees, shrubs, fruits, plants, and flowers—the thousand things of which these are specimens—each a world of study within itself.

In all this, book-learning is available. A capacity, and taste, for reading, gives access to whatever has already been discovered by others. It is the key, or one of the keys, to the already solved problems. And not only so. It gives a relish and facility for successfully pursuing the unsolved ones. The rudiments of science, are available, and highly valuable. Some knowledge of botany assists in dealing with the vegetable world—with all growing crops. Chemistry assists in the analysis of soils, selection, and application of manures, and in numerous other ways. The mechanical branches of natural philosophy, are ready help in almost everything; but especially in reference to implements and machinery.

The thought recurs that education—cultivated thought—can best be combined with agricultural labor, or any labor, on the principle of *thorough* work—that careless, half-performed, slovenly work, makes no place for such combination. And thorough work, again renders sufficient, the smallest quantity of ground to each man. And this again, conforms to what must occur in a world less inclined to wars, and more devoted to the arts of peace than heretofore. Population must increase rapidly—more rapidly than in former times—and ere long the most valuable of all arts, will be the art of deriving a comfortable subsistence from the smallest area of soil. No community whose every member possesses this art, can ever be the victim of oppression in any of its forms. Such community will be alike independent of crowned kings, money-kings, and land-kings.

But, according to your programme, the awarding of premiums awaits the closing of this address. Considering the deep interest necessarily pertaining to that performance, it would be no wonder if I am already heard with some impatience. I will detain you but a moment longer, Some of you will be success-



ful, and such will need but little philosophy to take them home in cheerful spirits; others will be disappointed, and will be in a less happy mood. To such, let it be said, "Lay it not too much to heart." Let them adopt the maxim, "Better luck next time;" and then, by renewed exertion, make that better luck for themselves.

And by the successful, and unsuccessful, let it be remembered, that while occasions like the present, bring their sober and durable benefits, the exultations and mortifications of them are but temporary; that the victor will soon be vanquished, if he relax in his exertion; and that the vanquished this year, may be victor the next, in spite of all competition.

It is said an Eastern monarch once charged his wise men to invent him a sentence, to be ever in view, and which should be true and appropriate in all times and situations. They presented him the words, "*And this, too, shall pass away.*" How much it expresses! How chastening in the hour of pride! How consoling in the depths of affliction! "And this, too, shall pass away." And yet, let us hope, it is not *quite* true. Let us hope, rather, that by the best cultivation of the physical world, beneath and around us, and the intellectual and moral world within us, we shall secure an individual, social, and political prosperity and happiness, whose course shall be onward and upward, and which, while the earth endures, shall not pass away.

The Wisconsin Junior Academy of Science

Sponsored by the Wisconsin Academy of Sciences, Arts and Letters

"For the discovery and development of scientific ability among the youth of Wisconsin"

Fifteen years ago the Wisconsin Junior Academy of Science was founded by a committee of the Senior Academy and the College of Letters and Science of the University of Wisconsin. On May 20, 1944 the first nine papers were presented at a Marquette University meeting. Within 10 years over a hundred papers were being presented at four district and two statewide meetings annually. Now there are seven districts (see map on back cover) and 21 papers presented at the final joint meeting with the Senior Academy each year.

The Junior Academy, under the leadership of Chairman JOHN W. THOMSON (UW Dept. of Botany), operates with a volunteer staff of educators on district and statewide committees. There is close coordination with the 187 public and parochial High School Science Clubs in 108 Wisconsin cities (1959-60 figures) and also with the National Science Talent Search. Most of the students entering that contest also participate in the subsequent Wisconsin Science Talent Search, accomplished through cooperation with the Science Clubs of America. In the latter contest, they may compete for Wisconsin Academy scholarships and for recommendations for scholarship consideration at the college of their choice.

Besides a four-year Marquette University scholarship for a major in Science, the Senior Academy offers several cash scholarships and numerous other prizes to the contest winners and other participants. The Senior Academy also administers a plan for financial support to student research projects through an arrangement with the American Association for the Advancement of Science. Now the Senior Academy is giving serious consideration to the possibility of also forming a Junior Academy of Arts and Letters.

Following are summaries of 16 Junior Academy papers presented at the recent statewide meeting in Platteville, May 2, 1959. Five others not ready for publication may be published later. It was thought that this special Junior Academy of Science Issue might help illustrate the possibilities of a separate Junior Academy TRANSACTIONS sometime in the future. With about 4,000 students participating in Wisconsin's High School science clubs, this important program deserves the support of all Senior Academy members, corporations interested in the future of science in Wisconsin, as well as state officials and legislators. -- W. E. Scott

JUNIOR ACADEMY NEWS

JUNIOR ACADEMY REPORT

By John W. Thomson, Chairman
Junior Academy Committee

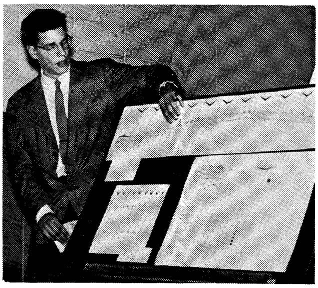
RACINE WEATHER

By Stephen Albert
St. Catherine's High School, Racine

I undertook the study of weather statistics as a project because of the interest I have developed concerning the state of the weather in the proximity of Lake Michigan and its effect on the growing season. During the past four years I have taken daily maximum and minimum temperature readings, on the Lakefront. I have also kept a daily record of the sky condition as well as the type and amount of precipitation.

One theory I undertook to prove was that the Lake has a noticeable cooling effect in the summer and a warming effect in winter. Water contracts as it cools, until it reaches a temperature of 4°C. As the temperature is lowered below 4°C, the water expands until the freezing point is reached. Because the volume of water decreases as the temperature is lowered, the density of the water increases. (The mass of the water is constant.) Therefore, water has its maximum density at 4°C; hence, as water cools it sinks to a lower region as warmer water replaces it. The specific heat of water also prevents the water from cooling as fast as other substances. These facts should prove my theory. I graphed the temperature record of 1958 as an example.

My first step was to obtain the average daily record of the maximum and minimum temperatures for the City of Racine. After searching through files and other sources of information, I concluded that there was no average daily record available. However, I did obtain an average monthly record from the U. S. Printing Office. I then located the records of the daily and average monthly temperatures for Milwaukee, 30 miles north of Racine. (The records were averages of the last 50 years.) I then com-



pared the monthly temperature for each of the two cities. I found that Racine's maximum was 2.3° higher than Milwaukee's and that the minimum was .3° lower than Milwaukee's. I interpolated this data onto the Milwaukee daily averages, and obtained Racine's daily average. I then graphed the results. Following this I graphed my own Lakefront readings. Of course, my daily readings did not follow the even pattern of the average temperatures--some were above the average, some were below. I showed the amount my maximum reading was above the average maximum by coloring in the portion with red and the amount it was below by filling in the portion with blue diagonals. In the same manner I showed the amount my minimum readings fluctuated--red diagonals above, blue coloring below.

The graph shows that the maximums of May, June, and July, near the Lake, were below the average inland maximum; the minimums, for September, October, and November, near the Lake, were above the average inland minimum. Racine's daily inland reports for the same period showed average or above average temperatures for the spring months, and below average temperatures for the fall months. For example: May 1, maximum inland was 65°, near the Lake it was 60°; June 1, maximum inland was 64°; near the Lake it was 55°; July 1, maximum inland was 88°; near the Lake it was 83°. The first frost inland was on November 6; close to the Lake it was November 18. The last item affords Lakeshore residents an extra two weeks for the growing season. The warmer winter averages enable less hardy plants to successfully withstand conditions and permits cultivation of plants not recommended for our planting zone. These findings seem to show that the Lake benefits those who live close to it.

The other theory I investigated concerned weather cycles. Meteorologists maintain that weather extremes occur in cycles. I attempted to show this by means of a temperature graph. I plotted the yearly maximum and minimum temperature records for the period of years between 1875 and 1958, in a method similar to that used in the preceding graph. It was interesting to note that the graph showed fluctuations occurring in 7-11 year cycles, tending to agree with the suggestion lately made by scientists that sun spot activity has an association with weather; sun spots actively occur in an 11-year pattern. The results of this experiment were not conclusive, and I hope to continue with more study on this interesting theory.

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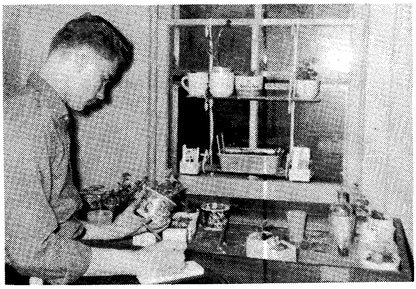
PLANT GROWTH STIMULI: A DREAM OR A REALITY?

By George Truettner
De Pere High School

An Asian fungus called Gibberella Fujikuroi produced strange effects on rice plants which were infected with it. Japanese scientists were the first to isolate the Gibberellin compounds approximately 30 years ago. Since then, the weird effects of this liquid on plants have been the subject of very intense study.



My first introduction to Gibberellic Acid came about while reading the December '58 issue of Scientific American magazine. I did not, however, begin experimenting until the middle of February this year.

For the first tests, I chose ordinary garden peas. There were seven groups of plants, six of which received solutions containing from one-tenth to one-ten-thousandth milligram of acid per cubic centimeter, and the seventh group, being the control, received clear tap water. All plants were given ten cubic centimeters of the proper solution every 24 hours, this being applied directly to the soil.

The effects of the acid were amazing. In one 24-hour period, the group of plants receiving the strongest solution of acid doubled in height. The effects, however, were not all good: the stronger the acid solution, the taller the plant, but the leaf and root systems were very poorly developed.

To discover exactly what the acid did, I ran a series of tests to pinpoint a reason for the growth spurt. By removing the plants from the soil and weighing them, drying, and again weighing, I was able to figure out the percentage of moisture. All plants contained above 98% moisture. The dried plants were then decomposed to inorganic ash by heating. The amount of ash was so small that I could not measure it with the instruments I was using.

Since that first experiment, I have worked with tomatoes, strawberries, dahlias, chrysanthemums, coleus, and Christmas cacti. I have also endeavored to find out whether or not the acid increases the plant's metabolic rate, which can be measured by the speed at which a plant takes in oxygen. This test must be done in darkness so the plant will absorb oxygen. The plant, plus a small quantity of Calcium Chloride (to absorb moisture), and lime water (to absorb carbon dioxide), are sealed in a cylinder into which air in measured amounts can be admitted. By attaching an open manometer, the difference in pressure inside and outside the cylinder can be seen. The time required for the plant to absorb a given amount of oxygen is recorded. A relationship can be established if the plants used are of approximately the same size and if all are given the same amount of oxygen. The results of this test are inconclusive; however, I plan to run them several times in order to prove my accuracy.

In my opinion, Gibberellic acid will, in the near future, be of great commercial value. The possibilities for agricultural crops is unlimited.

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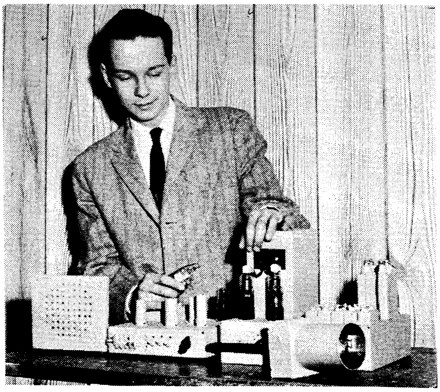
HIGH SPEED FLASH PHOTOGRAPHY

By Paul Wollwage
Appleton Senior High School

Strobe photography is simply taking pictures with bright flashes of artificial light. The duration of the flash is very very short. The light is produced in a glass tube filled with the inert gas xenon which is caused to glow by the discharge of an electronic condenser filled with high-voltage direct-current electricity. The condenser is connected in parallel with the electronic flashtube. When a spark from a small induction coil is applied to the third electrode on the surface of the flashtube, it causes the xenon gas to ionize thus creating light and heat.



My strobe unit operates at 2,000 volts direct-current and has four different flash durations. The flash duration is directly proportional to the internal resistance of the flashtube times the capacitance. I use four different condensers which give me average flash durations of five microseconds.

I specifically activate my strobe unit by means of a sound device. When an object breaks it makes some kind of sound. If the sound is changed into electrical impulses then there is a way to fire the electronic flash. My sound unit consists of a dynamic microphone, an amplifier, and an electronic thyratron tube. After the sound is picked up by the microphone, it is amplified. This signal then fires my thyratron tube which in turn trips my strobe unit. Since sound travels at 1,090 feet per second at 0° centigrade, the farther the microphone is placed from the object to be broken the greater the amount of breakage that will take place before the photo is taken. In other words, a picture may be obtained at the instant the object is breaking or after the object is just about completely broken.

I have been using a twin reflex camera to take my pictures. By using tri-x film and developing it 50% overtime I have been able to obtain satisfactory results.

In the future I am hoping to build a flash unit with a much shorter flash duration. This will be done by means of a spark gap.

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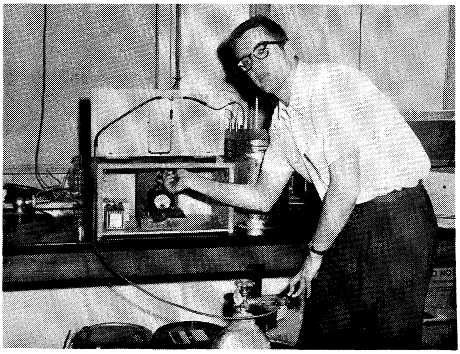
SEPARATION OF LIGHT HYDROCARBONS BY GAS CHROMATOGRAPHY

By John Scribner
Appleton Senior High School

TERMINOLOGY:

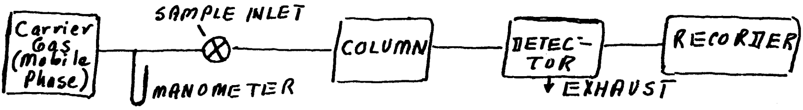
Column - a given length of uniform tubing, usually either copper or glass, which is filled (packed) with the stationary phase
Column effluent - the mobile phase emerging from the column and containing the separated fractions
Fractions - pure components of a mixture of gases: as, methane in natural gas, or oxygen in air
Internal standard - a pure sample, run through a chromatography system for comparison of its physical properties with those of the fractions being separated
Mobile phase - a moving stream of gas, inert to the column packing, which is used to force the sample through the system
Stationary phase; adsorbent - a suitable substance with strong adsorbent attraction for gases: as, silica gel, alumina, zeolite
Stationary phase; partition - a suitable solvent impregnated upon an inert support such as diatomaceous earth
Either is used for separation of fractions by their varying rates of diffusion through the column
Thermistor - an extremely small resistor whose conductance is directly proportional to the temperature and which has a high sensitivity of response to changes in temperature.



Gas chromatography is a simple (in principle) method of separating the fractions of mixtures of gases by selective adsorption or absorption over an adsorption or partition column. When separated, the fractions can be determined by various means of detection.

The necessary components of a chromatographic system are as follows: 1) a mobile phase, 2) a pressure and/or flow regulator, 3) a sample inlet, 4) a separation column, and 5) a detection and recording unit.

Fig. 1 BLOCK DIAGRAM OF BASIC CHROMATOGRAPHIC UNIT



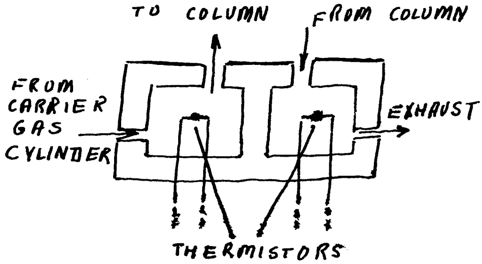
The properties of the carrier gas are dependent upon the detection system used and determine the type of gas needed. This will be discussed in connection with the detection and recording units.

A flow indicator is necessary, as most detection units are sensitive to the rate of flow of the carrier gas. A simple indicator consists of a manometer at the carrier gas inlet. By keeping the inlet at a constant pressure and having the exhaust at atmospheric pressure, a constant pressure drop is maintained which in turn insures a constant flow rate.

The column separates the fractions by selective adsorption or partition. In my initial experiments I used sodium zeolite as an adsorbent. My present partition column consists of mineral oil impregnated on C-22 firebrick ground to 30-60 mesh and packed in a glass column about four feet long with an inside diameter of four millimeters.

The design and efficiency of the detection and recording unit affect the performance and results of the entire system greatly. My first unit, with which I experimented unsatisfactorily, consisted of adsorbing carbon dioxide carrier gas in a caustic solution and measuring (with a gas burette) the increases in volume of the emerging fractions against the time of operation.

Fig. 2 THERMAL CONDUCTIVITY CELL



My present system consists of measuring impurities in the column effluent by comparing its changing thermal conductivity to that of the pure carrier gas. Here, helium is the best carrier gas because of its extremely high rate of thermal conductivity.

The detector consists of a metal block which has been bored so as to afford inlets for the two gas streams and for corresponding electrical connections. (See Fig. 2) Inserted in the gas streams are thermistors which are incorporated into a Wheatstone bridge network which compares their conductances with changes in the composition of the column effluent.

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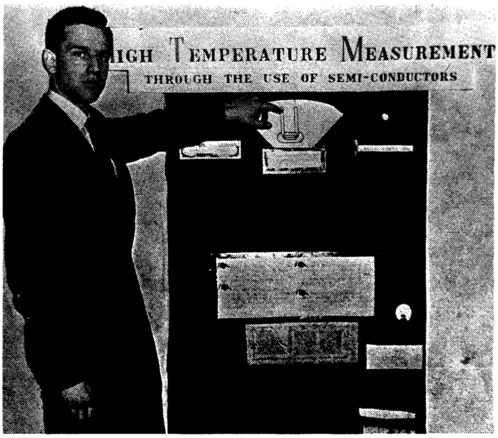
HIGH TEMPERATURE MEASUREMENT THROUGH THE USE OF A SEMI-CONDUCTOR

By Thomas K. Gregory
Nicolet High School, Milwaukee

As the knowledge of some scientific discovery increases and its uses become wider, more accurate equipment is needed to meet the requirements of a new age. This is exactly what is happening in the field of High Temperature Physics. As its uses are increasing, more and more accurate means of temperature measurement are being designed. The latest design is the disappearing filament optical pyrometer. This instrument, however, depends on the eye of the observer for its accuracy; and therefore, it may be very inaccurate. A still better method is needed. Finding a better method

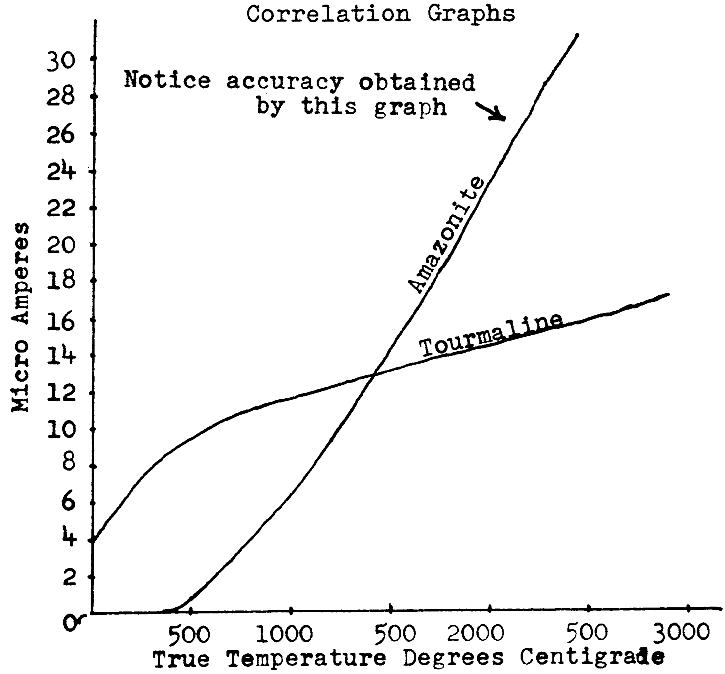


is the project with which I am concerned. After doing much basic research and reviewing literature, I found that from 1300°C on up very little had been accomplished in accurate measurement. I also read that certain minerals and cermats, which have a high conductance at high temperatures, have a high resistance to electricity at normal temperatures. This would be the principle which would be explored.

First a heat source must be built. Since other methods would be impractical for me to build, I decided to use a gas heat source. I constructed the gas source with fire brick and asbestos cement. A 'V' form is the shape which was found to be best.

After completing the furnace, I began work on a semiconductor. Tourmaline is a very complex mineral consisting of aluminum borosilicate combined with chromium, iron, magnesium, and the alkali metals. It crystallizes hexagonally and may be found in many colors. When heated or subjected to friction, however, it produces a static charge. In order to determine if Tourmaline would work, it had to be tested. Because of the high working temperature, I had to devise a way of conducting the electricity

Correlation Graphs



to and from the semi-conductor. For this purpose graphite and carbon rods were used. Because Tourmaline would oxidize very rapidly at the high temperatures, all oxygen had to be removed from the Tourmaline. To do this I first used a chamber in the rear of the furnace. It was filled with nitrogen and the contacts were made as shown. This apparatus was too bulky and inconvenient, so I switched to the element that I am pointing to in the picture. This element was much smaller and sturdier. It consisted of two carbon rods and the Tourmaline covered by a ceramic coat.

To test the elements a circuit was constructed which measures the change in resistance of the crystals. A graph plotting temperature against resistance was then made.

I also tested Amazonite, another mineral. After calibrating this metal a graph similar to the one in the diagram was obtained. Because of the large change in micro-amperes for only a small change in the temperature, this mineral would make a very accurate measuring device.

In the future I plan to make further tests to determine what effect size, shape, and current have on my graphs. I also will make more calibration graphs to substantiate the ones I have already made.

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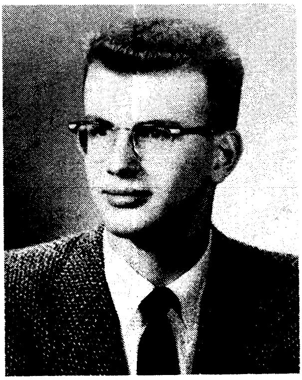
VISUALIZATION OF SECTIONS OF BODIES OF REVOLUTION

By Horst H. Fruehwirth
Rufus King High School, Milwaukee

If we take a look at our surroundings it is almost impossible to find an object that does not incorporate some geometric figure in its design or shape. My project deals with the study of a special kind of figures, namely sections of bodies, or more correctly, surfaces of revolution.



A section is the figure obtained by the intersection of one geometric figure with another. For example, the intersection of two planes is a straight line, which is the figure formed. A surface of revolution is a surface generated by revolving a plane curve about a line in its plane. To give a few examples: If a right triangle is rotated about one of its legs, a circular cone is generated; if a rectangle is rotated around one of its sides, a circular cylinder is the result. The shape of the surface produced depends on the figure which was rotated and on the choice of the axis. Any plane curve can be rotated and the resulting surface can become very complicated, depending on the two variables that control its shape.

The apparatus which I have with me is used to show conic sections. A white frame in the form of a triangle is rotated, forming a cone. To produce a section, I have to have the surface of rotation and a cutting plane. To supply the plane, I used a slide projector with special slides that I made myself. Basically, the slide consists of a thin line of a color contrasting its background. As the rays of the contrasting color leave the projector, they are arranged in a form that I call a plane of light. As this thin plane of light strikes the rotating frame it is reflected. The result is a band of light around the frame which is the section produced by the intersection of the plane of light and the surface of revolution. The shape of the figure that one sees, depends on the location of the observer, even though the figure does not change.

All of the sections produced with the cone are of the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$. The value of the constants depends on the nature of the cutting plane producing the section.

If we take a certain plane of light producing a section and give it a displacement in a vertical direction, the resulting figure seems to wind itself around the cone. It is somewhat similar to the thread of a screw or bolt. On a cylindrical surface this kind of a section or figure is called a helix. As different planes of light are used, a great number of different figures of more complex nature can be obtained.

With a machine such as the one I have here, many different forms can be used to form various bodies or rather surfaces of rotation. A practically unlimited number of different sections can therefore be studied with one machine.

In analytic geometry, projective geometry, and related studies, it is often necessary for the student to visualize intersections of planes with surfaces formed by the rotation of a plane curve. The study of conic sections is just one of many examples that demonstrate this. With the help of a machine similar to the one I constructed, it would be much easier for students to visualize and study particular sections of certain surfaces of revolution.

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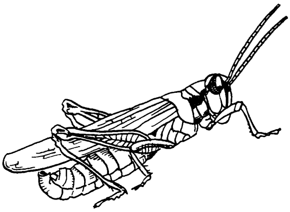


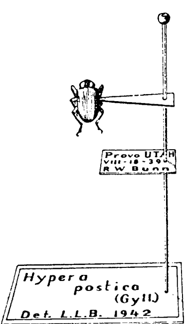
METHODS OF MOUNTING AND PRESERVING INSECTS

By Carol Barker
Adams-Friendship High School

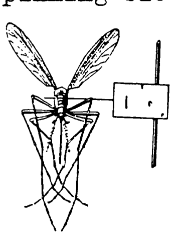
I have been an amateur entomologist since I was in the second grade. Two years ago, when I was a sophomore, our county agricultural agent recommended me to the State Agriculture Department as a Volunteer Pest Control Reporter. These people do a very thorough job, and I had to learn to identify many insects in our farm community and to observe insect populations closely. As a result, I have had a variety of field experience.

The equipment I use is almost entirely homemade. It has seen service in demonstrations to younger 4-H Club members and to my high school science classes, and much of it has been exhibited at county fairs.

There is a correct point for mounting each different order of insects. All bugs (Hemiptera) and beetles (Coleoptera) are pinned off-center in the abdomen. Roaches, grasshoppers, and crickets (Orthoptera) are pinned off-center in the thorax. Wasps, ants, bees, and flies (Hymenoptera and Diptera) are also pinned off-center in the thorax. Butterflies and moths (Lepidoptera) are pinned in the center of the thorax. These orders include most of the insects in an amateur's collection.



The insect is placed low enough on the pin to handle it well and high enough to leave room for two identification labels. The upper one contains the place and date collected and the collector's initials. The lower one identifies the insect. Sometimes a third label, containing the host plant and other data, is used. A pinning block assures uniform placement of labels.



Very small specimens may be mounted on card points or minuten nadeln pins, which are then mounted on a regular insect pin. The card point is a small, Isosceles triangle of stiff paper, with the insect glued on the point. Minuten nadeln pins are very small, headless pins. One end pierces a cube of balsa and the other the insect. These pins are dangerous, for they are so small they can work their way into one's body, and consequently his blood

stream, without his knowledge. If they reach his heart or brain, they can kill him.

A microscope slide may be used to mount specimens too small for either a minuten nadeln or card point mount. The specimen is placed on a drop of Caedex or other mounting medium. A glass slide cover, with sealed edges, protects it.

The most difficult specimens to mount are larvae. The simplest way is to drop them into alcohol and make a liquid mount. But the best way for study is to inflate and bake the skin so every body detail is clearly visible. This is accomplished by first rolling the body contents through the anal opening with a pencil. Then a glass cannula with a double-valve bulb arrangement is inserted into the anus to keep the larva inflated while it is baked in a divided oven with an alcohol lamp in the lower half heating the upper half. When the skin is dry, it is carefully taken off the cannula and mounted.

Plastic mounts are decorative. The liquid plastic, mixed with a hardener, is poured into a mold, the specimens arranged, and the mold allowed to set. I make jewelry, paperweights, and other ornamental objects in this way.

With the mounts described in this paper, I made an insect case which also contains a cross-section of the insects commonly found in our neighborhood. It is helpful in teaching identities to others. More beneficial than harmful insects are in my collection, for we have more friends than enemies in the insect world.

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Construction work amounting to $14,690,000 is either underway or recently completed at the STATE COLLEGES. Nine new student unions will open in September and Superior will have the first new science building, to which is connected the demonstration school. Eau Claire is looking forward to a Fall 1960 opening of a $1 million library and Whitewater will soon have a new laboratory school and girls' dorm. Demonstration farms at River Falls and Platteville, dormitories at La Crosse, Oshkosh and River Falls, and health-physical education buildings under construction at River Falls and Stevens Point soon will be realities. - - -

AMYLASE ACTIVITY OF SALIVA

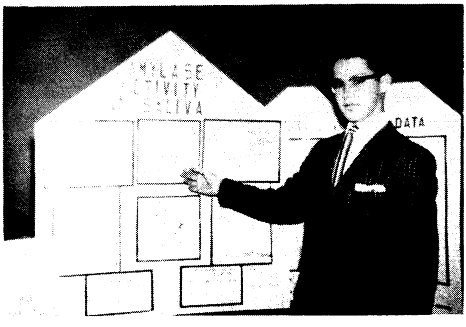
By John Schleppenbach
Notre Dame-McDonell High School, Chippewa Falls

The purpose of my project is to test the activity of the diastase enzyme, ptyalin, or salivary amylase, which is prevalent in saliva, on the substrate, starch. It includes: 1) The testing of the hydrolysis of starch by salivary amylase; 2) a study of the action of the enzyme at different temperatures; 3) observation of the microscopic structure of starch before and after enzyme action; 4) graphing of the amylase activity as affected by age and weight differences; 5) charting of the physical and emotional factor differences: hunger, excitement, illness; 6) noting the relation of enzyme action before and after use of antiseptic; HCl role; 7) determining the relation of amount of substrate to enzyme used.

Amylase is secreted in saliva chiefly from the parotid gland and is the first step in digestion. It breaks down starches into sugars by its hydrolyzing action. This change is effected by the addition of one molecule of water to satisfy the incomplete glucose molecules resulting from the polysaccharide. To test this activity I used the following method: To 5 ml. of 1% starch suspension heated on a water bath and held at a constant temperature, I added two or more drops of saliva. At one minute intervals after the addition of saliva, I introduced three drops of the starch-saliva mixture to one drop of dilute iodine in a depression of a spot plate.

The resulting color change formed the basis for all my tests on the hydrolysis of starch in its many phases from temperature difference to substrate variation.

Starch + H_2O $\xrightarrow{\text{Amylase}}$ Dextrin (Red) $\xrightarrow{\text{Amylase}}$ Maltose (Amber) $\xrightarrow{\text{Maltase}}$ Glucose (Colorless)



The time required for this phenomenon of color ranged from six to 20 minutes or more. A red color with Fehling solution confirmed the presence of a reducing sugar.

In my study of amylase action at different temperatures I found that the enzyme acts as a true catalyst and speeds the reaction. There is, however, a limit at which heat kills the enzyme. The reaction occurs very slowly at room temperature (70 minutes), is almost imperceptible at 0°C, is destroyed at about 80°C, and is most favorable at optimum 37° to 40°C. The optimum is reasonable, since body temperature comes within this range. Two phenomena occur with rising temperature: The catalytic effect of the enzyme is hastened; the action that destroys the enzyme is also hastened. The tests which follow were run at optimum temperature.

At this point I sidetracked to observe the microscopic structure of starch. Before enzyme action, the grains are oval in shape and enclosed in an envelope, as in my sample of rye flour. Water does not dissolve this envelope, but boiling causes the grains to swell and break. After enzyme action on raw or boiled starch, the starch is barely visible. Digestion by amylase changes it to a soluble sugar.

Enzyme activity at various ages strikes an interesting note. Action increases proportionally with age, i.e. is faster in older persons. During the same tests I noticed that amylase activity in females occurs faster than in males. This difference aroused my curiosity in the enzyme action in obese and slender persons. Trying saliva of these types in the same age group, I found that there is a slight difference.

The latter opened the door to amylase action in the presence or absence of physical and emotional factors. Tests conducted on time-of-day difference showed little change. Appreciable differences appeared when the enzyme was tested during hunger, thirst, excitement and illness, when compared with their opposing factors. Why? I knew the amount of enzyme has little effect on enzyme action. Amylase is thermolabile, so fever or low body temperature could vary the action. The most pronounced cause I found was the enzyme's specificity to a definite medium--alkaline or neutral.

Therefore, my next venture was in the field of amylase action in the presence of antiseptics and HCl. Antiseptics (Listerine) killed the enzyme, since the blue color persisted with iodine. HCl has a catalyzing effect but the reaction occurs faster than does the enzyme conversion. The hydrogen ion replaces the water molecule of the enzyme to complete hydrolysis. This type of action occurs in the acid medium of the stomach, replacing the amylase action in an alkaline or neutral medium in the mouth.

Substrate and enzyme variation also proved satisfying. Varying the amount of starch changes the speed of the action, owing to the great dilution of saliva. However, increasing the saliva content has practically no effect.

In the future, I plan to study amylase activity in animals. I also plan to find the amount of amylase in saliva by a test which I have devised.

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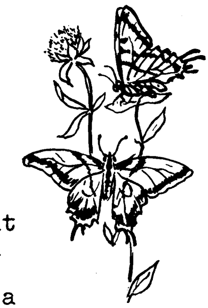
BUTTERFLIES

By Anthony Hakl
Columbus High School, Marshfield



Of the many possible studies of insect life out of doors, collecting and raising butterflies appeals to me most. The equipment I used is by no means elaborate. My net is a two-foot cheesecloth bag on a 12-inch hoop. For carrying my live specimens, I found that a round oatmeal carton provided with a screen top the best.

To kill my butterflies I used either the cyanide jar or applied chloroform directly to the head of the butterfly. I prefer the chloroform way because it is faster and will allow spreading and pinning of a specimen before it stiffens.

A sturdy cardboard box of medium size provided with a glass top and filled with a layer of cotton makes a very desirable mounting box. There were times when I rearranged my specimens. This required careful relaxing of a stiff butterfly. A small glass tank half filled with a layer of damp sawdust serves this purpose very well. The results were very desirable if I prolonged the relaxing time to about 72 hours.

My collecting was confined to an area of approximately one square mile because I wanted to see how many kinds of butterflies could be found in an area of that size. So far I have found 14 different kinds and their variations. By repeating a collection in this zone yearly I hope to obtain more conclusive data.

I began my collection with a butterfly commonly known as the Sulphur butterfly. At first they all look alike but from references I soon learned that they can be distinguished mainly by color, by peculiarities in wing venation and by comparing the upper and under surfaces of the wings. The time of the year for

(Continued on p. 122)

A Message from the President

Greetings to all members of the Wisconsin Academy of Sciences, Arts and Letters. As we look forward to our 90th meeting to be held in Madison in May of 1960 we must make certain that we will not be found in the condition of Henry C. Work's clock, i.e. "stopped short--never to go again." Instead we must make certain that we maintain the requisites of a healthy, living Academy. A variety of elemental constituents, efficient organization, activities which promote growth and assure continuity by providing for adaptiveness to changing conditions, are the attributes of life--and must be present in our organization if we are to have a Living Academy. I should like to make a few remarks with regard to each of these characteristics.

Academy constituents: Once each year at our annual meeting scientists and humanists, both old and young, are brought together in a way that promotes scholarship and advances research so that horizons are raised and the frontiers of knowledge extended. As we look ahead to the 1959-60 year, it is encouraging to note the growth of both our Junior and Senior Academies.

When our schools open this fall, there will be a call to order for approximately 125 chapters in the seven districts in which Junior Academy of Science operates (see back cover map). This represents a membership of nearly 3,500. Junior Academy leader Professor John W. Thomson, the officers of these many clubs, and the devoted teachers who sponsor them, are to be commended for their efforts and achievements.

For some time now the Senior Academy has been looking ahead to when there will be an active Junior Academy of Arts and Letters at work in our schools. We all may hope that the "driving force" to establish a first chapter comes into being this year.

A continued growth in membership of the Senior Academy can be assured for this year through a complete cooperation of our members with the campaign being planned by the membership committee under the leadership of Professor Robert F. Roeming of the University of Wisconsin-Milwaukee.

Organization: A rapidly increasing membership demands efficient committee organization and leadership. The committees presented and elected at the annual meeting are moving into action. Special committees for 1959-60 will be announced soon after the September meeting of the Council. Those to be approved are 1) Program, 2) Finance, 3) Junior Academy of Arts and Letters, and 4) Publicity and Public Relations.

Activity which promotes growth: In 1957 the Program Committee recommended a tentative series of program themes to the Council. The accepted proposal called for:

1) 1958--A meeting in Whitewater with a Symposium on the Kettle Moraine
2) 1959--A meeting in Platteville with a Symposium on the Driftless area
3) 1960--A Meeting in Madison with a Symposium on the Lakes of Wisconsin.

The success of the programs in Whitewater and Platteville indicate that programs which include planned symposia and coordinated field trips add purpose and interest to our annual meetings. Accordingly, we are looking forward to the early part of May when both the Junior and Senior Academies will meet concurrently in Madison at the Wisconsin Center Building with the University of Wisconsin serving as our host.

Adaptiveness: Throughout the years the Academy has received some financial aid from the State Legislature for the publication of the TRANSACTIONS. The funds from dues, gifts, and interest from endowments always have been sufficient to meet our annual costs of operation.

The effects of inflation on the costs of publishing the TRANSACTIONS and the Wisconsin Academy Review and the expanded activities of the Academy indicate that additional income is needed by our organization. The State Emergency Board has been asked to consider increasing the appropriations to the Academy. We also will need other sources of income if we are to continue to increase our activities and services throughout the State of Wisconsin.

President Henry Meyer is Professor of Biology at Wisconsin State College-Whitewater and prior to going there, he taught at Ripon College in a similar capacity for a number of years. He has been active in Wisconsin Academy affairs for some time and especially served in the Program and Planning and Junior Academy activities.

All of us are proud of the achievements of the Wisconsin Academy. We must maintain or better the quality of our publications. We must increase our support of the Junior Academy, particularly in the area of providing scholarships and awards for winners in the annual Science Talent Search. We must face the fact that general operational costs have increased. In the months ahead we must find these necessary additional sources of income. Everyone can help in doing this by:

1) paying our dues regularly and promptly
2) joining an "Every member get a new member" campaign
3) selling the Academy and its program to a friend or organization able and willing to finance a Junior Academy Scholarship
4) making individual cash gifts for the support of the Academy.

---Henry Meyer, President

their emerging also helps to distinguish butterflies. My collection includes three kinds of Sulphur butterflies, which are the large size showing seasonal variations, those collected in spring and those collected in fall. Of the family Nymphalidae I have the following: Milbert's Tortoise Shell, Painted Lady, Buckeye and Mourning Cloak. The family Papilionidae is represented by the black and the tiger swallowtail butterflies and the Monarch butterfly represents the family Donaidae.

I also tried to raise my own butterflies from eggs and larvae with some rather unusual results. One day I found some eggs I had seen a black swallowtail butterfly lay. I took them in the house where 10 days later they hatched. The larvae went through various moults until they were about two inches long with a green body having black crossbands with yellow spots. At this time they changed into chrysalids. The process included fastening themselves to a twig and shedding their skin. Then a hard encasing covering of chitin formed in which the transformation from larva to butterfly took place. The stage of development lasted from September to February.

At this time in February I discovered a strange fly among my chrysalids. I didn't know where it had come from until I saw a hole in the side of one of the chrysalids. However, it was not until the following summer that I became sure when I found the same kind of fly among the plants in the garden apparently stinging a caterpillar. What it was really doing was depositing its eggs. The eggs eventually hatch and eat away at the insides of the larva. By the time the larva goes into its chrysalid stage the parasite or ichneumon fly is full grown and emerges through the side of the chrysalid. A few days later my first swallowtail butterfly emerged. Its wings were wet and crumpled but within about a half hour they were beautifully filled out, having nearly a three-inch spread--a perfect specimen.

What I have done so far in butterfly collecting is relatively simple and a large proportion of my problems and failures were a result of inexperience. However, all of this has led me to a better acquaintance with butterfly books through which I learned much about butterflies and how to distinguish the different kinds commonly found. Some of my plans for the future are: 1) Include moths in my collection; 2) tag butterflies for charting flight distances; 3) recheck the same one square mile area for the kinds of butterflies found there.

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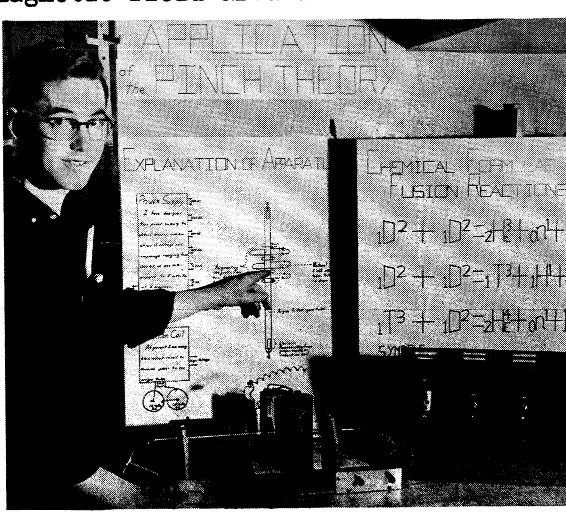
EXPERIMENTATION WITH THE CONTAINMENT THEORY TO PRODUCE THE "PINCH EFFECT"

By Dennis W. Thomson
Mount Horeb High School

The "pinch effect" theory states that if a number of electrically charged particles are moving in one direction, a magnetic field is produced which tends to confine the particles by self constriction. For my research in proving the pinch theory, I used the preceding theory as a base. First of all, I broke the theory down into its relative components and then constructed apparatus that I felt would correspond to the theory.

My first problem was to obtain a stream of particles moving in one direction that would be a fluid body and still retain all the properties of a conductor. I decided to use a one-half inch by 16 inches neon gas tube for this purpose. It would be in this tube that I would exhibit the pinch. When a current was passed through the tube, the gas became a completely ionized system of positively charged nuclei and negatively charged electrons. The gas remained fluid and because it acted like any conductor, it set up the desired magnetic field around it in which the lines of force corresponded to the left hand rule. The only way in which this tube differed from a possible fusion reactor is that I was able to pass the current directly into the gas through electrodes rather than having to induce it. I could prove the lines of force with an ordinary compass.



To operate the gas tube, I knew that I would have to use a D.C. voltage both to keep the particles moving in one direction and also to eliminate any possible A.C. cycle problems. I could not financially afford to build a transformer supply of high enough voltage but I did have the alternative of rectifying 30,000 volts off of one of the school's induction coils. I did this through the use of an army surplus 2x2 high frequency rectifier tube. By hooking this tube up in a half-wave rectifier circuit in series with the gas tube, I was able to pass about 15,000 D.C. volts through the gas tube.

The theoretical ideal with this theory would be to pass enough current through the tube so that the gas would confine itself. Since this is impossible, on a practical basis, auxillary magnetic fields must be used.

To operate my magnetic fields I designed a power supply that would furnish 2.5 to 600 D.C. volts with amperage variations from 200 milliamperes to 3 amperes.

I experimented with a large number of self-designed magnetic fields. I used various coils from long coils carrying heavy current to short coils carrying light current without securing the desired effect. With television deflection coils I was able to obtain deflection in the gas but not of the type of pinch that I desired.

I was finally able to obtain the correct type of pinch using an ion stream in a very low pressure tube connected to a vacuum pump. I used the same power supply that I had in the neon tube experiments. I used as an auxillary magnetic field the coil from an old 18-inch speaker. The coil had 575 D.C. volts at 190 milliamperes passing through it. The pinch I had obtained was ¼ inch in from the tube wall and was uniform around the whole inner side of the tube, thus demonstrating the possibility of using magnetic fields of this type in fusion research on holding atomic fuels.

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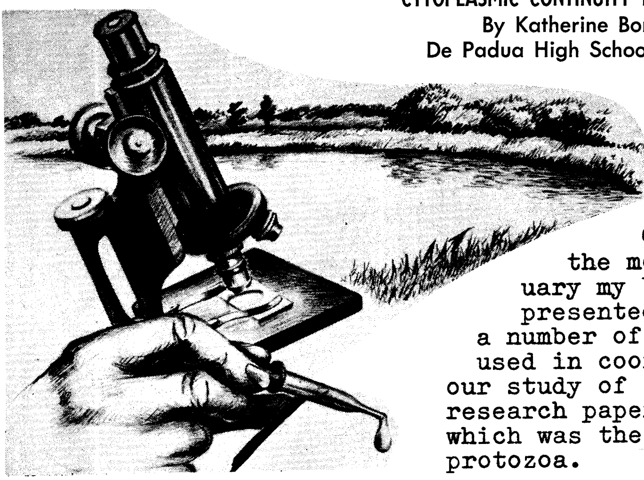
The appointment of FRANCES E. FALVEY as dean of MILWAUKEE-DOWNER COLLEGE has been announced by Pres. John B. Johnson, jr. Miss Falvey will come to Milwaukee-Downer from Millikin University at Decatur, Ill., where she has been dean of women since 1948. She previously taught at Hollins College in Virginia and at Southern Methodist University, Dallas. Dean Falvey holds her doctorate in education from Teachers College, Columbia University, New York, and her B.A. and B.Mus. from Southern Methodist University. She will assume the deanship at Milwaukee-Downer College in September. ---

CYTOPLASMIC CONTINUITY IN PARAMECIA

By Katherine Bonacci
De Padua High School, Ashland



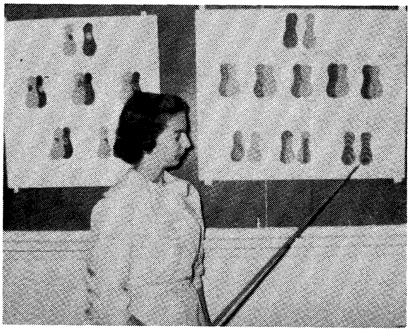
One day during the month of January my biology teacher presented to our class a number of topics to be used in coordination with our study of genetics for research papers, one of which was the heredity of protozoa.

Before explaining this theory, I would like to say that, other than the paramecium, the only way protozoa reproduce is by fission, so that the heredity traits remain the same.

For a review of ordinary conjugation, I will go through the process. Two paramecia, when in a conjugation, form a bridge near their oral groove. Their micronuclii divide into several particles, half of which are exchanged, so that when they reorganize they now contain half of their original nucleus and half of their conjugant's.

Sonneborg not only believed that they exchange parts of their nucleus but also cytoplasm, depending on the length of conjugation. To illustrate his theory he used two types of paramecia, the ordinary and a "killer type," one living in a different environment than the ordinary. He stated that if two paramecia were in conjugation less than 3½ minutes, there would be no exchange of cytoplasm but between 3½ and 30 minutes there would be different amounts exchanged. As the time increased so would the amount, and after 30 minutes there would be a complete exchange.

As a result of becoming acquainted with this theory, I decided to do some experimenting. To prove the full possibilities of this theory, I needed two types of paramecia, the ordinary and one living in a different environment. First, I placed a culture of protozoa in a salt solution consisting of seven grains of salt and two cc's of water, and



another in what I had supposed to be vinegar, but upon examination turned out to be turpentine. Having examined the solutions, I found them only able to live in the salt. I then made serial dilutions ranging from normal to .0001 normal. After examining them, I found paramecia only able to live in .0001 normal and .001 normal.

Now that I had my "killer type," I wanted to see how long they would live and how fast they would reproduce. For this I needed a slide that would keep a definite protozoan in a definite limited area under controllable conditions, and prevent evaporation completely. I used a tissue culture slide which looks like a regular rectangular slide used for examinations under the microscope, except it has a well or depression in it. I placed a drop of solution on a coverslip and inverted it. I then placed a ring of vaseline around the well and placed the coverslip on top. This prevented evaporation and also kept a definite protozoan in a definite limited area under controllable conditions.

One problem which arose was that by the results you could not really tell if they were the two original conjugants or the resultants, so I decided to color them. I used litmus blue, cochineal and congo red. I have paramecia living in each but I do not know if they are colored permanently or just temporarily, for this has been my most recent work. I have not as yet proved the theory, but I have developed a salt resistant strain of paramecia, a slide that prevents evaporation completely and keeps a definite protozoan in a definite limited area under controllable conditions, and I have colored them, but I do not know the results.

This has been an interesting project and I hope to continue either to prove it true or false.

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<u>A CORRECTION</u>: According to Professor HUGH ILTIS, Curator of the U.W. Department of Botany Herbarium, reference on p. 52 of the Spring 1959 Academy <u>Review</u> to <u>Aconitum</u> <u>uncinatum</u> at Parfrey's Glen was incorrect. The rare flower referred to should have been <u>Aconitum noveboracensis</u>.

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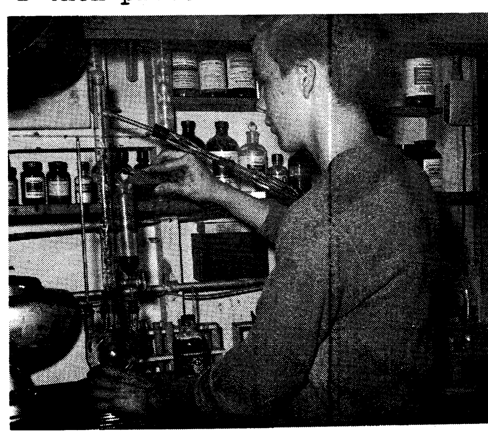
THE SYNTHESIS OF VITAMIN K[1]

By John C. Carmody
Wauwatosa High School

My experiments in chemistry began a number of years ago when I acquired a small lab which I installed in my basement. As the number of practical experiments in inorganic chemistry was depleted, I gradually turned to organic chemistry. This area holds few bounds, and I plan to experiment in the field for some years to come.

Upon finding the structure of the vitamin, I decided that to try to make it might prove to be both challenging, useful, and a good application of previously learned theories and techniques. I then proceeded to formulate a general sequence of reactions. After much experimenting, I was able to prepare a small sample on a low yield (600 mg. --about 30%).



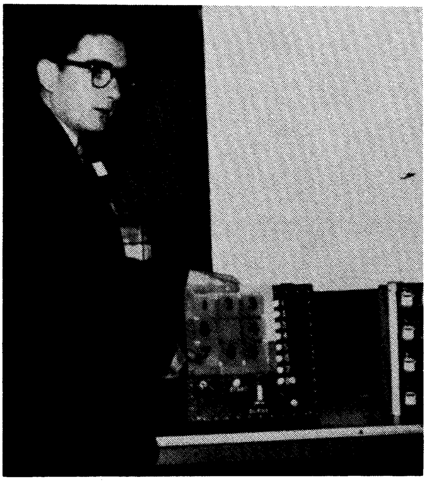
Briefly, the procedures ran as follows: 2-methyl-naphthalene, the basic starting material, was first oxidized to 2-methyl-1, 4-naphthoquinone with a solution of sodium hydrosulfite to enable the attachment of a phytol chain in the third position. As the chain was in the form of the alcohol, I used the Friedel-Crafts reaction with boron trifluoride as the catalyst. The compound was then purified and oxidized to vitamin K_1 with silver oxide. Several tests were applied to the product and all proved positive. The name of the vitamin is 2-methyl-3-phytol-1, 4-naphthoquinone.

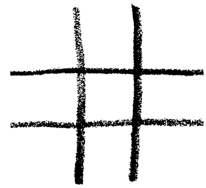
It was found on later investigation that the products of some of the intermediate reactions were also important K vitamins--thus 2-methyl-1,4-naphthoquinone is vitamin K_3, a compound important commercially and used for the control of prothrombin in the blood.

No direct help was obtained on the synthesis of the vitamin, and all work was done in my own laboratory. I wish to thank Lakeside Laboratories, Inc. of Milwaukee for the use of their library.

TICKTACKTOE

By William Hubrick
Richland Center High School





Probably all of you some time in your life have played ticktacktoe. If so, you probably thought it was a very simple game. To this I would agree, but you must remember that we are playing the game with the finest piece of machinery ever developed, the human mind. And another thing, how many of you that did play actually stopped to analyze the game? Probably not very many.

When you attempt to build a computer to duplicate even a seemingly simple task, you have a job on your hands. I discovered this after much thought, work, diagramming, and my share of failures. I chose the game ticktacktoe for my project, and decided that I would analyze the game and then build a computer to play against a human opponent.

As I have already stated, I had several failures--four, to be exact--before I arrived at the correct circuit. The main trouble I had was that of getting enough power into the circuit without overloading parts.

My finished product is a computer that plays ticktacktoe and never loses. The machine is designed to analyze the human move and then make the move that is, "in its opinion", the correct move. The machine "assumes" that the human will be intelligent enough to play logically with it, and so as a result if the human makes a mistake the machine will not always account for it. A computer could be built that would account for all possible human errors but it would be too costly to be practical.

I will not be able to explain in detail the workings of the computer in such a short space, but will generally outline its workings. The machine has two basic circuits, the in-put--that is to say, the circuit that feeds information into the computer where it is correlated. The second is the output circuit which feeds out the processed information. The in-put relays are equipped with holder circuits and thus provide the machine with a type of memory. The impulses coming out of the machine are recorded on a panel of lights, red for the machine's moves and green for the human opponent.

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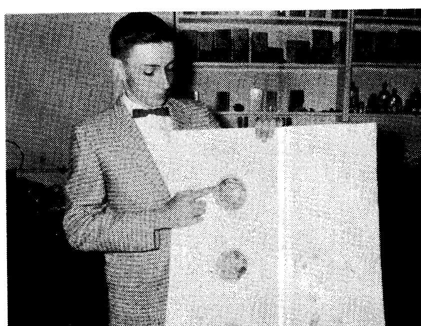
EFFECTS OF METALS ON BACTERIA

By Gary Gurske
De Padua High School, Ashland

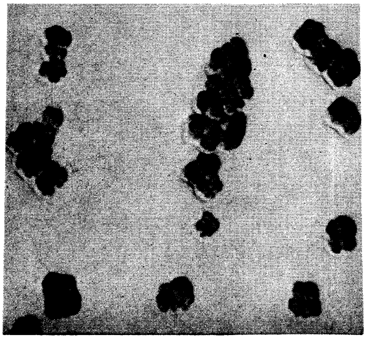
In January I became interested in the study of bacteria. Consulting Sister Georgette, my biology instructor, I was set up with some of the equipment I would use.



In order to become acquainted with the growth of bacteria, I conducted some tests by innoculating four petri dishes with bacteria from a doorknob, desk top, and from my hands before I washed them and after I had. I washed them with just water and dried them with a paper towel. In a few days I was very surprised at the results. The dish innoculated by my washed hands was covered by bacteria while the others had a small amount. Acting on a conjecture I innoculated another dish with a paper towel like the one I had used to dry my hands. In a few days I had the same results as the dish of the washed hands.

This is where my experiment actually began. Because of the small amount of bacteria on the dish innoculated by the doorknob, I wondered if metals had an effect on bacteria.

In the first part of my tests I used six metals: zinc, copper, lead, tin, nickel, and iron, and two types of bacteria, Serratia Marscens and Sarcina Lutea. In these tests I found that zinc had a positive effect on the Serratia Marscens, the red colored bacteria. It kept the bacteria from growing within one centimeter distance from the metal. Copper also had a positive effect on both types of bacteria. It had the same effect as zinc had on the bacteria.



Sarcina Lutea

In the second part of the test I used three metals: zinc alloy 1, zinc alloy 2, and aluminum. The reason for choosing the zinc alloys was because of the positive effect of the pure zinc I wondered if an alloy would have the same effect. The reason for choosing the aluminum was for its extensive use in the home.

In these tests I found that the zinc alloy 2 had a positive effect on the Serratia Marscens just like the pure zinc had had. It had a negative effect on the Sarcina Lutea. The zinc alloy 1, and aluminum proved to be negative in both types of bacteria.

Because of my limited number of tests my conclusions are indecisive. But, I do know that some metals have an effect on bacteria.

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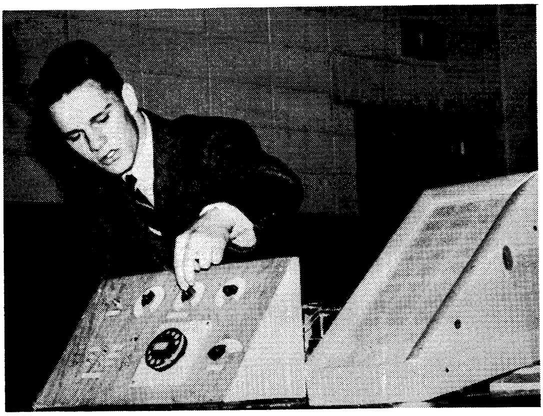
MATHEMATICAL COMPUTER

By Gary Dix
Salem Central High School

The construction of this computer was made possible when my uncle gave me an old bowling machine. This machine furnished almost all of the parts I needed, and those which I had to buy cost about $8.50. The design is completely my own and in the following paragraphs I shall attempt to explain it.

The heart of this machine is three stepping relays, each of which represents a decimal place. Each relay has ten contacts which represent ten numbers from the decimal system. These relays advance one space for each electrical impulse that is sent into them. After ten impulses are sent in, these relays reset to their first contact, which corresponds to zero.

When the machine is set to add, the dial sends pulses into one of these relays, and the dial switch controls which of these relays is pulsed. Each time that one of the relays resets, the relay of the next highest decimal place is stepped up one digit. This corresponds to carrying over digits in the usual process of addition.



The usual method for subtracting is to reverse the direction of the relays, but this could not be done here because the relays which I used would go only in one direction. Therefore I have designed the following system: The minuend is dialed as it would be for addition. The subtrahend, however, is dialed as itself subtracted from 1000, and this is added to the minuend to give the answer.

When multiplying and dividing, two more components are used. The first of these is a set of scanning contacts or, more simply, a scanner. This feeds pulses into the three basic stepping relays. The other is a stepping relay which differs from the others in that it resets only one space at a time.

In multiplication the pulses from the dial advance the fourth stepping relay. The multiplier switches control the scanning contacts, and they determine what number is added to the other stepping relays. Upon every rotation of the scanning contacts, the number set on the multiplier switches is totaled on the three basic relays and the fourth stepping relay is reduced one space. In this way the scanner makes as many revolutions as the number that is dialed. When a number is multiplied on the machine, it is consecutively added a certain number of times.

In division the dividend subtracted from 1000 is set up on the three basic stepping relays. The scanner successively adds the divisor to this number. During this time, the fourth stepping relay records the number of times that the scanner revolves. When the total of 1000 is reached, the three basic relays are reset and then the number recorded on the fourth relay is transferred to them, and this number is the answer.

This computer is not especially fast or accurate, because of the age and condition of the relays which were used. However, I believe that this basic design could be successfully adapted to better computers.

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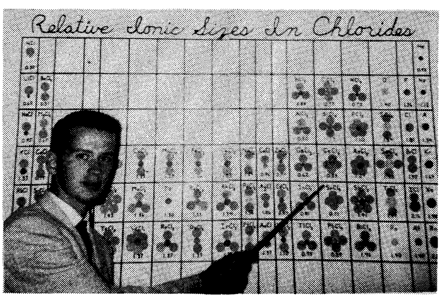
A PERIODIC CHART FOR CHLORIDES

By Randall Cowley
Central High School, La Crosse

The study of the elements of the earth dates far back into recorded history; however, the first attempts to organize a table of the chemical elements in accordance with their properties is quite recent. It was not until 1787 that four Frenchmen began work on a classification system of elements. Since that time and especially since Mendeljeef's announcements in 1869, many new ideas, improvements and variations of periodic tables have been devised.



While studying chemistry in my junior year, I learned the value of an organized periodic table in helping me to learn about the elements. During the study of compounds and their properties, it occurred to me that arranging of compounds of elements on a periodic chart might show relations of properties that would be helpful in understanding the nature of the elements after they have formed chemical bonds. I found that no such tables, to my knowledge, had been developed. So I decided to investigate further.

My first problem was one of selection. Evidently one cannot easily include all known compounds on one chart nor can one conveniently set down many properties for each compound. I chose to develop my "compound" periodic chart around chlorides because they are relatively simple compounds and also because most elements form chlorides.

Using the periodic chart developed by Mendeljeef and elaborated by Gardner in 1930 as a guide, I took the families of elements and arranged their chlorides in a horizontal position on my first chart rather than the conventional vertical position. Better than one-fourth of the melting points and boiling points of the chlorides are at present only estimated or are unknown because of the difficulty of determining them accurately. The horizontal position of the periodic families of chlorides facilitated the graphing of the known thermal points and the estimating of the unknown ones.

On the first chart were included for each chloride its symbol, molecular weight, melting and boiling points and its solubility in cold water. The chart made evident the known fact that the chlorides of metallic elements have relatively high melting points and boiling points whereas the chlorides of the non-metals have low melting points and boiling points. One interesting fact brought out on the chart was that, for the chlorides series: $MaCl$, $MgCl_2$, $AlCl_3$, $SiCl_4$, PCl_5, SCl_2, the compounds with an odd number of chloride ions had higher melting points than those with even numbered chloride ions.

For my second chart chlorides of the elements were put in the standard positions of Mendeljeef's chart. For each molecule I constructed circular disks of colored paper to represent its ions. The chlorine ion has a radius of 1.81 angstroms. I used a disk with a radius of 18.1 thirty-seconds of an inch as a basic unit and varied the sizes of the combining ions respectively. I used a different color of paper for each family of chlorides. Included on the chart were the symbols of the compounds and the radius of the ion combined with the chlorine.

This chart gave an understanding of the relative sizes of the ionic aggregation or covalent molecules in graphic form.

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FILMS AVAILABLE

Academy member C. G. SAGER (Sager Film Productions, Box 115, Grafton) has completed a series of 16 mm. films on "Your Wisconsin," commissioned by the Milwaukee Journal to help commemorate their 75th anniversary. They are all approximately 25 minutes in length, sound, color, and available through the Journal without charge. Write to Mr. Court Conlee, V.P., Promotions, The Milwaukee Journal, Milwaukee 1.

Individual films on:	Title:
Schools	"Freedom's Future"
Forests	"Timbre of the Times"
Waterways	"Waterways"
World trade	"World Trade"
Medical research, training	"People and Patience"
Youth problems	"Growing Up in Wisconsin"
Highways	"Paving the Way"

GEORGE W. KEITT, Plant Pathologist

A UW Retirement "Profile"

GEORGE W. KEITT has given distinguished service to the University of Wisconsin for 49 years. Few faculty members have been privileged to serve the University so long, and few have made as many contributions to the development and reputation of the University. Starting in plant pathology when the science was in its infancy, his work in the field established him as one of the distinguished teachers and research workers, and brought students to Wisconsin from all over the world. His professional colleagues elected him to many positions of responsibility in professional societies and voted him many honors.

His high ideals, sound judgment, personal integrity and his quiet, modest and courteous manner brought to him the trust and respect of his colleagues in all divisions of the University. At various times they demonstrated this trust by electing him to responsible faculty committees, where he performed outstanding service. His colleagues at the University are happy to know that Professor Keitt will continue his research.

He affiliated with the Wisconsin Academy in 1917 and in 1958 was elected a Life member. ---From Wisconsin Alumnus, July 1959

FARRINGTON DANIELS, Chemist

A UW Retirement "Profile"

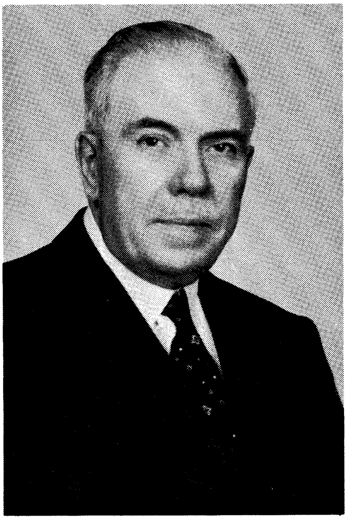
To all who know him, the name of FARRINGTON DANIELS connotes imagination, enthusiasm, a warm personal interest in others as individuals, farsighted concern for the future of the world, and outstanding achievement as a scientist, administrator and teacher. Since joining the University in 1920 he has taught and supervised the research of scores of students. He has played a leading role on important policy making committees of the University and nation. Since 1952 he has been chairman of the chemistry department. He is author of six books.

He is currently vice-president of the National Academy of Sciences. Among the other important offices he has held are the presidency of the 85,000 member American Chemical Society and the directorship during 1945-46 of the Metallurgical Laboratory of the wartime atomic energy project. He has won the Priestly and the Willard Gibbs Medals (Acad.Rev. Summer 1955). He has been affiliated with the Wisconsin Academy since 1921.

For him, promotion to emeritus status means not retirement but added effort in research and continued service as a statesman of science. ---From Wisconsin Alumnus, July 1959

FORREST R. POLK, Administrator

Retirement Profile



When Oshkosh State College President FORREST R. POLK closed his office door and stepped into retirement on June 30, he left behind him the results of 28 years of administration in the largest and one of the most respected of the Wisconsin State Colleges. No president in the history of the college had served as long nor faced as many crises as did President Polk. From the moment he became president in 1931, problems were his constant companions. At the outset of his administration, the nation was stunned by the Great Depression. In terms of the college, this period was a struggle between increasing enrollments and curtailed budgets. Through this period, he gave the college remarkable staying power.

The depression ended, but World War II came with its special problems. Young men who normally would have been carrying books to classes were carrying rifles onto battlefields. For the college, which is primarily a teacher training institution, it meant an obstacle in the flow of teachers into our state elementary and secondary schools. To expedite the graduation of needed teachers, he arranged for an accelerated teacher-training program to counter shortages created by war. Also, under his administration, the war effort was aided directly by the establishment of the 96th College Training Detachment of the Army Air Force.

Following the war, the GI students came and taxed the facilities of the college to the fullest. They were followed by a "normal" increase in enrollment which was larger than the boldest predictions indicated. Between the school years of 1953-54 and 1957-58, the enrollment more than doubled. These rapid enrollment increases brought problems of staff, facilities, and supplies. How these problems were met by President Polk's administration can be seen in the academic strength and physical growth of the college which can be measured in the growth of its offerings. Since 1932, when 10 majors were offered, six new majors and several minors have been added.

Special educational projects were also initiated under President Polk's administration or with his cooperation. With several of the State Colleges, he helped to establish and maintain a conservation summer study camp in northern Wisconsin. Another project was the establishment, in cooperation with his education staff, of an "internship" teaching program for elementary education seniors. Under the program, seniors who sign teaching contracts early in the spring semester spend two weeks of practice teaching in the schools in which they have contracted to teach following graduation.

The physical facilities of the college, which remained fairly dormant during the depression and war years, began to expand shortly after World War II. Through purchases and gifts, land was acquired and a long range building program was begun. A women's residence area, which today contains three dormitories, was established; a new health and physical education building was erected; and a modern student union was built. Also, during the closing stages of his presidency, a site was acquired for a dormitory for men and preliminary plans for building it were completed. Preliminary work also was begun on a new college library building.

President Polk was born at Tobinsport, Indiana, on Oct. 12, 1888. He received a B.S. degree from Valparaiso College in 1909 and a B.E. degree in engineering from Purdue University in 1914. He has done graduate work at the University of Chicago and at the University of Wisconsin. He came to the college in 1915, after a few years of teaching and administration in the public schools of Indiana. His first association with the college was as an instructor in the Industrial Department from 1915 to 1917. He then became a member of the A.E.F. as a first lieutenant in the 315th Field Artillery.

After an interval of civil engineering following the war, he returned to the college as an instructor of mathematics in 1921. In the late 1920's, he embarked on his doctorate study at the University of Wisconsin. Before he could complete this study, he was called back to the college to assume the presidency. In recent years he gave significant leadership and support to the Wisconsin Academy.

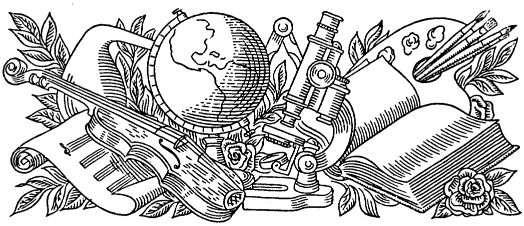
In his retirement, Forrest R. Polk and his wife will continue to make their home in Oshkosh.--D. W. Zahalka, Oshkosh

# # #

SUMER IS ICUMEN IN

Sumer is icumen in,
  Lhude sing cuccu;
Groweth sed and bloweth med
  And springth the wude nu.
    Sing cuccu;
Aew bleteth after lomb,
  Lhouth after calve cu;
Bulluc sterteth, bucke verteth;
  Murie sing cuccu.
    Cuccu, cuccu,
Wel singes thu, cuccu,
  Ne swik thu naver nu.

(Thirteenth Century, Anonymous)



STATE AND ACADEMY NEWS

HIGH SCHOOL PROGRAMS AND COLLEGE ATTENDANCE IN WISCONSIN

(Article Prepared for Wisconsin Academy Review by Joint Staff of Coordinating Committee for Higher Education in Wisconsin)

Following are some of the conclusions reached in a recent study of value to the Coordinating Committee for Higher Education in Wisconsin entitled, "The College-Preparatory Function in Wisconsin High Schools:"

30% of the Wisconsin public high school seniors in 1957 planned to attend degree-granting institutions

Approximately 60% of all Wisconsin high school graduates in the upper half of their classes in 1957 planned to continue their schooling beyond high school

77% of the public and private high school seniors in 1957 had taken algebra; 54%, geometry; 13%, trigonometry; 45%, chemistry; 30%, physics; and 37% foreign languages

One-third in the top quarter did not continue

Women were superior to men scholastically in rank in high school class, but scores in mental ability tests showed little difference

70% of the Wisconsin students entering Wisconsin colleges in 1957 ranked in the top half of their high school classes; 42% ranked in the top quarter

A high percentage of all the freshman applicants to Wisconsin public and private colleges in 1957 were graduates of Wisconsin high schools, with 91.8% at the state colleges, 75.3% at the University, and 50.7% at the private institutions

Nearly one-third of all the Wisconsin freshmen were placed on academic probation during the academic year of 1957-58 in the state colleges and University (including Milwaukee and extension centers). 22% were placed on probation in the private colleges

The percentage of Wisconsin freshmen receiving academic honors in 1957-58 was highest at the state colleges,10.1%

The University (including Milwaukee and extension centers) dismissed the most freshmen for academic reasons for the year 1957-58, slightly over 15%.

This study by a University of Wisconsin educational research group was published in a recent issue of the U.W. Bulletin of the School of Education. It encompasses a comprehensive study of the problems of high school-college relationships in Wisconsin and examines the manner in which Wisconsin's secondary schools are attempting to fulfill their college-preparatory function. Its purposes, without endorsing any particular type of program, are to aid the high schools in strengthening their programs and adjusting their curricula to the increasing demands for college preparation now facing the secondary schools.

A total of 420 Wisconsin public schools and a one-sixth sample of seniors in Wisconsin public and private high schools answered questionnaires which were devised and analyzed by Professors EDWARD A. KRUG and CLIFFORD S. LIDDLE of the School of Education, RUSSELL C. MOSELY, staff member, State Department of Public Instruction, and DANIEL S. PARKINSON, curriculum research assistant at the University. Responses from admissions officers and registrars of Wisconsin institutions and documents pertaining to the problem were also used. The Joint Staff of the Coordinating Committee participated in some of the planning of this study.

The historical development of the college-preparatory function in the United States is followed to emphasize the practices, trends and relationships between the high schools and colleges throughout the entire span of our educational history. It is interesting to note that even in the late 19th century preparation for college was only an incidental objective of the high school. An 1892 NEA committee report states in part: "The secondary schools of the United States, taken as a whole, do not exist for the purpose of preparing boys and girls for colleges. ... The preparation of a few pupils for college or scientific school should in the ordinary secondary school be the incidental, and not the principal object."

As the Krug study points out, this situation is far from the case today, when high schools must prepare students for continued learning and study, whether in a college or somewhere else. With the increasing percentages of high school graduates seeking college entrance, the college-preparatory function is becoming more important than at any previous time in the history of American secondary education. The study concludes that our high schools must carry out the responsibility not only of preparing students to enter college, but also of preparing them to do good work after they are admitted. Equally important is the job of providing a general education for all students, whether or not they are going to college.

Among other conclusions of the study is the importance of closer cooperation between high schools and colleges, since a relationship is found to exist between the pattern of high school study and success in college. High schools and colleges should furnish each other with more information about their curricula and instructional practices than they do at present. Interest in advanced placement and scholarship awards to attract larger percentages of talented youth should be more widely considered. More uniform testing programs are needed in both high schools and colleges, and needless duplication of these programs should be eliminated. Since requirements for admission serve as guides for the selection of students, and in view of the increasing enrollments, sound and clarified admission policies should be developed.

The function of the College Board Entrance Examination, which has been increasing in membership nationally, is explained in detail in this report, as its nature and purpose are often misunderstood. It is felt by the research group that the Examination could be an aid in helping students and institutions make sound decisions relative to preparation and admission to college.

The Krug document describes the traditional method used by high schools to enable students to prepare for college, which is the "college preparatory curriculum" or "track." More than half of the 420 public high schools in Wisconsin surveyed for this report use such "tracks" and approximately 35% of the public and private high school seniors reported they were following such a program. The college preparatory "track" does facilitate counseling in many cases, and although it is no guarantee for college entrance, it does help the student with definite college plans choose courses demanded by many of the colleges. It also seems to encourage an improvement in teaching procedures so that various college-type methods are often encountered, such as note-taking on lectures and written term reports. More graduates from high schools which have the "track" go to college than from those without such programs.

The college preparatory classification is a rough indicator of ability when the intellectual levels of the college preparatory students and the non-college preparatory students are compared. The greater number of superior students come from the college preparatory group, yet there is substantial overlapping between the two groups. Some of the college preparatory students rank low scholastically in their classes and in the Henmon-Nelson tests; some non-college preparatory students rank high in both. There were about 2000 high ability students in the 1957 graduating classes in Wisconsin's public and private high schools who did not take the college preparatory course.

In this connection, the study emphasizes that there is no substitute for individual counseling for subject selection, both for those preparing for college and for other purposes. Adequate counseling conferences and guidance services should be strengthened in the secondary schools.

In the final chapter of the Krug study data is presented relating to admission and retention of high school students who were admitted in the fall of 1957 to Wisconsin's public and private colleges. Special attention is directed to the graduates of the state's public and private high schools. It concludes with the statement that the number of college students is increasing every year, and with the great demand for specialized talent, this greater number of students is a favorable growth. However, it is hoped that something will be done to decrease the numbers of students on probation or dismissal lists and increase those on the academic honors list. Certainly, the strengthening of the high school programs for improving the college preparation of Wisconsin's youth would be an important step in this direction.

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CHARLES N. FREY of Scarsdale, N. Y., an Academy member since 1922, recently gave 25 volumes of the TRANSACTIONS to the Academy library in order to preserve them for use by other members in the future. As some of these issues were practically out of print, his generosity was appreciated.

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UNIVERSITY OF WISCONSIN NEWS

(Prepared by U.W. News Service)

Vice Pres. FRED H. HARRINGTON has been elected to honorary membership in the Wisconsin chapter of Phi Beta Kappa. ... A six-floor addition to Sterling Hall on the UW campus at Madison was dedicated in ceremonies April 22, attended by some of the Army's top mathematicians and research leaders. The $1,200,000 building, a gift from the Wisconsin Alumni Research Foundation, houses the U.S. Army Mathematics Research Center, Numerical Analysis Laboratory, part of the physics department, and the astronomy department. ... Prof. JONATHAN W. CURVIN of the UW speech department was named by directors of the American National Theatre and Academy to represent U.S. colleges and universities at the bi-annual International Theatre Congress in Helsinki, June 1-6. ... About 450 art educators from across the nation met on the UW campus at Madison for the 17th annual conference of the National Committee on Art Education, April 29-May 2. Prof. FREDERICK M. LOGAN was general chairman. ... The College of Engineering has received over 2½ tons of natural uranium from the Atomic Energy Commission. The uranium, valued at nearly $90,000, is on loan for use in instruction of students in nuclear processes.

Dean JOHN E. WILLARD of the Graduate School has received a $1,000 Award for Nuclear Applications in Chemistry at the American Chemical Society's national meeting in Boston. ... President Emeritus E. B. FRED has received a Citation for meritorious service from Virginia Polytechnic Institute, from which he received his bachelor's degree in 1907 and his master's degree in 1908. ... Prof. JOHN D. FERRY has received the high honor of election to membership in the National Academy of Science, the 24th UW scientist to be so honored. He also has been named chairman of the Chemistry department, succeeding Prof. FARRINGTON DANIELS, who retired July 1. Prof. Daniels received the honored doctor of science degree in June from the University of Minnesota. ... Three of the University's outstanding young teachers have received $1,000 awards: Prof. DONALD BUCKLIN, zoology, the first Emil H. Steiger Memorial Teaching Award; Prof. EUGENE KAELIN, philosophy, and Prof. KARL KROEBER, English, both William Kiekhofer Memorial Teaching Awards. ... Prof. ROLAND A. RAGATZ of the College of Engineering received the $1,000 Benjamin Smith Reynolds Award for excellence in teaching. ... Seven UW faculty members have been elected to the American Academy of Arts and Sciences: Profs. HELEN WHITE, English; JOSEPH HIRSCHFELDER, director of the Naval Research Laboratory; RUDOLPH LANGER, director of the U.S. Army Mathematics Research Center; GAINES POST, history; VAN R. POTTER and HAROLD RUSCH, oncology; and FOLKE SKOOG, botany.

The University has announced that it will open a Center for Luso-Brazilian Studies next September under direction of Prof. LLOYD A. KASTEN of the department of Spanish and Portuguese. ... Prof. FELIX POLLAK of Northwestern University was appointed curator of the rare books department in Wisconsin's Memorial Library, effective June 15. ... Prof. R. BYRON BIRD, of the chemical engineering department, has been awarded the Curtis W. McGraw Research Award of $1,000 by the American Society for Engineering Education. ... Prof. KARL PAUL LINK of the biochemistry department has been granted $1,000 as a 1959 winner of the John Scott award for his discovery of dicumarol.

LAKELAND COLLEGE NEWS

(From Reporter Robert R. Spatt, Rt.,Sheboygan)

The Lakeland College Board of Trustees have announced that the next building to be erected on the campus will be a new science hall. The Rev. Dr. RALPH LEY of Waukesha, chairman of the board, says he hopes the building will be completed by 1962, the year of Lakeland's centennial. ... Academy member ALLEN WANGEMANN of the biology department now has the rank of assistant professor. ... The faculty has approved an expanded program of course work in physics with a view toward strengthening the college's science curriculum. ... New member of the college's board of trustees is NORMAN A. SCHOWALTER of West Bend, a vice-president of the West Bend Aluminum Co. Re-elected were Dr. LEY, Mrs. HENRY HEFTY, Madison, and VERNON ZIMMERMAN, Appleton.

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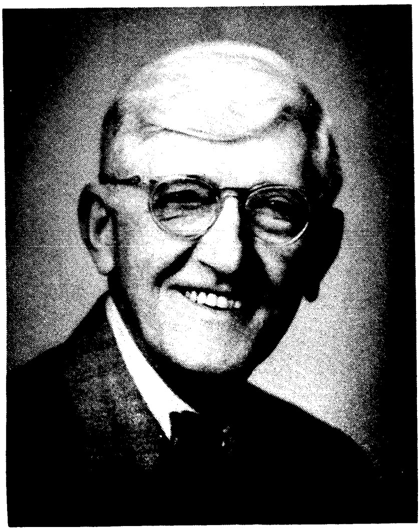
In Memoriam

E. J. B. Schubring
1878-1959



EDWARD JOHN BERNHARD SCHUBRING was born on a farm in Sauk County, Wisconsin, on Nov. 17, 1878 and died at La Jolla, California on July 22, 1959.

He secured the LLB degree from the University of Wisconsin in 1903 and became a law clerk in the office of Burr W. Jones, Madison. The next year they formed a partnership, which was dissolved upon appointment of Mr. Jones as Justice of the Supreme Court of Wisconsin in 1921. The firm of Schubring, Ryan & Peterson was formed in 1923, and at the time of death he was senior partner of the law firm of Schubring, Peterson, Sutherland and Axley.

Both Mr. and Mrs. Schubring became Life Members of the Wisconsin Academy in 1957, having been affiliated with the organization since 1920. The Fall, 1958 issue of the Academy *Review* carried further biographical details on page 163.

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MISCELLANEOUS BOOKS AND BOOKLETS

These recent publications of interest are free from sources listed unless otherwise indicated. * - author an Academy member.

From Conservation Department (State Office Bldg.,Madison 1): Leaflets on George W. Mead, Crex Meadows, Germania and Mazomanie Wildlife Areas; leaflets on "Wisconsin's County Forests" and "The Marinette County Forest Story;" Technical Bull.No. 19 on "The Hemlock Borer" by ALI HUSSAIN and R. D. SHENEFELT* and "The European Pine Shoot Moth and Its Relation to Pines in Wisconsin" by DANIEL M. BENJAMIN*, PHILIP W. SMITH* and RONALD L. BACHMAN; Forest Inventory Pub.No. 36 on "Forest Resources of Eight Counties in West Central Wisconsin" (Polk, Barron, Dunn, St. Croix, Pierce, Pepin, Buffalo and Trempealeau).

From other state agencies: State College Board of Regents, State Capitol: "Wisconsin's State College Story;" Secretary of State's Office, State Capitol: "Notes on the Great Seal and Coat of Arms of Wisconsin;" Coordinating Committee for Higher Education in Wisconsin, Wisconsin Center Bldg., (UW, Madison 6): Report on "Education Beyond High School " (June, 1959); Governor's Office, State Capitol: Division of Industrial Development Newsletter (published bimonthly); State Historical Society (Madison 6): Leaflet on the new Circus World Museum; UW Extension Service, College of Agriculture: revised (Feb.1959) circular 425 on "Growing and Selling Christmas Trees" by FRED R. TRENK*; UW Agr. Experiment Station (Madison 6): Bull. 535--80 p. of Jan. 1959 on "What's New in Farm Science" and Research Bull. 194 (rev.Mar.1959) "Wisconsin's Population--Changes and Prospects" by DOUGLAS G. MARSHALL*; and State Soil Conservation Committee (Soils Bldg., UW, Madison 6): a Quarterly called "Happenings in Soil Conservation."

From other sources: U.S. Soil Conservation Service, Wis. State Office (3010 E. Washington ave., Madison): "Soil and Water Conservation in Wisconsin;" Upper Mississippi River Conservation Committee (WILLIAM J. HARTH, Sec-Treas., Illinois Dept. Cons., Room 102 State Office Bldg., Springfield, Ill.): "Proceedings of the Fifteenth Annual Meeting (Jan. 1959)"; Trees for Tomorrow,Inc. (Merrill, Wis.), bimonthly publication called "Tree Tips."

Available for a price: "The Story of Durward's Glen" (in Columbia County) by Miss Mary Grace Terry--available from the author (Rt. 2, Baraboo) for $1.00; "Climatology and Weather Services of the St. Lawrence Seaway and Great Lakes," Tech.Bull. 35 of Weather Bureau, U.S. Dept. Commerce from Govt. Prtg. Office, Washington, D.C. for 45¢; from Joseph W. Jackson (2010 Adams st., Madison 5): "Twenty Tips for Catching Muskies" - leaflet for $1.00 and "Musky Fishing--What to Do and What Not to Do as Told by the Three Old Guides to the Author"--128 p. privately printed, $4.50; and "WATER," a new bimonthly membership publication of the Wisconsin Agricultural Water Users, Inc. (Box 258, Stevens Point) with no subscription price listed; Information circular of Wis. Geological and Natural History Survey, from State Geologist, UW Science Hall, Madison 6: "Water Levels in Observation Wells in Wisconsin through 1957" by R. E. AUDINI, C. F. BERKSTRESSER,jr. and D. B. KNOWLES of the U.S.G.S., $1.25.

NEW POSITIONS

The following are new positions of Academy members not reported elsewhere: R. W. POULTER, naturalist-photographer and General Superintendent of the John Deere Horicon Works, this fall will join the faculty of Iowa Wesleyan College, of which he is an alumnus. ... A. W. SCHORGER was re-elected an Investing Trustee of the American Ornithologists' Union. ... DONALD W. HILL of the Coordinating Committee for Higher Education Joint Staff has accepted a position as Assistant Superintendent of Schools in Chicago. ... HENRY J. DUWE has been appointed Assistant Dean of the UW Extension Division and LE ROY J. PETERSON Associate Dean for Milwaukee extension operations. ... CLAY SCHOENFELD now is UW Assistant Summer Sessions Director and Assistant to the Director of Extension Division. Last spring he was installed as chairman of the board of the University YMCA. ... ROBERT TAYLOR's new UW title is Assistant to the President and he also serves as Director of the new Department of News and Publication Service. . . . L. JOSEPH LINS now is UW Coordinator of Institutional Studies.

EUGENE E. PARFITT recently was elected President of the North American Lily Society. ... CARL FRISTER of Milwaukee is the new Field Note Editor for the Wisconsin Society for Ornithology. ... An article in American Forests for July 1959 called R. G. LYNCH of the Milwaukee Journal "the foremost newspaperman in conservation." ... BRUCE G. BUELL (Green Bay), Chief Forester of the Marathon Division of American Can Co., is President of American Forest Products Industries. ... ARTHUR D. HASLER is in charge of organizing the symposium on "Interaction in Nature" for the American Association for the Advancement of Science meeting in Chicago Dec. 26-31. ... LAURENCE R. JAHN has accepted a position as midwestern district representative for the Wildlife Management Institute and will continue his headquarters at Horicon. ... KENNETH B. RAPER and JOHN W. THOMSON have received National Science Foundation grants to continue their respective studies on fungi which produce citric acid and American arctic lichens. ... S. W. WELSH has been re-elected chairman of the Wisconsin Conservation Dept. Forest Management Board. ... FRED G. WILSON has been serving as Chairman of the Menominee Indian Committee of the Wis.-Mich. Section, Society of American Foresters and JOHN A. BEALE also serves on this committee.

RAY P. HUSSONG of Green Bay is the new President of the Wis. Society for ornithology and FRANCES HAMERSTROM, Plainfield, is vice-president. ... EVA JOHN KUHN of Whitehall has been elected President of the Wisconsin Regional Writers' Association. ... Governor GAYLORD A. NELSON has appointed JOHN W. SAUNDERS, Jr. of Marquette U. to the State Board of Examiners in the Basic Sciences. ... PAUL J. WAITE has transferred to Des Moines in his new position as State Climatologist of Iowa. ... Dean MARK H. INGRAHAM was appointed to the State Investment Board recently by Governor GAYLORD NELSON. ... FREDERICK M. LOGAN is one of the new directors of the Madison Art Association, and DON ANDERSON was re-elected as a Madison Art Foundation director. ... J. MARTIN KLOTSCHE, provost of the UW-Milwaukee, was named chairman of the metropolitan study commission in mid-August by Gov. GAYLORD A. NELSON. He has had wide experience in civic affairs in the Milwaukee area and hopes the commission can arouse public interest in metropolitan problems, as well as inspire teamwork among the several units of government in reaching solutions.

HONORS AND AWARDS

The following are honors and awards of Academy members in addition to those reported elsewhere: MILLER UPTON, President of Beloit College, is a member of the Honorary Advisory Board of "Who is Who" in Wisconsin, Inc. which is scheduled for publication of a 1960 Edition under Publisher and Editor JOHN M. MOORE (P. O. Box 3063), Hampton Station, Milwaukee, 18). ... Sister M. LAURETTA of Marshfield was featured in a two-page photo-story in the April 1959 issue of Life. ... A. W. SCHORGER recently received the Brewster Memorial Medal of the American Ornithologists' Union for his scholarly studies on the passenger pigeon. ... FRED J. SCHMEECKLE was honored at a retirement banquet recently and has moved to Rt. 1, Eagle River. ... FREDERICK L. BROWNE, chemist with the U.S. Forest Products Laboratory, was honored at a Washington, D.C. Department of Agriculture cememony for his 40 years of service. ... The Wisconsin Regional Writers' Association fall conference at Wisconsin Dells on September 26 will include presentation of a memorial for former Academy member FIDELIA VAN ANTWERP.

IRA L. BALDWIN, special assistant to the U.W. President, recently received the American Association of Conservation Information Award of Merit "for outstanding leadership in Wisconsin conservation education." ... CHARLES H. SAGE, retired vice-president of the Kimberly-Clark Corporation (Neenah), was honored by the Forest History Foundation, inc. in election as a Fellow of the Foundation for his "many years of devoted service" to their program. ... M. N. TAYLOR, Executive Director of Trees for Tomorrow, Inc. (Merrill), was given an award by the Wisconsin Chapter, Soil Cons. Society of America, for use of the outdoors as a conservation education laboratory and they also elected him a Council member. ... ALEXANDER WETMORE, one of the Academy's honorary members, recently was awarded the honorary doctor of laws degree by Ripon College. ... JOHN E. HARRIMAN of Appleton won the 1959 Herfurth men's award as a Senior in the U.W. Chemistry Dept. ... HARRY C. BROCKEL, Milwaukee's port director, was given the 27th annual Cosmopolitan Club distinguished service award recently. ... CLIFFORD LORD was given the Award of Merit of the State Historical Society at their recent annual meeting for his outstanding work while society Director. ... I. O. HEMBRE received a Presidential Citation for his work in Soil Conservation Society of America in 1958.

NEW MEMBERS

List to be carried in Fall issue

ACKNOWLEDGMENTS not listed elsewhere
(with permission from copyright holders)

Cover sketch from UW BADGER 1926; p. 97, signature of Abraham Lincoln from copyrighted booklet by Lincoln National Life Foundation, Fort Wayne, Ind.; p. 104, "cuccus" from "Guide to the Gallery of Birds in British Museum (Natural History) 1910;" p. 119 and title sketch p. 115, copyrighted "Handbook of the Insect World," by Hercules Powder Company, Wilmington, Del.; p. 115, mounted insect sketches, USDA Misc. Pub. 601, "Collection and Preservation of Insects;" p. 125, "Conservation Sketches" by Chas. W. Schwartz, Missouri Dept. of Conservation; p. 130, Courtesy General Biological Supply House, Inc., Chicago, Illinois Steam plow, p. 103, from "The Growth of Industrial Art," 1892, Govt. Prtg. Office (repro. from original copy and published by G. B. Gunlogson, 1935)

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TRANSACTIONS

(Price List, Revised Jan.1959)

Vol. 1	$50.00
Vol. 2, 20, 29, 35, 38	5.00
Vol. 3-19, 21-28, 30-34, 36-37, 39-42	.50
Vol. 43-47	3.00
Future issues	4.00
Baker - Fresh Water Mollusca (2 vol.)	3.00

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THE WISCONSIN JUNIOR ACADEMY OF SCIENCE