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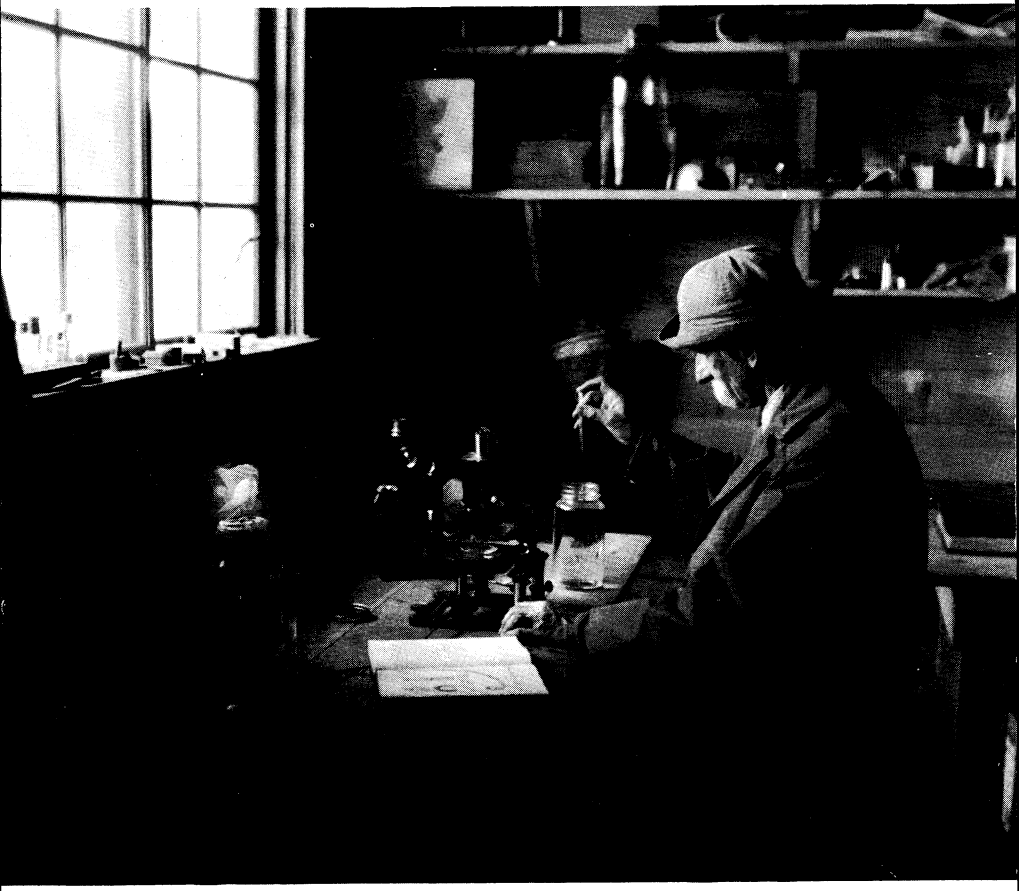
THE WISCONSIN ACADEMY OF SCIENCES, ARTS AND LETTERS



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FOSSIL POLLEN IDENTIFICATION OF POST-GLACIAL VEGETATION IN FIVE WISCONSIN PEAT AREAS

By Virginia Perner*
Columbus High School, Marshfield

Most of my work with pollen is concerned with the analysis of fossil pollen found in peat beds. The statistical record obtained in my project presents a study of the post-glacial vegetational history of selected peat beds located in five counties of Northern Wisconsin having peat deposits: Oneida, Marathon, Clark, Wood, and Juneau. The bogs in question are widely separated, and lie along a line nearly 200 miles long from north to south. (Fig. 1 on p.98).

Fig. 2

For a better graphic picture of the post-glacial vegetation of these areas, the results were divided into two troups: the edaphic pollens, or pollens of such plants as aided directly in the peat formation, or the exotic pollens, those blown in from the surrounding region. The frequency of each species of plant-life represented in the pollen counts was expressed in terms of percentage of its own group. Pollen (Fig. 2) of 15 different species of plant-growth was recognized and recorded in the tables. About 10,000 pollen grains were counted to furnish the statistical information needed to complete the analysis of the peat columns used.

Samples of peat were withdrawn from various known depths in the inner zones of the peat bed, where depths were more than four or five meters deep. Sampling columns of peat were from about 80 to 150 cm. in length, and pollen counts were made at 10 cm. intervals, each counting consisting of at least 180 to 200 pollen grains, since I discovered that at this point the counts appeared to level off and stabilize.

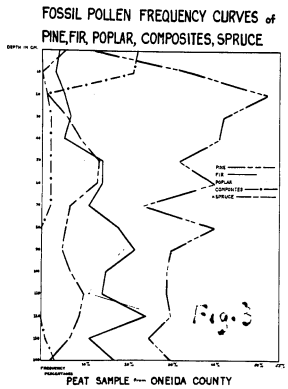
Although different methods of preparing the peat for examination were tried, the procedure suggested by Erdtman in "An Introduction to Pollen Analysis" was followed with modifications I was obliged to introduce. Identifying and counting pollen grains is known to be time consuming. For that reason I chose the less complex way proposed and

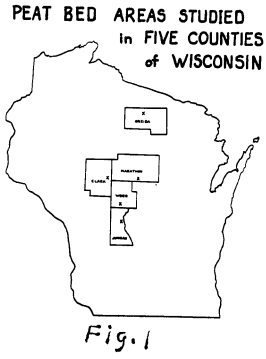
* - See center spread for additional illustration.

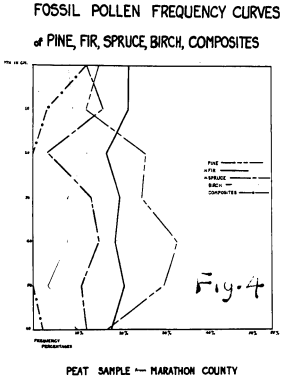
used by G. T. Brown in Pollen-Slide Studies, whereby the field of the microscope slide is checked for pollen grains by moving it in a straight path next to the one just analyzed.

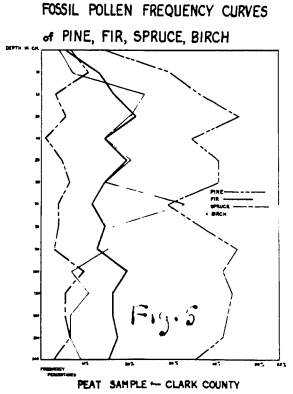
From the different pollen frequencies and their percentages, the following data was obtained. Each of the peat beds analyzed had several major dominant pollens. Those of pine showed maximum frequency in the bogs of all five counties, while oak was represented in peat from the two counties farthest south: Wood and Juneau. Birch, on the other hand, appeared in the three counties farther north: Oneida, Marathon and Clark. But spruce occurred in the three counties that lie closest to each other: Marathon, Wood and Clark. The more dominant frequencies of the fossil pollen grains were further graphically represented in order to observe the possible interruption of forest succession for each peat area. (Figs. 3-7)

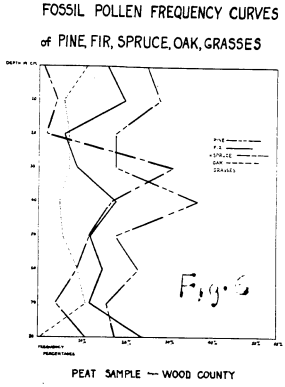
Oneida County: The dominance of pine was interrupted at two points by birch shown by pollen taken from 70 to 125 cm. depths. Fir and birch apparently continued to

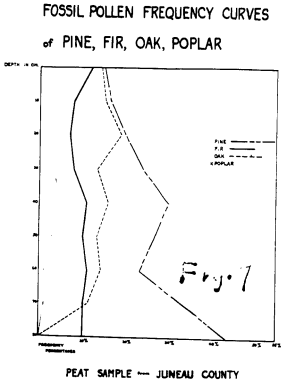












exist side by side with a consistent pattern of frequent alternations of rise and fall marked by the pollen frequencies up to a 140 cm. depth.

Marathon County: Here the dominance of pine was interrupted once by spruce shown by pollen counts from a 10 cm. depth. At two points, 20 to 50 cm. levels, the birch and fir show opposite trends, otherwise they continue to co-exist with the pine.

Clark County: As in the Oneida peat area, birch again interrupted the dominance of pine for identically the same depth of 70 cm. for the pollen test of peat. From here on the birch continues to diminish rather sharply, being completely overtaken by the fir. Prior to this drop fir and birch paralleled in development.

Wood County: The almost simultaneous interruption for pine and fir by spruce for the peat area in this county is indicated by the tests at the 30 cm. level. Then spruce begins a steady decline down to the 70 cm. depth of peat tested. Oak, although never higher in abundance than 10%, continued to be represented in all frequency tests down to the distance of 80 cm. of peat where it stopped.

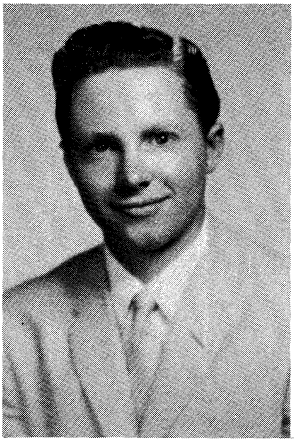
Juneau County: Studies for this county were undertaken mainly to make another observation with regard to oak. As far as the 20 cm. level of peat, pollen frequencies were very close to those of the dominating pine. However, from there on, oak had a steady downgrade followed by a very sharp diminution and then complete disappearance at the 80 cm. test of peat. The fir continued to be represented along with the pine but with no indication of increase. The poplar, most probably edaphic to the peat bed, followed a very gradual decrease down to zero at the 80 cm. level.

Of the minor flora in the tests I made for the five counties, hemlock continued to reappear in Clark County in spite of five points of disappearance. Composites, fern spores, and grasses noticeably contributed toward the pollen frequencies for each county's peat bed. The decrease in cattail pollen in Juneau and Wood County peat, however, seems to indicate dry periods. Nevertheless, I observed that deeper samples yielded larger pollen grains of cattail.

Data in this study points to several possible conclusions. Hemlock forests must have existed in surrounding areas at the formation of peat bogs in five counties, beech in three: Juneau, Clark, Oneida; tamarack in Wood and Juneau. Although considerable data from fossil pollen grain counts was obtained, more and deeper samplings of the same bed would be required if they are to be considered of statistical historical value. # # #

DON'T KNOCK THE ROCK
(Prehistoric Indians of Wisconsin)

By Richard Derickson*
Blue River High School



Ever since that day, thousands of years ago, when man first picked up a rock to defend himself against a wild animal, the rock has been the major key in the advancement of his culture and the essential tool of his survival. Man first used flint, obsidian, and copper for manufacturing of his artifacts that served purposes ranging from weapons to objects for the decoration of his home as well as his body.

I was six years old when I found my first Indian arrowhead. Since that time, by reading books and taking countless field trips, I have acquired some knowledge of ancient man and how he used rocks to advance his culture.

I have found that, in locating a village or campsite, three things have to be kept in mind: 1. Early man built his settlements on soil that had excellent drainage--the best type of soil for this was sand. 2. He had to have good drinking water. 3. He had to have access to a navigable stream which was his only means of transportation other than walking.

After I have found a sandy knoll or terrace on a navigable body of water, I look for the small spoon-shaped chips that were made in manufacturing a stone artifact. Also, I look for pieces of pottery which usually gives me a good idea of the culture or age of the village site, depending upon the thickness and the design of the pottery and the materials used in making it. For example, if I find a thick piece with a cord-wrap design and incised lines, it may very well belong to the Hopewellian Culture. The Woodland Culture, on the other hand, usually made their pottery thicker and used tiny bits of sand or shell for tempering.

When the Indian gave up his stone implements for those made of steel, glass, and other materials that the white man brought, he did not realize it, but he was still dependent upon the lowly rock for his livelihood.

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* - See center spread for additional illustration.

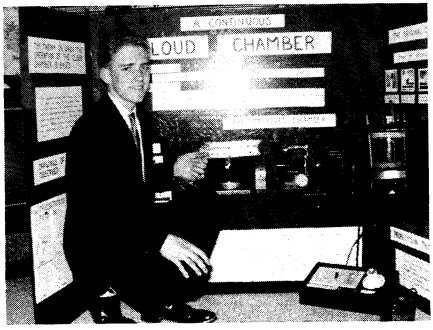
As time went on, the white man became more and more dependent on the rock for the advancement of his culture. Examples are: the use of hematite (Fe_2O_3) and limonite ($2Fe_2O_3.3H_2O$) for steel to build planes, automobiles, sky-scrapers, etc.; coal for fuel in blast furnaces and furnaces in our homes; rock crystal quartz (SiO_2) for laboratory ware, special lenses and prisms (and when cut at an exact angle to its axis, it generates a minute electrical charge, thus making it useful in radio, television, and radar); barite ($BaSO_4$) for making glass, as a filler in paper, and lithopone for paint; flourite (CaF_2) in making a fluid slag in making steel and the high test gasoline, freon; and uranium (UO_2), the "rock" that won World War II, is prized as a source of atomic energy.

In the preceding paragraph, I have mentioned only a few of the important rocks that make this a better world to live in. I have found it very interesting to study them with regard to their occurrence, chemical composition, and how man uses them to his advantage. I hope that this paper will convey to those who read it the respect and admiration that I have for the rocks and minerals that play such an important part in our daily lives.

# # # #

THE OPERATION AND CONSTRUCTION OF THE CONTINUOUS CLOUD CHAMBER

By William Gutknecht
Greendale High School



As in all phases of science, the experimenter begins with a problem. Mine was to construct and successfully operate a continuous cloud chamber.

The cloud chamber is a scientific instrument used for the observation and study of the trajectories of charged subatomic particles. The first chamber was built by C. T. R. Wilson of Cambridge University in 1911. His chamber was an expansion type which is different from the continuous type. I will explain the difference further on.

All chambers, however, operate on the same principle. This is, as charged subatomic particles travel through the air, they create ions out of the air atoms. These ions act as nuclei for condensation when they are in a supersaturated vapor of a liquid, such as water or alcohol. The vapor forms on these nuclei until a visible number of droplets are formed. As the particles travel through the air, they create a trail of ions and thus a trail of visible droplets. We see then, to create a working chamber, a supersaturated vapor must be formed.

In the expansion type of chamber, the supersaturated vapor is formed for only part of a second and thus trails are visible for only part of a second. In the continuous type of chamber, the supersaturated vapor lasts for quite awhile, allowing tracks to be observed quite easily and for some time.

My original chamber was a glass cylinder with a metal pan attached to the bottom and a heating element at the top. A piece of dry ice was placed under the pan and alcohol was poured on a pad that was attached to the heating element. The warmth of the element caused the alcohol to vaporize off the pad and it then settled to the bottom where it quickly cooled and formed a supersaturated vapor. When a radioactive source was placed in the supersaturated vapor, tracks could be observed. This is the general way of forming a continuous supersaturated vapor. However, the chamber had several drawbacks. Alcohol could not be supplied to the pad as fast as it vaporized, vision was obscured by the heating element, and the paths were quickly dissipated by turbulence.

After doing added research, I decided to build a modified chamber. In this chamber the heating element is omitted, which stopped the turbulence and made vision easier. To make up for the loss of the heating element, which supplied the necessary amount of alcohol vapor, I covered the bottom of the chamber with alcohol made black with dye. I also lined the wall of the chamber--a cylinder of plexiglass--with an absorbent pad. The pad absorbed the alcohol and in comination with the alcohol covering the bottom, exposed enough alcohol to the air in the chamber to supply the necessary amount of alcohol vapor. The top of this chamber was made of a clear sheet of plexiglass. Both chambers had attached to them an electrostatic field created by having an electric potential between the top and bottom of the chamber. This device clears out unwanted ions which would create a background fog.

The modified chamber works quite well and with it I have observed the tracks of beta particles, alpha particles and mu-mesons. These three particles are created by

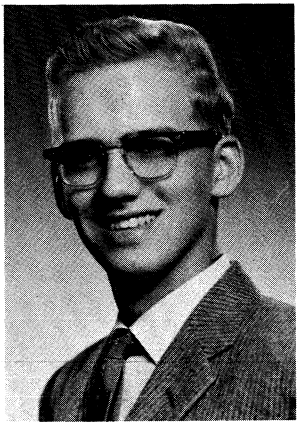
cosmic rays and also are emitted from radioactive sources. The radioactive sources I used came from the physics department of my school.

Through experimentation I have come to the following conclusions: an electrostatic field is not necessary for the operation of a cloud chamber but it allows more tracks to be observed per unit time, a continuous chamber operates best without a heat source, and methal alcohol works best in the type of chamber I have built. I have found this study to be very interesting and plan to continue it for some time.

# # # #

ATOMIC DISINTEGRATION

By Harvey Doerring*
Mary D. Bradford High School, Kenosha



From the definition of radioactivity there are four questions left unanswered: What are the particles that are emitted? Why are they given off? What are their properties? How do they affect us? I have been able to answer these questions by experimenting with the cloud chamber.

In the past two years, I have made three chambers. With them I have identified alpha and beta particles and have learned about their properties. To find out their penetrating power I surrounded the radioactive source with different barriers. Alpha particles were stopped by a piece of paper but beta particles penetrated a very thin piece of lead.

From my experiments I formed two theories. The first one was that the number of particles appearing per minute is related to a specific element. I disproved this theory. By keeping tables, I proved that the number of particles per minute depends on the source in the chamber, how long the chamber was in operation, and whether the electric sweep field was connected to the chamber.

The second theory was that the distance an alpha particle would travel before ionizing was related to a property of the element. I formed this theory because I noticed, in my experiments, that this distance would vary

* - See center spread for additional illustration.

with almost every particle which was emitted. As far as I've been able to find out, velocity can be the only variable. I have been unsuccessful in finding out if any mathematical relationship exists between velocity and this distance.

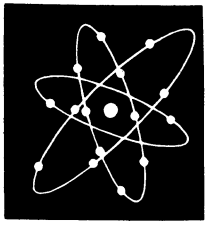
To learn more about the beta particles I designed an entirely new chamber and put it inside a strong magnetic field. By varying the strength of the field, I was able to find the desired field strength which would deflect the particles. By knowing the strength of the field in gauss and the radius of the deflection, I was able to compute the velocity, kinetic energy, and increase in mass of the electron as its speed approached the velocity of light.

The particles formed such a thin trail that it was very hard to photograph them. Because of this I was able to get photographs of only six beta trails. If I had had more photographs I could have constructed a graph showing the relationship that exists between velocity and kinetic energy of the beta particles.

Alpha particles were deflected slightly by a very strong magnetic field, but I wasn't able to derive or find a formula to compute velocity or energy by this deflection. Using two other formulas, I was able to compute the kinetic energy from the length of the trail, and knowing the energy made it possible to compute the velocity. From these formulas I constructed graphs showing the relation of velocity to energy, and energy to the length of the trail.

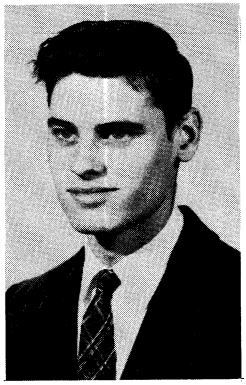
By working on this project I've developed a very strong interest in nuclear physics. In college (if I'm still interested) I plan to go into this field.

# # # #



RESEARCH IN RADIO ASTRONOMY—SUNSPOT CYCLE 19

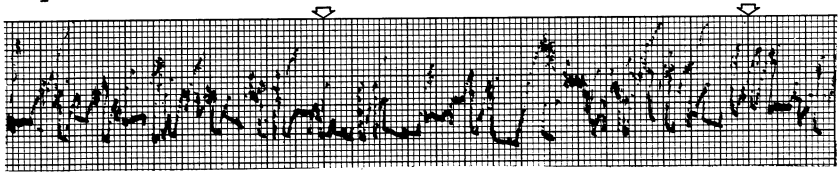
By Tim Hulick
Aquinas High School, La Crosse



It seems that in recent years the field of radio astronomy has been taking a larger and larger part in the study and advancement of space travel. It is now known to man that celestial bodies themselves do emit radio waves in the form of static emissions. There are many theories as to the answering the question "why" these stars and planets transmit these static radio signals. One of the most prominent theories having to do with this problem is the fact that all heavenly bodies must be either transmitting energy in one form or another or reflecting this energy coming from other planets or stars.

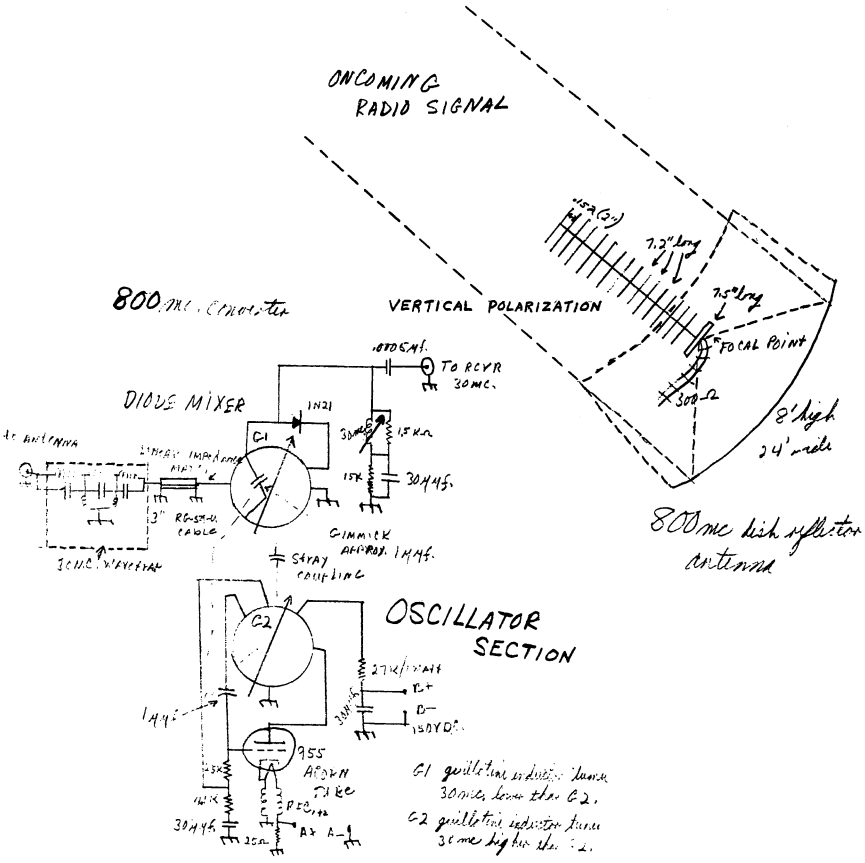
Because there is considerable light being emitted by most stars reveals that in some way energy must be released in the form of this light. This energy does not necessarily have to be released in the form of light entirely. We can be sure that considerable heat, gamma, and X-rays are also a result of this uncontrolled combustion, nuclear fission or fusion reactions that certainly must be taking place during every minute of every day. However, since visible light, ultra-violet, infra-red, X-rays, and radio waves are assumed to be all alike except in frequency, the latter may also be expected to take a great part in this energy release. The various frequency waves of these emissions have no definite frequency at all, therefore we would be justified in saying that it is possible and probable that this energy release exists in practically all wavelengths. Naturally it can be then assumed that we can record the light with our eye, the heat with our infra-red detectors, the radio emissions with our sensitive radio receivers.

This paper deals with the recording and possible interpretation of sunspot cycle number 19. Through the past



two centuries it has been noted by scientists throughout the civilized world that about every 11 years there appears on the surface of the sun certain coal-black spots thousands of times greater than the surface area of our earth. They observed these spots whenever they could; even today very little is known about the spots. It is not known whether they are central areas of concentrated reaction or whether they are areas of no reaction at all. As of now the origin of them is not known but we do know that very definite effects are produced by them on earth. Radio propagation is sometimes very excellent to all parts of the earth and sometimes a radio blackout is noticed when radio stations can only be heard for a radius of the groundwave distance. At the same time of these blackouts, a considerable increase of sunspot activity is noticed. These spots also play a definite part in the unusual weather taking place in the world.

I chose a frequency of 800 megacycles to listen for these sunspot noises because at this ultra-high frequency



the waves have no trouble penetrating the ionosphere to reach the earth-bound receiving station. An 800 mc. converter was used as the receiver having an intermediate frequency of 30 mc. The converter operates on the superheterodyne principle. The antenna was of the dish reflector type. Its dimensions were 8 x 24 feet. The dish itself was the reflector; the antenna radiator or driven element was 7.5 inches long cut to ½ λ for 800 mc. There are also several director elements slightly shorter than ½ λ . The reflecting dish acted as a concave reflector with a focal length of about 6 feet and the directors acted as convex lenses. The directors were spaced .15 wavelength while the driven element was placed at the focal point of the reflector. The overall decibel gain of the antenna is terifically high. The graph represents a permanently recorded facsimile of the sunspot wave forms as received with this device (p. 105). Due to the limited space allowed me, I will not be able to go into the actual technicalities of the units, but I can say that the entire experience with sunspot recording has been very fascinating and worthwhile. Future work with the sunspots is anticipated for sunspot cycle number 20 in 1968.

# # # #

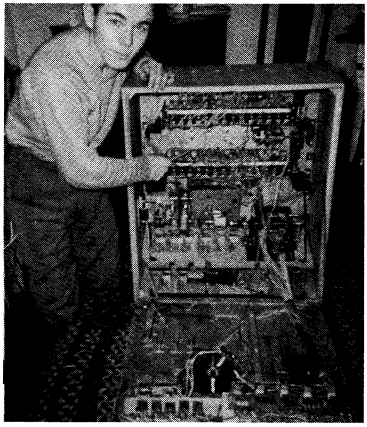
BINARY COMPUTING BY USE OF RELAYS

By R. John Swing, Jr.
Aquinas High School, La Crosse

In searching for a challenging and educational science project for this year in the subject of electronics, I was confronted with two problems. The first was the prohibitive cost of electronic devices required to build an instrument of any great scope of originality, and secondly, I did not wish to build an instrument from one of the many schematics published; but rather, to construct an original instrument through experimentation. Considering a calculating device, I studied a completely transistorized binary computer in the January 1960 issue of Electronics Illustrated magazine and decided to accomplish the functions through other means.

In an effort to limit my cost, I explored the possibility of computing by the use of relays, scanning disks and steppers such as are found in pin-ball machines. I further found that local dealers were willing to give me sections of various junk machines.

From all these sundry items, which eventually involved parts from 12 machines, a completely original circuit was devised. To my knowledge, no literature exists on this type of an instrument. Because the various machines used different voltage ratings, it posed quite a



problem to correlate the selected parts into one functional mechanism. It was necessary to use transformers with 6, 30, 45 and 50 volts from the secondaries and also 110 volt A.C.

To complicate the situation further, it was extremely difficult to apply the parts to suit my purpose. Therefore reconstruction of individual parts was also required and because of the fact that they were junk, obsolete, and worn, further revising was done. Through experimentation and correlating the functions of these sundry parts, the third rebuilding of the device successfully showed the workability of my theories involved in its construction.

On the control panel, several S.P.S.T. toggle switches are located. The purpose of the switches is the disconnecting of relays not being used in a certain function thereby eliminating unnecessary relay use and possible burn-out. Also located on the panel are three telephone dials, each with a specific function; i.e., one for addition, one for subtraction, and one for multiplication. Through the use of these dials, electrical impulses are directed to their respective circuits from which the desired solution is registered by use of lights as indicated by the binary number system that can be observed on the panel.

To accomplish addition, the circuit consists of relays required to employ wanted columns plus six steppers consisting of 50 contacts with two rows of contacts on each. Three steppers are wired in parallel, acting simultaneously, and an additional three steppers are wired in series to carry the count to one hundred. The impulses first activate two steppers to complete addition to 16 at which time another stepper is automatically employed. These three steppers react simultaneously to the impulses to add to the count of 50. At the digits of 2, 4, 8, 16, 32 and 64, these steppers also function to activate the specific relay employing their respective columns. With the addition of 50 completed, the computer continues to add by automatically employing three additional steppers similar in function while the primary three steppers cease to function. These additional three steppers carry addition to one hundred, thereby constituting the addition system.

The subtraction circuit is identical to that of addition with the exception that it is wired in reverse and is fed with its respective telephone dial.

The function of multiplication is accomplished by a completely separate circuit and is activated by the third telephone dial. By the employment of a D.P.S.T. toggle switch, the impulses are directed for the first multiplication digit into the primary multiplication stepper. This stepper with the secondary multiplication stepper has two functions. The first is characteristic of both which employs the wanted columns for a specific function; i.e., at the digits of 2, 4, and 8, relays are activated to employ these columns. The second functions differ in the fact that the primary stepper selects relays of numbers consecutively from 2 to 9, the selection based on the problem fed. The secondary selects then one of eight points, 2 to 9, on the activated relay, thereby energizing the desired wire which is connected to the multiplication scanning disk. The scanning disk when employed revolves six contacts, one or more of which pass by their respective contact points on a bakelite square. In the event any points are energized, the impulse is directed to its respective relay depending on which contact or contacts received the pulse which arranges the correct one-zero set-up, thereby indicating the desired binary number and completing the multiplication function.

This system can be made entirely automatic with further development but demonstrates the theories in present form at a cost to the exhibitor of solder used only.

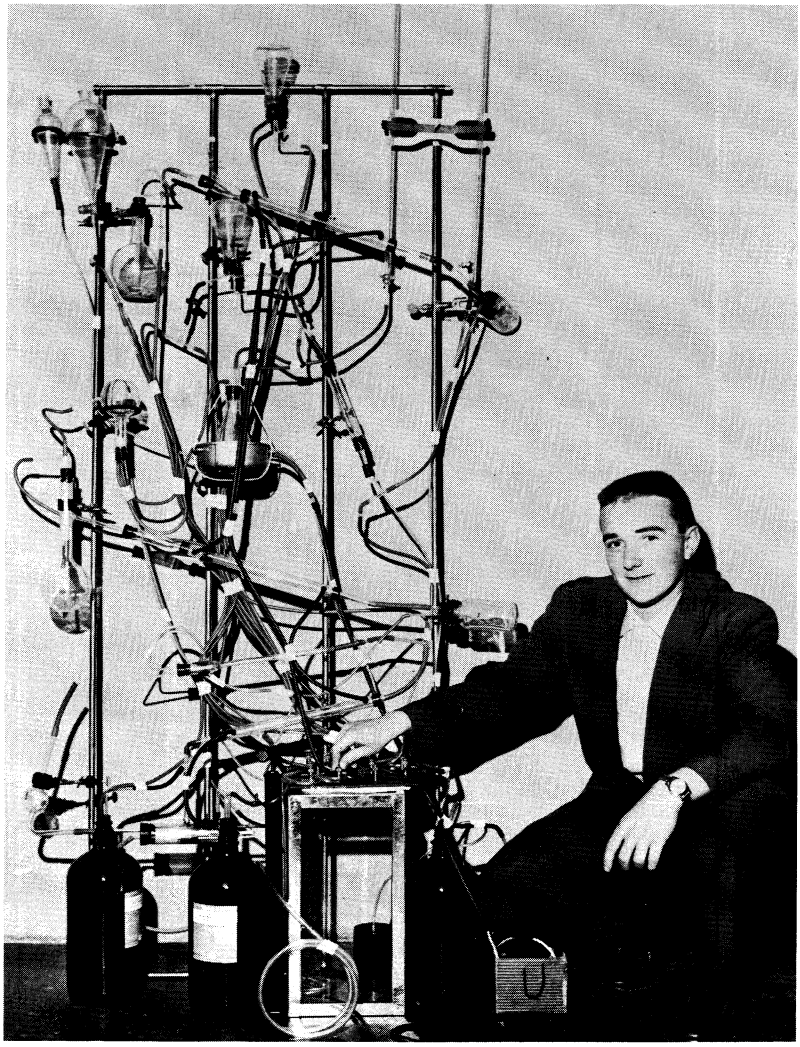
# # # #

ANALYSIS OF LUMINESCENT AMINOHYDRAZIDES

By Douglas King
Nicolet High School, Milwaukee

Luminescence is said to be any emission of light not directly ascribable to incandescence and therefore occurring at low temperatures. In direct chemiluminescence, cold light (light without heat) is produced by a chemical reaction. Some chemical energy is transformed into light energy. This light energy can be obtained by oxidizing various organic substances.

Oxidation reactions involving valence changes or the absorption of gaseous or dissolved oxygen may produce cold light. In most cases this light is of a short duration and a low intensity. However, there are a few exceptions - the most spectacular being the oxidation of luminol. This is the aminohydrazide with which I have been working in the laboratory.



After getting deeply involved in my own lab results, I built a machine which would both analyze the sub-reactions that take place in the oxidation of luminol and produce the luminescence resulting from this oxidation, and also allow the operator to control all the chemical reactions taking place by the use of a valve panel at the base of the machine.

The purposes of the machine are 1) to stop the reaction at any point the experimenter wishes before the reaction goes to completion (i.e. making it possible to run analyses on compounds resulting from sub-reactions); 2) to control at any given moment the way any given chemical is combined with or acted upon by another; and 3) to produce chemiluminescence as efficiently as possible so when analyses are run they will be as accurate as possible. Obviously, the machine is not necessary to produce chemiluminescence; however, the machine gives the operator complete control of many analyses being run at the same time.

The machine has an 18-valve panel to control the liquid chemical feeds, the air-oxygen feed, the condensor cooling system, the pressurized chemical feed and a by-pass system to change the chemical mixing pattern.

Use of the machine has produced the following conclusions: Visible radiation is not produced in the absence of any one of the components necessary for the reaction. The reaction will occur only in an alkaline solution and works at its best around a PH of 12. Up to a certain point the amount of light evolved increases with the increase in alkali concentration. The nature of the light appears to vary with the nature of the oxidant, apparently being most satisfactory with a very mild oxidant.

The hydroxide producer must be added when the compound is at its most stable state. Any increase in temperature will cut the duration of the reaction, but will increase the amount of light until the temperature reaches 64° F. Then just the opposite reaction takes place.

Carbonates used instead of hydroxides will cut the amount of light but increase the duration. However, since we need a PH of 12 one must introduce more Sodium Phosphate to raise the PH.

These facts along with a multitude of other more specific ones such as what happens when the PH hits 6 in the second sub-reaction between the third set of products, were determined through experimental results.

# # # #

News Note:

R. H. MYERS and TED J. McLAUGHLIN of the Speech Department, UW-Milwaukee, will be program participants at the 1960 Annual Summer Conference of the National Society for the Study of Communication to be held at Elkhart Lake, September 2-4.

# # #

ADDING MACHINE

By Robert Wink
Appleton High School

My project was the design and construction of an adding machine which illustrates, through the addition process, a basic principle that may be used in a computer. Components for construction of this adding machine were salvaged from pin-ball and bowling machines. I used electrical relays, multi-switches, and cycle motors.

My machine is shown on the opposite page. I enter a number in the machine by writing it on the input panel 1, in much the same fashion one would ordinarily write the number. The input panel contains an array of electrical contacts. These are connected to relay bank 2, which receives and momentarily stores the input signal for later instructions. The writing of a number on the input panel is done by means of the writing probe 3, which serves as a pencil, and is electrically connected to the input circuit. The shape of the number determines the relays that will be energized in the relay bank 2. To enter a zero the writing probe is drawn over all the outer contacts of the array on the panel; to enter the number 1 the probe is drawn over the center row of contacts, and so on. Following the writing of a number the contact 4 is touched with the writing probe to start the addition process. If an error is made in entering a number, this wrong number can be cancelled out by touching the contact 5 with the writing probe. This step automatically resets all the relays in bank 2. The correct number may then be entered.

A number entered on the relay bank is, in a sense, in code and it is decoded for the addition process by means of the cycle motor 6 and the solenoid-operated multi-switch 7. Multi-switch 7 and the cycle motor 8 are programmed so that the output circuit (left side of figure) receives one electrical pulse for the number 1, two pulses for the number 2, and so on. As these pulses are received by the output circuit, the solenoid-operated switch 9 performs the addition of the numbers and energizes certain relays or relay combinations in the output circuit. These energized relays turn on various combinations of lamps that are mounted on the output panel 10 and the answer appears as an illuminated number.

This adding machine is capable of handling only single digit numbers. I have ideas for a simpler design that will permit the handling of larger numbers and other computations.

# # # #

Robert Wink

CHLORELLA

By Robert Greenwalt
Appleton High School

Can the scientist find in an algae a nutritious food? The answer to this is now, and will be, very important for several reasons: in India and other population centers there is not enough food for all the people; population expansion is taking up more and more farm land; an atomic war would cause polluted land where crops could not be grown; and an efficient food will be needed for space travel. All of these problems need a food which is cheap, nutritious, and can be grown on little land.

I hope to find a solution with algae. Algae would be grown in tanks, requiring little land; different algae could be grown with different food values; and it would not be expensive, as the chemical and water media could be used over and over.

Having studied this, I purchased a clone culture of chlorella, an alga used in work of this kind before. I mixed up a culture media suggested by the General Biology Supply House of Chicago, containing ammonium nitrate, potassium phosphate, magnesium sulphate, calcium chloride, and distilled water. I split the culture I purchased into several finger bowls to guard against the accidental death of the culture, and added the culture media.

After the algae had grown quite thick, I put the contents of several finger bowls into a large tank and added more culture media. When the water level was lowered by evaporation, I replaced it with tap water; but, after two weeks, I noticed some oscillatoria growing in this tank. It had evidently entered from the tap water. I took my remaining pure algae from the finger bowls and put it into a larger tank which I partially covered to prevent rapid evaporation. I soon found oscillatoria growing in this tank also, but since the oscillatoria was in one corner, I took some chlorella out of the opposite corner and placed it in a third tank which I tightly covered to prevent air pollution. After a period of one month, this tank still appears unpolluted.

I grew most of my chlorella under a thermostat-light arrangement which gave alternating periods of light and darkness. Because chlorella grows very rapidly when exposed to short periods of light and darkness, this algae grew much faster than algae that received 12 hours of steady light and 12 hours of darkness.

Chlorella, because of its high chlorophyll content (between 5 and 6%), has a wet tea leaf taste. This undesirable taste and color can be taken out of chlorella by bleaching. I used a fluorescent tube directly over the algae and was able to bleach it to a dingy white in five days. Unfortunately, this bleached algae was accidentally spilled, and the fresh algae I tried to bleach was polluted with oscillatoria, which for some reason does not bleach as readily. The polluted chlorella were under the light for four weeks and did not bleach.

The growth of chlorella is very rapid. I placed the algae from two finger bowls into five liters of culture media and, within three weeks, the culture had grown from a few algae on the bottom of the tank to a dense suspension.

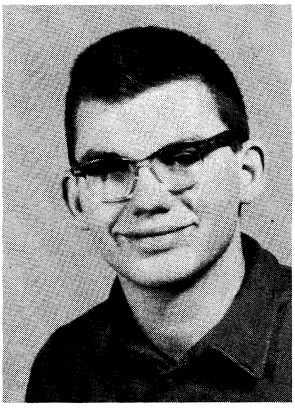
According to Science Newsletter, chlorella can be grown anywhere - in tanks, in pans, on roof tops, in jars, or in ditches. This I doubt, because of the ease with which my cultures were contaminated. However, I need to experiment with different chemical cultures to prevent or eliminate other algae, for my conclusions thus far show that chlorella is suitable for growth in factories only. Also, I need to verify the nutritional values accredited to it and how these values are affected by different media, lights, temperatures, and carbon dioxide; satisfactory methods of preparing and harvesting; the possible mutations; and a small pilot plant for the growth and harvesting of chlorella on a larger scale.

# # # #

INSTANT NYLON

By Robert Cooley
Mary D. Bradford High School, Kenosha

Instant Nylon - Interfacial Polymerization - is a process newly developed by Du Pont for the production of nylon which eliminates the commercial problems of temperature, pressure, and time. Using this new method nylon may be produced in an ordinary drinking glass. However, the process is more expensive than the usual method, and therefore has not been commercially adopted.



If carbon tetrachloride and water are placed in a glass, they will separate into two layers, because they will not mix. This property is known as immiscibility. The area where these two liquids come in contact is known as the interface. If one reactant for producing nylon, sebacyl chloride, is dissolved in the carbon tetrachloride, and the other reactant, 1,6-hexanediamine, is dissolved in the water, they will meet at the interface and will polymerize, or form molecular chains, to produce a film of nylon. This film, when pulled from the glass, forms a continuous strand of nylon, which may be drawn from the glass, or, if so set up, will pull itself out automatically by force of its own weight. This nylon strand may be washed, first in alcohol and then in water, and hung up to dry. When dried and stretched, the finished nylon thread is a strong fiber.

Experimentation for this project produced some interesting variations. The first experiment was to see if the advanced preparation of any solutions involved was feasible. It was discovered that the 1,6-hexanediamine could be dissolved in water ahead of time, and a quantity of that reactant was dissolved in the proper proportion, for future use. It was also found that it would benefit the reaction if some sodium carbonate were dissolved along with the hexanediamine, to act as an acid acceptor. Experimentation with the washes used, to see how the strength of the nylon could be improved, showed that a first wash of alcohol was useful to remove any carbon tetrachloride remaining on the strand, and that water for a second wash would remove any reacted chemicals.

An attempt to dry the nylon on a reel did not give as good results as hanging the strand on glass rods. In experimenting with colors, it was found that by dissolving a vegetable dye with one phase of the reaction, the water phase would become colored, and a colored strand of nylon would be formed. Also, the dried nylon could be successfully dyed red, green, yellow, and blue with clothes dye. Mixing sebacyl chloride with hexanediamine to see if nylon would be formed without the reactants first being dissolved in a liquid produced crude nylon which could not be removed in a strand.

Carbon tetrachloride is immiscible in water. It forms a layer below the water, because of its greater specific gravity. Benzene, too, is immiscible, but it

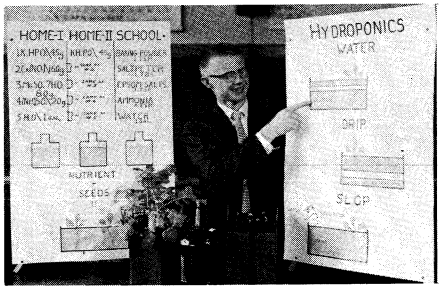
will stay on top of the water, since it has a small specific gravity. Therefore, using the three liquids, it was deduced that three phases would result: carbon tetrachloride on the bottom, water in the middle, and benzene on top. Experimentation showed this to be true. Using this discovery, and mixing the reactants in the appropriate solvents, it was possible to produce two separate films of nylon, one at each interface. It was not possible however, to remove the nylon from the container in two separate strands since the strand from the lower interface combined as it passed through the upper interface. Further experimentation is in order.

A great reward for making this project was the substantial amount of information acquired in such fields as organic chemistry and textiles. Perhaps the greatest reward was seeing the happy faces of children as well as the comprehending glances of adults at science fair demonstrations, as they received their free samples of homemade Instant Nylon.

# # # #

HYDROPONICS

By Bruce Laube
P. J. Jacobs High School, Stevens Point



Hydroponics is defined as the art and science of growing plants without the aid of soil and the application of these methods to practical use. I became interested in hydroponics a year ago this summer. To prepare a background of knowledge for myself, I used the scientific method of research. I read books and magazine articles from three libraries and kept a bibliographical card for each article read. I found that there exists today three types of hydroponic gardening: water culture, drip culture, and slop culture.

Walter culture consists of a shallow wire basket filled with excelsior or straw suspended over a nutrient solution. The plants grow in the excelsior while their roots hang into the solution below for food and water. The air space provides the necessary oxygen. With drip culture the plants are supported in a sand or gravel medium and a nutrient solution continuously drips into the medium. The excess solution passes into a catch pan

enabling it to be reused a number of times. Slop culture is the method I used. The plants are supported in a sand or gravel medium and the nutrient solution is added every three or four days. Water is also added to supplement the moisture.

I raised red radishes at home and at school using two formulas: one using chemicals and one using household materials. I dissolved 4.5 g. of dibasic potassium phosphate, 16.0 g. of calcium nitrate, 8.0 g. of magnesium sulfate, and 2.0 g. of ammonium sulfate in one gallon of water. The original solution called for 4.5 g. of monopotassium phosphate but it was unavailable at the time. This later proved unfortunate. The other solution consisted of 1 level tsp. of baking powder, 1 level tsp. of Epsom salts, 1 level tb. of saltpeter, ½ tsp. of ammonia, and 1 gallon of water.

After two unsuccessful trials with the chemical solution, I changed to the original formula containing monopotassium phosphate. After 19 days of growth the radishes still appear healthy. The radishes grown with the household materials did much better. After 45 days the radishes were just about ready to be eaten and now after 99 days they are well on their way to seed. By April 23, 1960, 80 days after planting, I had given the successful crop of radishes 38¼ cups of water and 10 3/8 cups of nutrient. I have succeeded in raising radish plants weighing 2,310 times the weight of one radish seed without the use of soil. And they taste like radishes, too.

From the beginning I have found these experiments to be interesting. I have proved the value of the scientific method of research and have proved that soil is not necessary for plant growth. As a result of my studies and experiments, I have found that hydroponics offers man a method for raising more food crops in less space and for less labor. Also, you can see that hydroponics is not only for the scientist. Anyone is capable of having a successful hydroponic garden in his living room if he wishes, or the nutrient solution can be used as a liquid fertilizer to supplement potted plants.

# # #

News Note:

Academy member ROY E. NICHOLS, professor of veterinary science at the University of Wisconsin, was elected president of the American Association of Veterinary Nutritionists at its annual meeting in August at Denver, Colo.

JUNIOR ACADEMY NEWS

JUNIOR ACADEMY REPORT

By John W. Thomson, Chairman
Junior Academy Committee

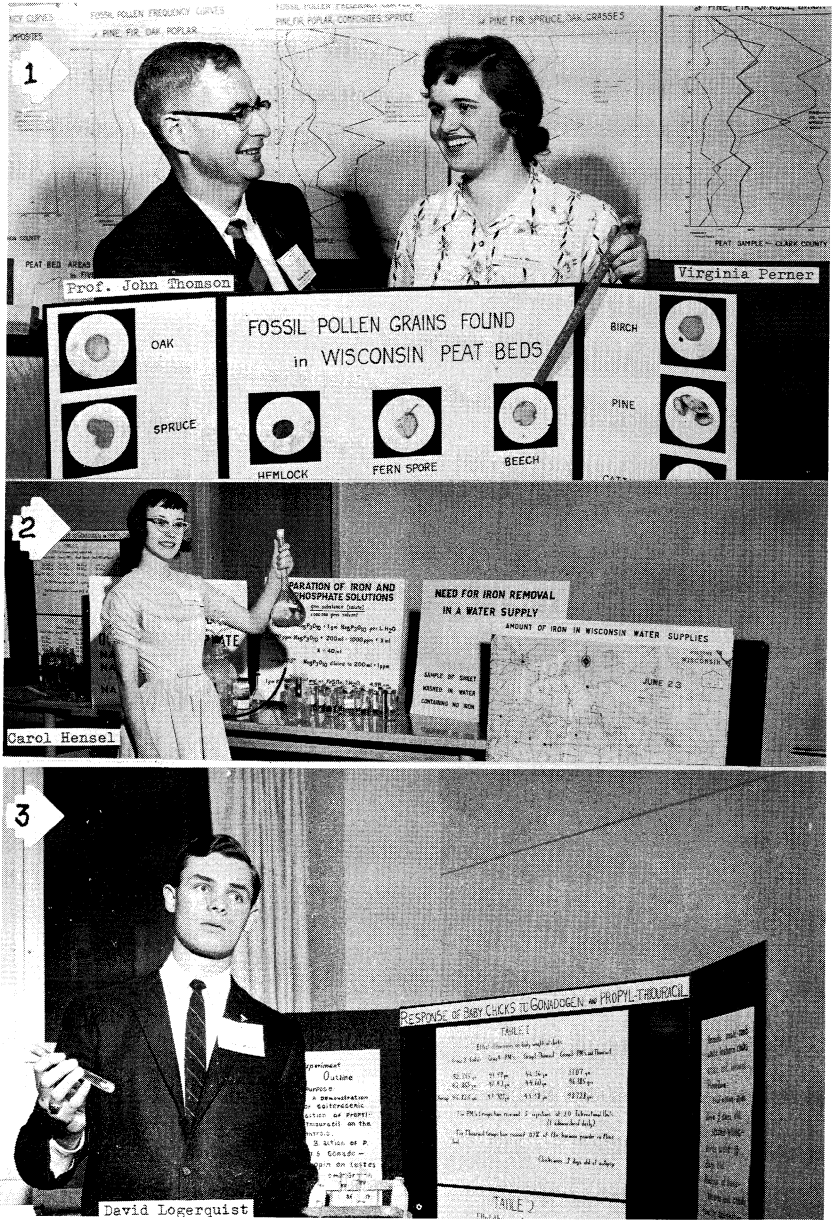
THE STATE MEETING

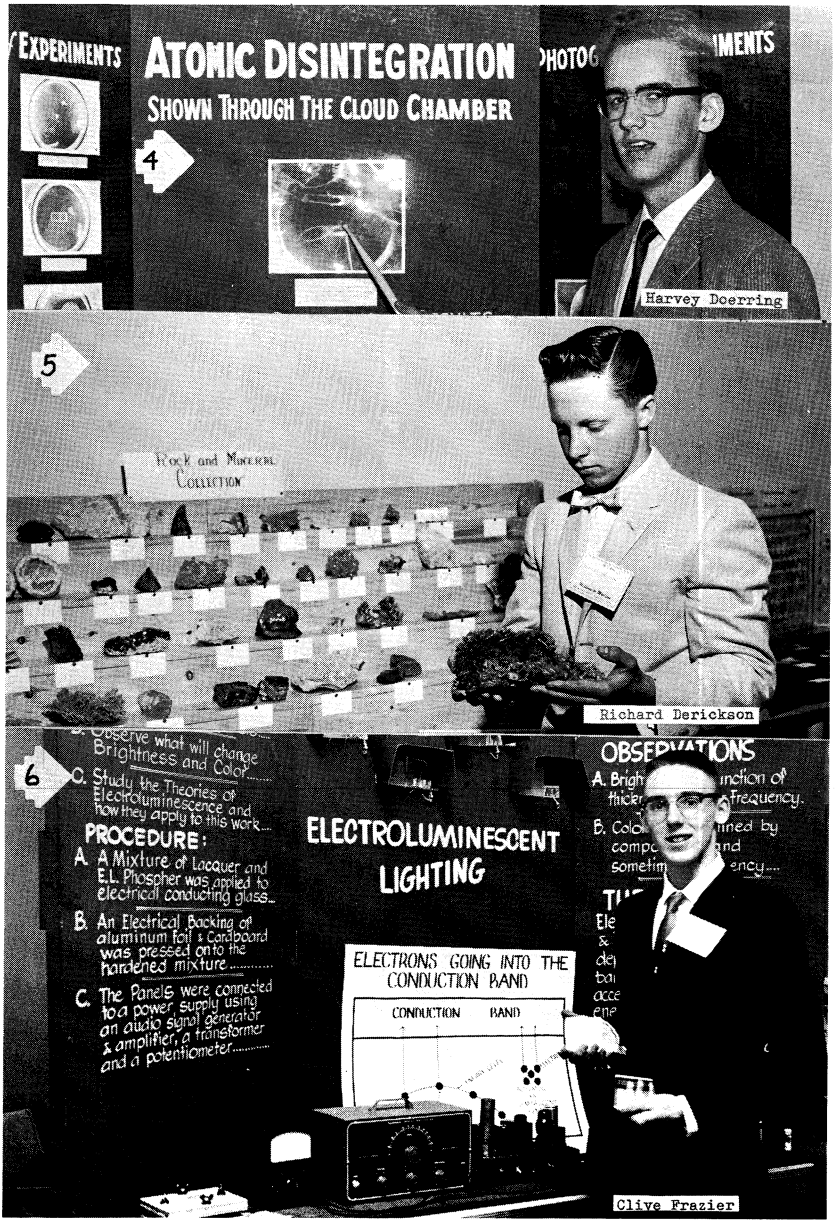
The state meeting was held in conjunction with the Senior Academy sessions at the Wisconsin Center of the University of Wisconsin on May 7. Many Senior Academy members dropped in during the day to watch the meeting and to talk with the participants. The room was well filled during the day and the sessions.

Award of citation for the most original work went to VIRGINIA PERNER of Columbus High School, Marshfield, who also was nominated for honorary membership in the American Association for the Advancement of Science. In the National Science Talent Search for Westinghouse scholarships, she won a trip to Washington. She was further honored as recipient of the four-year scholarship to Marquette University awarded in the Wisconsin Science Talent Search. Also during the banquet ceremonies, $100 scholarships from the Senior and Junior Academies were presented to ROBERT COVELLI, Mary D. Bradford High School, Kenosha, and JAMES MAYNARD, Solomon Juneau High School, Milwaukee. RICHARD DERICKSON of Blue River High School was the boy recognized by honorary membership in the AAAS.

Ratings of excellent for their projects went to CLIVE FRAZIER, Nicolet High School, Milwaukee, ROBERT COVELLI, Mary D. Bradford High School, Kenosha RICHARD HAAS, Pius II High School, Milwaukee, TIM HULICK, Aquinas High School, La Crosse, and ROGER HUCTHAUSEN, DOUGLAS SIEWERT and JIM BRANDL, Lincoln High School, Wisconsin Rapids. (Continued on page 122)

Professor JOHN W. THOMSON of the University of Wisconsin Botany Department has been the councillor and guiding light of the Junior Academy of Science since its inception 15 years ago. In recognition of his devoted and untiring work, the Senior Academy conferred upon him a Life membership which was presented at the banquet held on May 7, 1960 at Madison.


1
Prof. John Thomson
Virginia Perner
FOSSIL POLLEN GRAINS FOUND
in WISCONSIN PEAT BEDS
OAK
SPRUCE
HEMLOCK
FERN SPORE
BEECH
BIRCH
PINE
2
Carol Hensel
NEED FOR IRON REMOVAL
IN A WATER SUPPLY
AMOUNT OF IRON IN WISCONSIN WATER SUPPLIES
JUNE 23
3
David Logerquist
RESPONSE OF BABY CHICKS TO GONADOGEN AND PROPYL-THIOURACIL
TABLE I
TABLE 2


EXPERIMENTS
ATOMIC DISINTEGRATION
SHOWN THROUGH THE CLOUD CHAMBER
4
PHOTOG IMENTS
Harvey Doerring
5
Rock and Mineral Collection
Richard Derickson
6
C. Study the Theories of Electroluminescence and how they apply to this work....
PROCEDURE:
A. A Mixture of Lacquer and E.L. Phospher was applied to electricall conducting glass...
B. An Electrical Backing of aluminum foil & Cardboard was pressed onto the hardened mixture.....
C. The Panels were connected to a power supply using an audio signal generator & amplifier, a trainsformer and a potentiometer.....
ELECTROLUMINESCENT LIGHTING
ELECTRONS GOING INTO THE CONDUCTION BAND
CONDUCTION BAND
OBSERVATIONS
Clive Frazier

Junior Academy News - continued

Very good ratings were earned by
JOHN SWING, Aquinas High School, La Crosse
DAVID LOGERQUIST, Sevastopol High School,
DOUGLAS B. KING, Nicolet High School, Milwaukee,
HARVEY DOERRING and ROBERT COOLEY, Mary D. Bradford High School, Kenosha.

Honorable mention was accorded to
CAROL HENSEL, Sparta High School,
RONALD SERVAIS, Aquinas High School, La Crosse,
ROBERT RIEDNER, St. Mary's High School, Durand
ROBERT WINK and ROBERT GREENWALT, Appleton High School,
WILLIAM GUTKNECHT, Greendale High School,
BRUCE LAUBE, P. J. Jacobs High School, Stevens Point,
JOHN McKICHAN, Platteville High School and
KENNETH BILDERBACK, Potosi High School.
Papers published in this issue were presented at the meeting and those remaining will appear soon.

Twenty of the above-named students were nominated for the one year honorary membership in the Wisconsin Academy of Sciences, Arts and Letters. This will entitle them to the publications of the Academy and to attend its sessions. All of the participants who appeared on the state program will receive subscriptions to science magazines of their choice. Alternates and honorable mention winners at the district meetings will also have a choice of such subscriptions under the Junior Academy program of encouraging scientific work among the high school students.

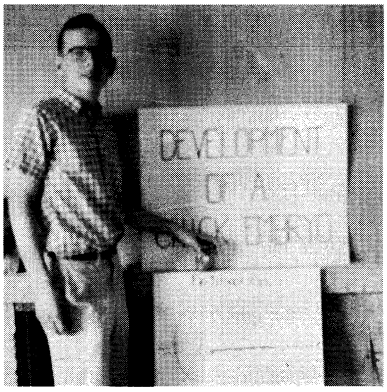
Some district chairmen elected at earlier district meetings were: LLOYD HAVILLE of Sparta High School for the West Central district, and BJORN CHRISTENSEN of DePere High School for the Northeastern district.

In addition to the students honored at the banquet for their work in the Wisconsin Science Talent Search, Chairman DANIEL Q. THOMPSON of Ripon College announced the following winners of recognition for scholarship consideration recommendations by the Senior Academy president to the college of their choice:
AARON ABRAMOVITZ, Wisconsin High School, Madison,
WILLIAM DEVEREAUX, Big Foot High School, Walworth,
DON KRATSCH, Oshkosh High School,
GEORGE REEKE, Abbot Pennings High School, DePere
JUDITH ROGNESS, Neenah High School,
LESLIE RUSCHE, Sturgeon Bay High School,
WILLIAM SCHOKENZHT, Rufus King High School, Milwaukee,
JAMES VAHL, Waukesha High School, and
JIM WEIDNER, Nicolet High School, Milwaukee.

# # # #

TWENTY-ONE DAY MIRACLE

By John McKichan
Platteville High School



Have you ever wondered what occurs inside an incubating chicken egg? I did!

I had observed an unincubated egg and a downy yellow chick, but I didn't know what happened between these two stages. This is why I chose the development of the chick embryo as my science fair project. Having my goal in mind, with the help of the Biology teacher, I got an incubator and forty hatching eggs. I planned to keep the incubator at school and to open one egg every day, observe the development, photograph the specimen and preserve it in formaldehyde.

As a background for understanding the development of the chick embryo, I studied "The Study of a Chick Embryo" from the sixth edition of Developmental Anatomy.

I cleaned the forty eggs and placed them in the incubator. There was a need for forty eggs because about 85% would be fertile and some of the embryos might die. The temperature was set at 102° F. for the first two days and then lowered to 99° F. for the remaining time. The humidity was also regulated. I turned the eggs every four hours to alternate the pressure on the embryo.

The photography end of the project caused some trouble. I used my Pony 135 camera and colored film so that slides could be made. The camera was mounted on a tripod, eleven inches from the dish the embryo would be in. Photo-flood lamps were used for illumination. Photographing at this close distance and with these bright lights required a close-up lens and a special light filter. These had to be ordered and thus the project was delayed even though the eggs were incubating. This meant that a second batch of eggs would have to be incubated. I set eighteen eggs and marked each with a small "O".

I preserved the embryos in a solution of 6% formaldehyde and 4% alcohol. Half-pint fruit jars were used. As each egg was broken, I kept a record of how the embryo looked and changed from day to day and other interesting things that happened. Each day as an egg was opened, I could easily see the interesting development of the chicken embryo. At the end of the 20th day, the climax of the project came: a chicken hatched. This was one day less than the normal twenty-one day development period.

As another facet of my project, I had two control eggs and checked them each day for weight change. To my surprise, they lost weight - .41 grams per day and 8.20 grams as a total for the twenty-day period. I believe the weight loss was due to the

loss of moisture and the oxidation of food by the embryo.

The project has left me with twenty-one wonderful specimens and two baby chicks. I also have wonderful color slides of each day's development. Although the project is over, I will never forget what I have learned.

# # # #

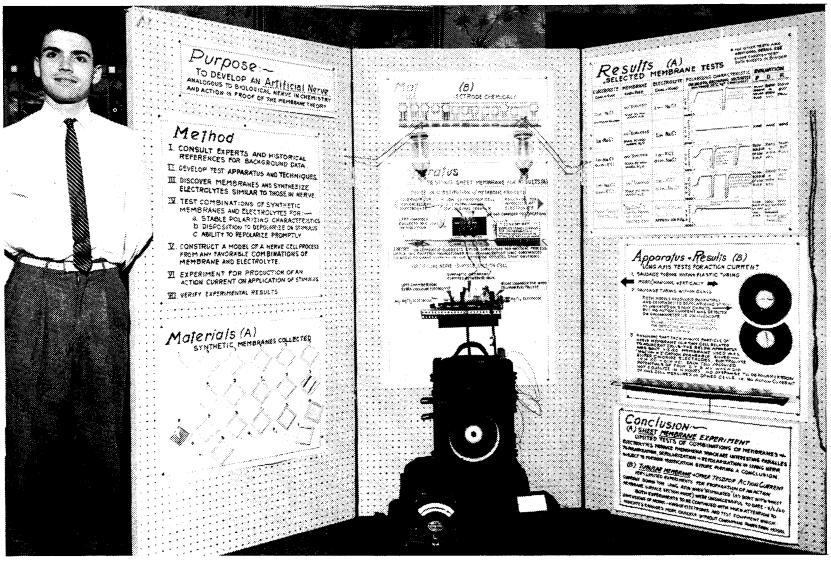
NERVE CYTOLOGY

By Richard A. Haas
Pius XI High School, Milwaukee

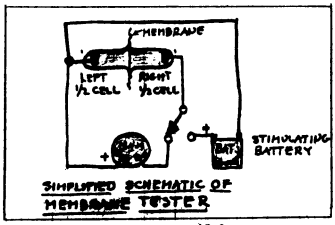
Nerve cytology treats of the physical and chemical processes of the nerve cell and, for the purposes of this paper, is limited to the process by which sensory and other data is transmitted along a nerve fiber. The ultimate purpose is to better understand these processes in order that flaws in the nervous system or the vital processes which it controls may, one day, be corrected or prevented. Among the problems are the involvement of submicroscopic substances and structures and the need to disturb them for study in or out of their natural environment. These and conflicting theories motivate the use of synthetic models for further study at this time.

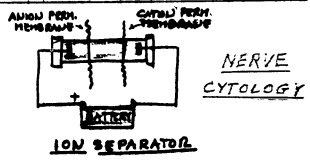
Purpose: It is the purpose of this experiment to construct an artificial nerve axon of synthetic materials most comparable in substance and function to living nerve fiber and to attempt to interpret any observed phenomena in proof or criticism of the currently accepted "membrane theory."

Method: This experiment has taken on two major phases. The first, to discover synthetic membranes which, when separating electrolytes of the kind and quantity found in living nerve, can

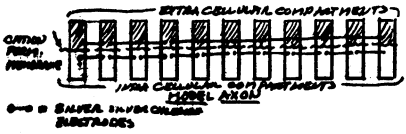


1) polarize and maintain a resting potential, 2) depolarize on suitable stimulus and 3) repolarize - relative to that on a small surface section of living nerve. The second phase involves the employment of the most ideal membranes discovered in an attempt to construct a model which will propagate an action current from the point of stimulation to the distal end.





NERVE CYTOLOGY



Apparatus and Results - Phase I - Synthetic Nerve Surface Section: The apparatus for testing for surface section phenomena consisted of two glass ½ cells representing the extra and intercellular compartments of nerve fiber. Each was equipped with iso-electric silver-silver chloride electrodes connected to a 24-hour recording millivoltmeter. The membrane under test was clamped between the ½ cells. Electrolytes, representing extra and intercellular fluids, consisted of varied molar solutions and combinations of sodium and potassium chloride, the most ideal of which produced resting potentials of about 3 mv. sustained for over 48 hours. Stimuli of 1.5 v. and 22.5 v. resulted in depolarization to a negative 3 mv. and recovery to the original + potential in about 4 minutes. Separate introduction of carbon dioxide or acetic acid into the "extracellular" solution produced similar results. An "ion separator" consisting of an arrangement of cylindrical chambers separated by synthetic membranes selectively permeable to anions and cations, respectively, was constructed. It was designed to facilitate the introduction of the unequal and unbalanced initial distribution of anions and cations into the artificial nerve attributed to metabolic action in living nerve. Accidental damage of its Lucite components by a lanolized acetone prevented its experimental employment prior to the presentation of this paper.

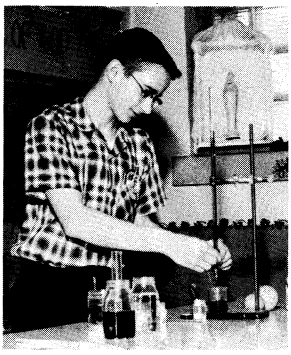
Apparatus and Results - Phase II - Artificial Nerve Axon: Initial tests included the employment of tubular synthetic membranes about 5' in length in place of the sheet membranes. The "intra-cellular" electrolytes were placed in smaller tubing which in turn was bathed in the "extra-cellular" electrolyte contained in larger tubing. Electrodes were inserted in positions to measure resting potential and apply the stimulating voltage and placed on the surface of the long axis of the inner tubing to detect any action current. While resting potentials were developed and electrically and chemically induced, "depolarization" was effected, action current, if any, was not observed. The indicating millivoltmeter (0 to +15 mv.) was highly damped and the oscilliscope used was apparently not adequately shielded or pre-amplified possibly preventing the detection of any action current. A model of 10 sets of series connected ½ cells each having its intra- and extra-cellular compartments separated by an anion permeable membrane was constructed. Depolarization of one "cell increment" had no measurable effect on the others.

Conclusion: Phenomena comparable to polarization, depolarization and repolarization in living nerve have been reproduced in a synthetic surface section model. Although critical evaluation must now precede any conclusion, the fact that metabolism played no part in the synthetic model suggests that forces other than metabolism may explain these processes. Further experimentation with improved techniques and instrumentation are needed before any conclusions are made with respect to eliciting an action current in a synthetic axon.

# # # #

DETERMINATION OF VITAMIN C IN ORANGES AND ORANGE JUICE

By Robert Riedner
St. Mary's High School, Durand



Long, long ago it was realized that without a substance found in certain fruits and vegetables, man developed a remote disease called scurvy. Explorers such as Vasco da Gama, Cartier and Magellan lost almost their entire crews because of this disease. Scurvy is a disease resulting from a deficiency in the diet; it is simply the lack of Vitamin C.

Fruits and vegetables had been a remedy for scurvy for about 300 years until researchers began to examine food for Vitamin C. Zilva, C. G. King, Reichstein, and Haworth were important scientists delving into the study of Vitamin C. They established the chemical structure of Vitamin C and synthesized it in 1933--making it available at lower costs than if it had been extracted from natural sources. In the United States today, the average weekly production of man-made Vitamin C now approaches 50 tons--the amount contained in approximately a billion oranges of average size.

One glass (250 cc) of fresh orange per day is enough to supply the necessary intake of Vitamin C. But you need it every day; Vitamin C is not stored. Citrus fruits (such as oranges and lemons), berries, green vegetables, cabbage and pears are particularly good sources of the Vitamin. Potatoes, carrots, apples and bananas contain less of it, but provide an adequate amount if eaten in sufficient quantities.

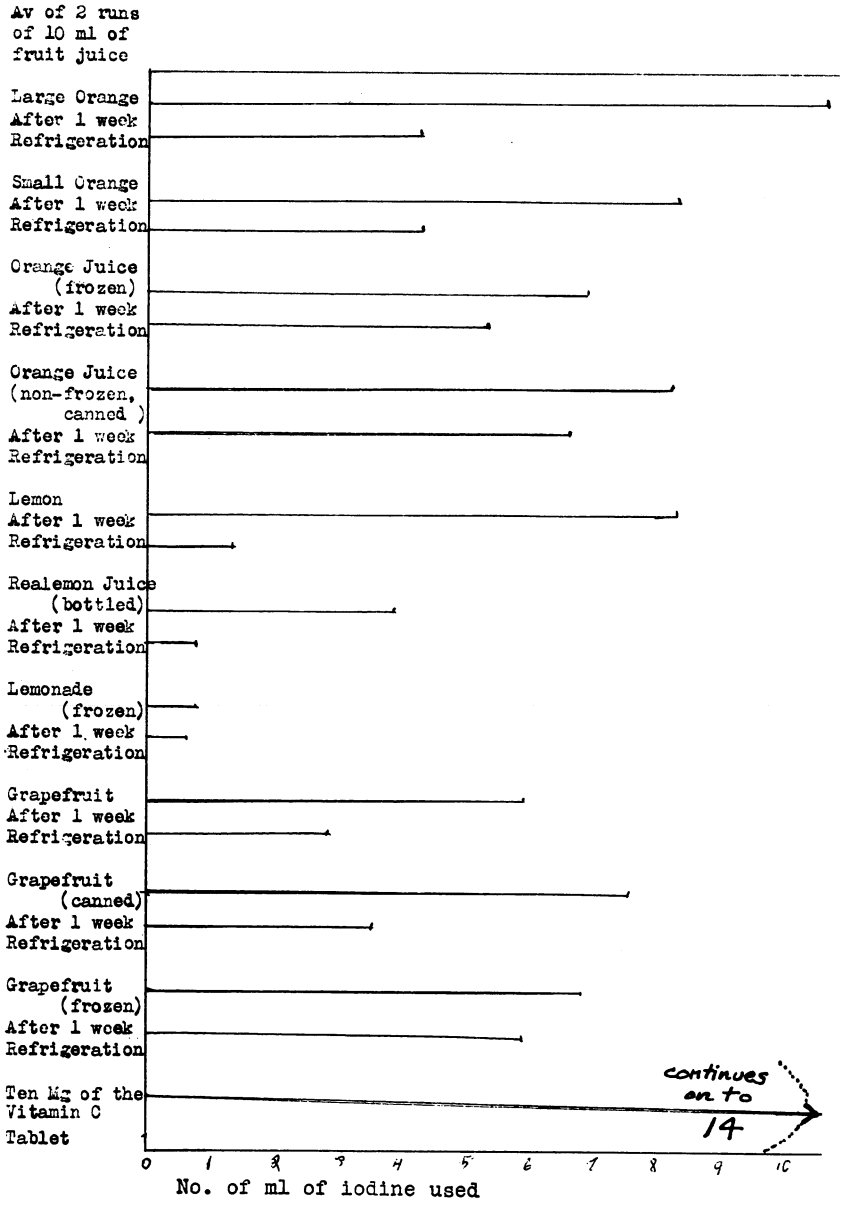
My problem is to determine the amount of Vitamin C in an ascorbic acid tablet, in a can of frozen orange juice, in a non-frozen can of orange juice, in a large and small orange, in a lemon, in a can of Realemon Juice, in frozen lemonade, in a can of grapefruit juice (frozen and non-frozen), and in a grapefruit.

After filling the burette with a standard solution of iodine, I used a pipette to measure the orange juice. Then I put the measured amount of orange juice in the beaker with water and a little starch, titrating it with the iodine, using the starch solution as an indicator.

Iodine combines with Vitamin C. Starch is used as an indicator in the experiment because the iodine will not react with

the starch until all the Vitamin C has combined with the iodine. As soon as no free Vitamin C is left in the solution, the iodine reacts with the starch and causes a blue-black color to appear throughout the sample. Here are the results:

Vitamin C in Citrus Fruits



THE EFFECT OF POLYPHOSPHATES ON IRON IN POTABLE WATER

By Carol Hensel*
Sparta High School

Too much iron in water supplies is not only a problem in our state but throughout the nation. Many communities in Wisconsin have a concentration of iron in excess of .03 parts per million in their water supplies which is considered objectionable because it causes turbidity, interferes with washing clothes, imparts a metallic taste and plugs pipes with sediment.

In my search for an answer to the problem of iron in potable water I have investigated several methods which both public water departments and private individuals have employed. The use of water softeners; oxidation, sedimentation, and filtration; and the addition of a chemical group called polyphosphates are a few of these methods. The latter method, the use of polyphosphates to chelate iron in water to keep the iron from precipitating, is the method I have studied.

In the practical application of adding polyphosphates to a water supply, it is necessary to know how much to add, its effectiveness, and limiting factors. After reading various publications, I was unable to find conclusive information concerning this subject. The problem for my experimentation became the question of how much polyphosphate to add to a water supply, its effectiveness, and the limiting factors.

I prepared a number of water samples containing different concentrations of iron and polyphosphate. Because of the limits of my balance, it was difficult to accurately weigh out the

* - See center spread for additional illustration.

small amounts of chemicals needed to be added to the 20 ml. samples of water tested. Therefore, I prepared separate stock solutions containing 200 p.p.m. of polyphosphate and ferrous iron so that one ml. of stock solution would be equivalent to 1 p.p.m. when diluted to 200 ml. The solutions were then pipetted into the water samples adding up to 20 p.p.m. of polyphosphates and up to 20 p.p.m. of iron in varying combinations. In this way I obtained known concentrations of iron and polyphosphates in each sample.

Example of Calculations Necessary to Prepare Iron and Polyphosphate Solutions

$$\text{p.p.m.} = \frac{\text{gms. substance (solute)}}{\text{1,000,000 gms. solvent}}$$

1,000 p.p.m. $Na_5P_3O_{10}$ = 1 gm. $Na_5P_3O_{10}$ per L. H_2O

200 p.p.m. $Na_5P_3O_{10}$ x 200 ml. = 1,000 p.p.m. x X ml.

X = 40 ml.

1 ml. of 200 p.p.m. $Na_5P_3O_{10}$ diluted to 200 ml. = 1 p.p.m.

$$1 \text{ gm. } Fe^{++} = \frac{278.02 \text{ mol. wt. } FeSO_4 \cdot 7H_2O}{55.85 \text{ mol. wt. Fe}} = 4.98 \text{ gm. } FeSO_4 \cdot 7\ H_2O$$

After allowing the bottles to stand for several days, I observed the precipitate of iron on the bottom of the bottles. A visual comparison was made, and the bottles were classified according to the amount of precipitate formed. In this experiment the polyphosphates did not completely chelate any of the sample iron solutions. For several days the bottles containing 3 p.p.m. ferrous iron and 5 p.p.m. or more of polyphosphate did not contain an observable precipitate. After three months, a slight precipitate was noted. Therefore, time seems to be one of the variables affecting the results. However, the first observations are similar to what would be found in most water supplies. Usually, but not always, the higher the ratio of polyphosphate to iron, the lower the amount of precipitate formed.

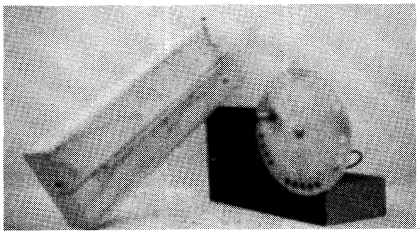
# # # #

AN AUTOMATIC TELEPHONE DIALING MECHANISM

By Ronald Servais
Aquinas High School, La Crosse

I have always been intrigued by telephones. As a child, I played with walkie-talkies and old phones, learning some of the basic principles of the telephone. But these failed to hold my interest for long. A few months ago, I decided that I wanted to improve upon the present telephone system.

To me, the dial lacks the thoroughness characteristic of the remaining parts of the phone. It is time consuming and subject to human error. The dial itself is simply a switch that breaks the flow of current rapidly. These breaks are equal to the number dialed. Therefore, when 1 is dialed, one break occurs; when 2 is dialed, two breaks occur; and so forth. There are many ways in which this could be simplified and perfected. One major remedy would be to replace the present circular dial



with ten pushbuttons, one button representing each number. Several prototypes have already been produced, but as yet are not for the general public.

Another prominent idea would be such a dial that could complete the desired circuit at the push of a button. Thus a series of breaks, representing the five or seven digits in an entire telephone number would have to be contained on a single dial. There has been much thought in these lines but relatively little else.

Although such a dial could dial only one number, it would be of great importance. Emergency numbers, such as those of the family doctor and the fire department, could be placed on them. By merely pushing a button, these numbers would automatically be dialed. We can readily see their value. This became my project.

I visualized several ways of making this feasible. One would be a circular metal disk, punched with holes in a very definite pattern. As this disk rotates about its axis, it rubs on a metal button, which completes the circuit. When this button comes upon a hole, the circuit is broken, and the mechanism becomes a switch. With these holes in a particular order, the same result can be obtained as dialing several numbers on the regular dial.

Another idea which I had would be to cut notches on a straight strip of metal. These notches would correspond to the holes in the disk. When this strip would slide through its stand, the notched edge would rub on a metal contact point, thus achieving the same result as the disk.

I then constructed both types. I had some difficulty with the strip due to friction but the disk worked perfectly. It will dial an entire number that is placed upon it when it is rotated one revolution. Without a doubt the project was a success.

# # # #

Acknowledgments -

Sketch on p. 104 from The Amalgamator, March 1955. All center spread photos by Gerhard R. Schultz except No. 4. John Muir picture on p. 138 with permission from frontispiece of Vol. I, "The Life and Letters of John Muir" by William Frederic Bade', copyrighted by Houghton Mifflin Publishing Co. (1923). Photo of B. O. Dodge on p. 141 by Bachrach (1940). Other "In Memoriam" photos, pp. 141-144: Miss Engel from Madison's East High School annual of 1959; Smith from The Timber Producer; Urdang from U.W. Photo Laboratory and Wilde by Platz Studios, Milwaukee. The front cover photo of Birge by M. E. Diemer is from archives of the State Historical Society and the back cover map is from "The Peat Resources of Wisconsin" by Frederick W. Huels, published by the Wis. Geol. & Natural History Survey, 1915.

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RESPONSE OF BABY CHICKS TO GONADOGEN AND PROPYL-THIOURACIL

By David Logerquist*
Sevastopol High School

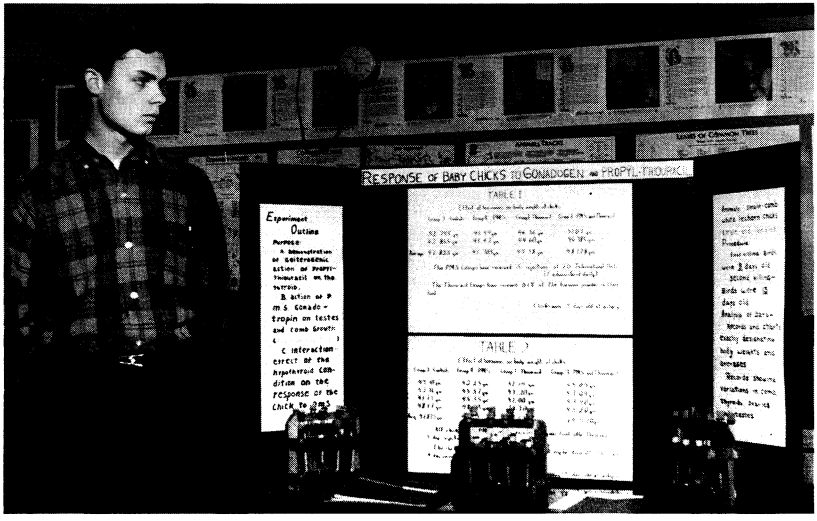
The responses of chicks to various hormones may seem to be a worthless and time consuming study. However, it is a project of considerable biological importance. By using the same methods which I followed, scientists hope to gain a better understanding of the endocrine systems of the vertebrates. This may eventually enable them to determine the causes of many physiological malformities and how they can be corrected.

One of the men who has been working with the reaction of hormones on chicks is Dr. W. R. Brenemen, who is an instructor at Indiana University. I obtained several of his reports as well as his general method of procedure. In my own experiment I altered some of the steps considerably.

In the following paragraphs I will assert the various phases of my project. The chicks used in this experiment were four-day old, single comb White Leghorns. There were 12 males and 12 females. The hormones which were used were pregnant mare serum (P.M.S.) and propyl-thiouracil. P.M.S. is a follicle stimulating hormone and the thiouracil causes the formation of a goiter. The P.M.S. was donated by Upjohn and Company. The thiouracil was obtained from a local pharmacist.

There were three main objectives which I hoped to achieve. They are as follows:

A. A demonstration of the goiterogenic action of propyl-thiouracil on the thyroid glands.
B. The action of P.M.S. gonadotrophin on the testes, ovaries, and comb control.



* - See center spread for additional illustration.

C. The result of interaction--the effect of a hypothyroid condition on the response of the chick to P.M.S.

Two primary effects and two secondary effects were anticipated: The primary effect of the thiouracil on the thyroid and the P.M.S. on the reproductive organs. The secondary effect of the thiouracil on the reproductive organs, P.M.S. on combs, and thiouracil on the response of reproductive organs.

The chicks in the P.M.S. groups were injected with 20 International Units daily for five days. The thiouracil was powdered and 0.1% was added to those groups for the same five day period.

After the third or fourth day it was evident that the chicks in the P.M.S. groups had combs which were more highly developed than the others. No other variations were denoted at this time. All chicks were definitely healthy.

Two chicks from each group were killed when they were nine days old. The special feeding requirements and the P.M.S. injections had been completed. The chicks were weighed on an analytical balance and their weights were recorded. The thiouracil had only a slight effect on the comb growth in comparison to the controls. The 16 chicks which remained were given regular food for the next four days.

The extra period of growth proved to be very conclusive. There was a continued occurrence of varying body weights. In order to evaluate the information obtained from both killings, it is necessary to compare the results of each. They are as follows:

A. The weight of the controls continued to increase at a normal rate.
B. The chicks in the P.M.S. group made a very pronounced increase in body weight.
C. The thiouracil group did not make the normal gains.
D. The P.M.S. and thiouracil group definitely did not mature normally in regard to weight.

These facts indicated that propyl-thiouracil actually retards growth. Conversely, P.M.S. tends to stimulate growth to a certain extent.

In the majority of cases, the effects of each hormone on the combs, thyroid glands, and reproductive organs of the chicks were definite enough to be seen with the naked eye. In comparing the P.M.S. groups, comb and reproductive organs at the last killing, a very satisfactory increase was made in respect to the anticipated gains. Group No. 3, which is P.M.S. and thiouracil, however, represented the greatest change. There were no unexpected mortalities in this experiment.

This project benefitted me in many ways. I became familiar with the use of hypodermic needles, the analytical balance, and the tools and methods of dissection. Perhaps of greatest help to me was the fact that I grasped the value of scientific procedure. Because of the difficulty I had in obtaining the hormones, I was not able to vary the amounts which I administered to the chicks. I definitely plan to continue my study of varying concentrations on the endocrine system.

# # # #

THE BOOKSHELF

EFFECTIVE FEATURE WRITING
By Clarence A. Schoenfeld

Harper & Brothers
49 East 33rd st.
New York 16, N. Y.
1960 429 p. $6.00

Mr. Schoenfeld defines a feature article as "the hybrid of the writing world" because it includes the cold facts of a news story, the action of a novel, the viewpoint of an essay and the sales appeal of an ad. While it is "the product of factual reporting, it represents reporting to which has been added interpretation and imagination through the devices of rhetoric to breathe into it the appeal of fiction."

The content is a skillful digest of the best that has been written on this subject in recent years, with generous quotes from articles published in writers' magazines. A beginning or professional writer can find anything he wants to know or confirm, in the index which lists information from manuscript presentation to copyright law. The title indicates "tips" for feature writing only, but throughout the book there are valuable suggestions for improving all prose writing, especially those for "readability" and the economy of words:

"Creative cutting ... makes for faster pace, and faster pace is what readers want--and editors pay for. In Victorian times we had a horse-and-buggy pace in writing, but this is the age of the jet, the five-minute lunch period and the one-minute newscast." "Conciseness is the soul of clarity--and sales." "In the context of feature writing (research) doesn't connote mysterious scientific procedure. It means ... searching and researching, for facts. Good, solid reporting, in other words."

With an assigned subject, "we writers do not have the complete 'say.' There are, however, two vital components of readability over which we can exercise virtually complete control. They are composition--the composing of readable sentences into meaningful paragraphs, and organization--the putting together of potent paragraphs into an effective whole."

This book is not a how-to-do-it manual, but rather serves as a guide, much as an experienced guide takes a hunting party over a trail, because he knows the twists and turns, the pitfalls and the way out. We find it of great value to our editorial staff in helping to judge the manuscripts which come in for our consideration. --- Neita O. Friend, Editor
Creative Wisconsin

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DICTIONARY OF WISCONSIN BIOGRAPHY

State Historical Society of Wis.
816 State st., Madison 6
1960 385 p. $11.00

Wisconsin long has needed this biographical directory of those who have made significant contributions to its past history. This is a labor of love by the Historical Society's staff and cooperators during the past quarter century. Sketches of about 1,400 deceased individuals were written by some 425 contributors including a substantial number of Wisconsin Academy members. The fifteen-member Board of Editors included WILLIAM B. HESSELTINE, MILTON LONGHORN, FREDERICK I. OLSON and ALICE E. SMITH of the Wisconsin Academy. Professor Olson, of the University of Wisconsin-Milwaukee, is reported to have been a major contributor, especially of sketches on twentieth century socialist leaders and reformers.

Anyone interested in Wisconsin will need this reference guide to the state's history. Here are the basic facts on everyone of importance from early explorers and pioneers to business leaders, educators, scientists, authors and politicians. The editors agree their most difficult question was, "What has this person done to warrant his inclusion in the Dictionary?" All but two of the Wisconsin Academy's first 16 Presidents appear in the sketches.

Although not perfect (because everyone you consider "significant" may not have been included) this is a monumental contribution, an example of successful cooperative effort by the State Historical Society, and an invaluable historical research tool. It is also a fine example of the bookmaker's art with fine typography, printing and binding which is a credit to the North American Press of Milwaukee. -- W.E.S.

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MADISON SCHOOL FOREST

Board of Education
City of Madison, Wisconsin
1960 150 p. $1.00

All but one of the five authors of this book - DANIEL M. BENJAMIN, FRANCIS D. HOLE, PAUL J. OLSON and JAMES H. ZIMMERMAN- are members of the Wisconsin Academy, and Conservation Commissioner Olson (who also is Principal of Madison's Midvale Elementary School) wrote five of the ten chapters. In addition, more than 110 leaf prints illustrating plants described by Zimmerman were prepared by Academy member ALVIN M. PETERSON of Onalaska.

Here is the story of a small parcel of land about a half mile square in the "driftless" area of Western Dane County, Wisconsin. The book explains its foundations in the geological past, original plant communities and succession and the historic record of land use in the recent century. A management plan for its future use as an educational "outdoor laboratory" for Madison's public schools is explained - with at least half of the land to be left as a "natural area" in contrast to a "managed area." The present soils, insects, birds and mammals are discussed along with a significant chapter by Commissioner Olson on "Wildlife - Its Place in the Community and Some General Principles." Others who contributed to this publication included Conservation Department Foresters TOM RAUSCH and KENNETH ROBERTS, Game Biologist GEORGE J. KNUDSEN and Wildlife artist JENS VON SIVERS.

This is even more than an excellent guide to the ecological

community known as the "Madison School Forest." It is an example of what could - and should - be done to help make more than a thousand Wisconsin school forests important in the lives of the state's future citizens. If you review this book you will want to see the forest itself - and after you see it once, you'll want to return again and again to follow the well-marked trails to new and more meaningful outdoor experiences. -- W.E.S.

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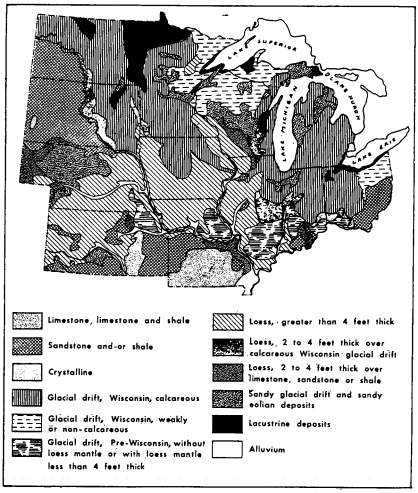
SOILS OF THE NORTH CENTRAL REGION OF THE UNITED STATES

N.C. Region Soil Survey Committee
204 Soils Bldg., Univ. of Wis.
Madison 6, Wisconsin
1960 192 pp.+ maps,charts $2.00



This bulletin of about 192 pages and some 20 illustrations is accompanied by a large colored soil map and six charts listing hundreds of soils of the region for the first time in a published classification. Descriptions of the great soil groups, as well as of particular landscapes throughout the region characterize this very fertile part of North America stretching between the Dakotas and Missouri to Michigan and Ohio.

Academy member F. D. HOLE of the UW Soils Dept. was the Wisconsin representative on the N.C. region technical committee in charge of preparation of the bulletin and both he and UW Prof. ROBT. J. MUCKENHIRN played a responsible part in its publication. UW Cartographer RANDALL D. SALE was responsible for many of the illustrations.

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WHAT SAY YOU OF PAUL
By Dorothy Moulding Brown

Revised Edition - 1960
Available from Author
1711 Jefferson st.,Madison 5, Wis.
$1.00 postpaid

This booklet is brim-full of lore about the legendary Paul Bunyan who performed so many mighty deeds in Wisconsin less than a century ago. Here is a collection of stories assembled with the help of her husband, the late CHARLES E. BROWN, and many others. It is one of the best references on this subject and even contains a four-page bibliography. There also are illustrations of "Johnny Inkslinger," "Brimstone Bill," Paul Bunyan with "Babe," his famous Blue Ox, the Hodag and other subjects such as the mosquitoes with stingers "fore and aft."

Mrs. Brown also has for sale two other booklets: "Wisconsin-Midwest Edible Mushrooms" (60¢ - 30 pages) and "Wisconsin Indian Place-Name Legends" (40¢ - 30 pages). --W.E.S.

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BECKY SHARP FOREVER

By Ralph A. McCanse
UW Extension Dept. of English

A Note on the Psychological Realism of W. M. Thackeray

A certain critical misinterpretation of one of the characters most significant in the roster of the English novel has been strangely pervasive. In the face of disproof surely quite manifest, a particular assessment of Becky Sharp has persistently termed her mis-cast on one strategic occasion and false to her own ingenious self - has persistently tainted the art and philosophy of the very author of Vanity Fair. Thackeray has been accused by no dearth of misguided commentators of a certain inconsistency in his psychological realism - accused perhaps of sheer oversight, not to say of a sudden whim-inspired concession to sentimentalism.

The particular passage involved concerns Becky Sharp's ostensibly generous gesture in disabusing the widowed Amelia Osborne of fallaciously cherished loyalty to her husband's memory. Of this scene one eminent commentator typically declares of Becky, "when she tells Amelia the truth about George Osborne.. one can forgive her much." The inference quite plainly is that Becky Sharp (inveterately selfish sharper that she is) has been actuated by generosity and by the beneficent alone. Still another literary historian, widely followed in the present generation, concurs - and reads into the given passage a motive of unadulterated kindness for the young widow's faithful suitor that is nothing less than shocking to admirers of rascality for its own picaresque deliciousness: "Becky has no reason to love Dobbin surely, yet she makes it possible for him to get his Amelia when she at last reveals the truth about George."

"At last"! But has Becky lapsed into a really surprising turn for renunciation that actuates her in the end? Caveat emptor. Let the devotee of the superbly shrewd Becky Sharp simply peruse with care the quite characteristic situation: Becky is in one of her recurrent extremities. Two possible followers - shady though they be - are at hand in the persons of the convivial "Max" and "Fritz". But these mercenaries have shown all regard not for Becky but for the notably well-to-do (and appealing) widow Amelia. What more sound in the master showman of Vanity Fair than to have his eminently opportune Mistress Becky open the way for Dobbin at last to find consideration, to find acceptance from Amelia and thus eliminate the latter from the field? In a word, the character falsity here is a critical misconception; our Becky is sharp forever!

(EDITOR'S NOTE: Brief critical studies that may provoke readers to further pursuit of essential commentary - perhaps indeed of rebuttal - are welcomed by the Review. Contributions of this nature should be sent to Professor McCanse (212 Extension Bldg., Univ. of Wis., Madison 6) who has been Associate Editor of the Academy Review in the field of Letters for the past six years.)

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A NOTE ON THE COVER

E. A. BIRGE, one of the world's greatest teacher-scientists, is shown in his limnological laboratory at Trout Lake (Vilas county, Wisconsin) in the cover photograph for this issue. He was President of the University of Wisconsin (1918-1925) and for many years a member of the state Conservation Commission and Forestry Commission. From 1897 to 1915 he was Director of the Wisconsin Geological and Natural History Survey and twice President of the Wisconsin Academy in 1889-90 and 1918-1921.

The picture was taken by M. E. DIEMER. As a portrait of an elderly professional man absorbed in the midst of the work which occupied so much of his long life, Mr. Diemer's is an excellent presentation. Paul Vanderbilt, curator of Photo Collections of the Wisconsin Historical Society which generously loaned this picture, describes Diemer's work for the University as that of a "kind of one-man predecessor to the present photographic laboratory."

Mr. Diemer, now retired, lives at 4900 Lake Mendota Drive in Madison. During the most active part of his career in photography he completed an immense amount of work on all the technical subjects called for by the College of Agriculture in particular. In his work on travel films and color photographs of botanical subjects he traveled widely throughout the world and in the United States.

In the photograph of Birge taken by Diemer we have a pictorial document in the photographic tradition of the early masters, David Octavius Hill and Matthew Brady, or the latter day Karsh of Ottawa and of Philip Halsman. Our cover for this issue is a fine portrait of a great scientist, taken by a master photographer.

--Frederick M. Logan

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DEVOCIOUN!

And as for me, thogh that I can but lyte,
On bokes for to rede I me delyte,
And to hem yeve I feyth and ful credence,
And in myn herte have hem in reverence
So hertely, that ther is game noon
That fro my bokes maketh me to goon,
But hit be seldom, on the holyday;
Save, certeynly, whan that the month of May
Is comen, and that I here the foules singe,
And that the floures ginnen for to springe,
Farwel my book and my devocioun!

---Geoffrey Chaucer

JOHN MUIR IN THE SIXTIES

By Elsa Horn Stiles
Sheboygan, Wisconsin

(Continued from Spring 1960 Issue)

The problem of self-support shadowed his entire "hungry, happy and hopeful" career as a student. To earn $32 a year for instruction plus a dollar a week for food and extras for chemistry glassware and acids, he worked as a livery boy, errand boy, baby sitter, summer harvesthand, scientific apparatus hand crafter. He also made and sold some "early rising bedsteads" to which an ordinary clock costing a dollar could be attached. One winter he fared well financially by teaching school for $20 a month. He walked the 10 miles, boarded at various farm homes, studied at night and lectured at week-end school meetings to the country folk who crowded to listen but thought him "queer."

Muir at age of 23

Since Muir's student days coincide with most of the Civil War, it is of interest to search for his relationship to it. When he returned to the campus in September, 1861 he found the Fair Grounds converted into a vast military training center and named Camp Randall. In an undated letter to Mrs. Pelton, his Prairie du Chien landlady, he tells of visiting two of their volunteer friends in camp the night before they left for Missouri. "-- They seemed healthy and pleased with their exercises. Dwight seemed to blow his pipe with great glee in the midst of the tireless army of chattering drums. Byron visited us in our room and went up to town to church with us one Sunday. You would hardly know him in his great blue coat. -- and oh dear such conversation! -- when I expressed my abhorrence -- Byron laughingly said, 'Why, John, this is not a beginning to what you would hear in other tents. This is one of the best regiments.' After lecturing to them a few minutes upon having the character formed and being possessed of tightly clenched principles before being put to such a trial as a 3-years' soaking in so horrible a mixture, Byron growing grave dropped his camp language and declared with some emphasis that there was no danger of him -- that his principles were 'firm as the adamantine hills.' I frankly expressed my opinion that principles which permitted what had passed in that tent tonight had better be anything but fixed. ---

"I was down the morning they left Madison and helped Byron buckle his knapsack. Dwight with his fife seemed uncommonly happy but oh how terrible a work is assigned to them -- how strange that such can so completely compose themselves for such work and even march to the bloody fray in a half-dance with a smile. -- Were all the secession soldiers safely arranged in rows side by side on long tables, where are the soldiers whose patriotism would enable them calmly or otherwise at such an hour

to cut their throats for the common weal. -- But the gallant charge, the well directed grape shot, the exploded mine -- ah this, This is noble ---. Don't you think, Mrs. Pelton, that if all this be indeed necessary, the slaughter should be conducted solemnly. Should not the secessionist who maybe is a Christian, who if we were acquainted with him would be a bosom friend through life--should he not be shot solemnly, when the judge sheds tears on pronouncing the doom of an atrocious murderer? How strange, it seems to me, I should feel, if in heaven one with the white robe praising, should for a little cease his praises and tell me that I had beheaded him that sunshiny day at Bull's Run ---." Nevertheless the shadow of the draft as the war progressed also crossed his recurrent enrollment plans, but his number was never called.

During the first two summers' vacation, John lived at home while cradling four acres of wheat a day in long sweating days made longer by his botanical studies. He collected plants during the noon hour, kept them fresh in a bucket of water and identified them in the evening until midnight. Thus by the end of the first year after taking botany he became familiar with the principal native plants of his home region. Part of this has been made a Marquette County Park since 1957. It is hoped that most of the flowers he mentions in his writings will return to this fragmentary preserve. He kept up this practice while attending classes - the bucket of flowers awaiting classification ever present in his room.

In a letter to Mrs. Pelton dated 1862, he writes "--- you ask how it is with me. I answer, it is well, at least in a worldly point of view. I have been home during summer vacation and have again commenced the fall term. My pecuniary matters have materially improved as has my health, so that if other circumstances, such as the unsettled state of the country, and others over which we have no control will admit, I shall spend several years in college. --- "

By the third summer vacation he was eager to become familiar with plants farther afield. He planned a walking trip along the Wisconsin River to its mouth joining the Mississippi, then crossing into Iowa prairie. Two classmates begged to join him and the three of them started out in high spirits, visiting Prairie du Chien enroute. Their experiences in search of breakfasts at farmers' doors and their thoughts during noon relaxes are amusingly and picturesquely written in rhyming verse, giving lively color to the Wisconsin scene. What else is known of the exploits of this adventure is humorously written in three segments as letters to Emily Pelton, a member and niece of the Prairie du Chien household. In a letter to her dated February 27, 1864 he says, "Dear friend Emily. You speak in your last letter of the pleasure which a letter written during the ramble would have given. That is not yet too late. 'Backward, roll backward, Oh time in your flight.' Recess in the Bluffs near MacGregor, Iowa, July 7, 1863. ---" Then follows an account of a surprise and an escape on a toilsome day. The next day he sent her the next day's - July 8th - exploits in which two of them (one of the three having dropped out) procured a boat on the Mississippi and attempted a return up the Wisconsin. The third installment dated July 9th recounts their second unsuccessful attempt up the river with larger oars hewn out by their own hatchets the night before. After a sandbar rescue they spend the night in a hospitable farm home near Wright's Ferry. Here the second companion drops out and Muir completes the summer's walk alone, perhaps

in time for harvest work near home and return to classes in September 1863. If so, he did not finish the year for on March 1, 1864, he wrote Emily again a hasty note saying he had no time now to recount the woodman adventure which closed the July 10th ramble and states that he has already bidden everyone goodbye and that he is taking the cars in half an hour.

These letter accounts to a personal friend are fascinating, not only because of their Wisconsin freshness but because they portend Muir's potential as a writer. Furthermore, it was in this manner of writing - fulfilling requests of eastern newspapers and magazines for accounts of his lonely ventures in the wilds - that he earned his living during the 1870 decade by happy rambling. It freed him from the incessant need for machine shop employment and gave to the world the essence of his researching spirit.

On May 23, 1865 he wrote Emily a letter from Medford, Canada saying he was living in a retired romantic hollow and busy with work and study and dreams. By September 1867, after a week in Madison in August he was on his 1000-mile walk to the Gulf which took him down the Florida Keys and Cuba, thence on board ship to California via New York and Panama. He landed in San Francisco in April 1868, walking through the streets to find a way out. It seems plausible that the picture of him in possession of the Wisconsin Historical Society Museum with a tiny San Francisco photographer's identification on it, was taken at that time for he looks as if he had just stepped out of a boat or come in from a hike. It was used as a basis for the lithograph portrait sketch (see first installment in Spring 1960 issue of Review) for it seems also to answer descriptions of him as a student--hair touselled, beard needing trimming, skin transparently clear, blue eyes shining. He was also said to be straight as an arrow, lean and six feet tall. By 1869 he spent his first summer in the Sierras as the responsible man in a sheep herding assignment, later returning to begin his first winter there.

Thus at the close of the 1860 decade he began his rockbound solitudes leading to another decade of greater findings. His statement that he left the University of Wisconsin for the University of the Wilderness was not merely a poetic phrase. It embodied his rendezvous with a life in constant danger of being shortened or wasted. For he felt himself enfolded in the rock pages of God's Manuscript, dedicated with a passionate urgency to deciphering their hieroglyphs.

# # # #

NEWS Word recently has been received of the death of two Wisconsin Academy members, Professor MICHAEL F. MALONEY of Marquette University (English) and Professor LUCIUS CHAPIN PORTER of Beloit College (Philosophy). In Memoriam information will be carried in a future issue. All members are requested to assist in advising the editor promptly of such news and any data on the deceased will be appreciated.

--- Walter E. Scott

In Memoriam

Bernard Ogilvie Dodge 1872-1960

BERNARD OGILVIE DODGE was born at Mauston, Wisconsin in 1872 and died in New York City on August 9, 1960. Graduating from Milwaukee Normal School, he later earned his Bachelor's degree at the University of Wisconsin. In 1908 he went to Columbia University as a graduate student, holding two summer research fellowships at the New York Botanical Garden. When he obtained his Ph.D. in 1912 he joined the botany faculty at Columbia. In 1920 he went to Washington to the Bureau of Plant Industry, but returned to the Botanical Garden in 1928 as plant pathologist. Retiring in 1947, he was a consultant for ten years. An Academy member since 1912, he was granted Life membership in 1951.

When he went to New York, he took a collection of some 600 species of fungi, mostly from a single Wisconsin county. His early work on classification of fungi developed into his major interest in the genetics of fungi, a subject on which little was known when he began his studies in Washington. He published several papers on plant diseases and a book on diseases of ornamental plants. His successive papers on Neurospora resulted in their establishment as one of the principal tools of genetical and biochemical investigation. His work laid the foundation for the use of these fungi as superior experimental subjects. For the present generation of scientists, Dodge's Neurospora occupies a place comparable to that played by Mendel's peas for an earlier generation.--Adapted from "Herbertia" from N.Y.Botanical Garden.

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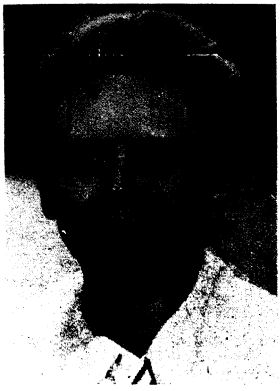
Martha S. A. Engel 1897-1960



MARTHA S. A. ENGEL was born at Sun Prairie, Wisconsin on April 16, 1897 and died August 11, 1960 at Madison. She attended Milwaukee Downer college and obtained her B.A. and M.A. degrees at the University of Wisconsin. Beginning her teaching career while a graduate student, she then went to Parsons College as assistant professor of biology. She also taught for a year at Illinois State Teachers College in Normal before coming to East High School in Madison in 1929, where she remained until retiring in 1958. East High School's greenhouse and biology museum were built at her suggestion. Miss Engel was an artist as well, and exhibited in several Wisconsin traveling exhibits. Besides illustrating a pamphlet on

Wisconsin Shrubs, she prepared two sets of slides on botany and zoology for the Welch Manufacturing Company. The Prairie and Its People was co-authored with Andrew W. Hopkins. (see Fall 1956 Review) She was also formerly a vocal solosit with the Madison Civic Chorus. A devoted church and Sunday School worker, she organized teacher training classes at St. John's Lutheran church and was an active member of the national Board of Parish Education of the American Lutheran church from 1948-58. She joined the Academy in 1949 and was also a member of the American Association for the Advancement of Science, State Historical Society, Association of Biology Teachers, and was listed in Who's Who in American Men of Science. A recent gift card from her pupils illustrates the appreciation felt by many of them over the years: "We hope our lives are as successful as the example you have set for us."

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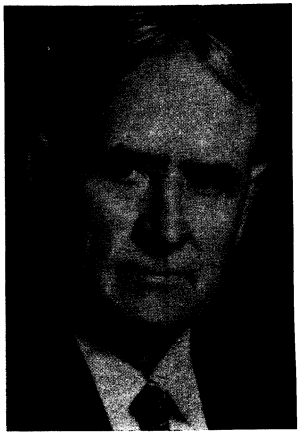

Walter W. Smith 1876-1959

WALTER W. SMITH was born in 1876 and had lived at Gillett, Wisconsin since 1901. He had an active business career until his death in 1959, helping to organize five different industrial plants. He was president of Linwood, Inc. at the time of his death. An untiring worker for the betterment of his community, he served his church in many capacities and was on the school board for 31 years. At the State School Board convention in 1952 he was presented the Wisconsin Education Association award. A special citation for outstanding service to the Timber industry in the Lake States was presented by the Timber Producers Association in 1958. For several years he was president of the National Woodenware Manufacturers Association and conservation chairman of the Hardwood Plywood Manufacturers Association. He was a member of several other industrial organizations and joined the Academy in 1956. -- Adapted from The Timber Producer, November 1959.

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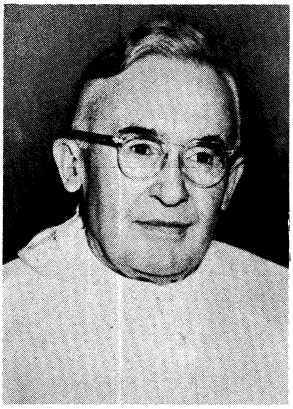
Michael J. McKeough 1891-1960

Father MICHAEL J. McKEOUGH, O. Praem., was born Sept. 18, 1891 at Green Bay and died there June 5, 1960. He attended St. Norbert College, where he earned his Bachelor's degree in 1914. Three years later he was ordained and became chaplain at St. Joseph's Academy. Shortly afterward he became an Army chaplain, and upon his release in 1919 began his studies at Catholic University and received his Master's degree a year later. His studies were hampered by ill health but in 1926 he obtained his Ph.D. degree.



He was an ardent educator and organizer, and several Norbertine order schools owe their fine establishments to his efforts. La Salle College awarded him an honorary Doctor of Laws degree in 1941 in recognition of his work in Pennsylvania. Camp Tivoli on Shawano Lake in Wisconsin is the oldest Catholic boys camp in the midwest and was founded by him in 1925. In 1945 he became professor of education at Catholic University and was later appointed editor of the Catholic Educational Review. He was made dean of the Catholic Sisters College in 1948. Returning to St. Norbert College in 1951, he became dean the following year. He retired in 1957 and began work on a planned book on the philosophy of education. He was a nationally known and respected educator and author, and his doctoral dissertation (1926) is still widely quoted as an authority on the Catholic viewpoint of Darwin's theory of evolution. He affiliated with the Wisconsin Academy in 1956.

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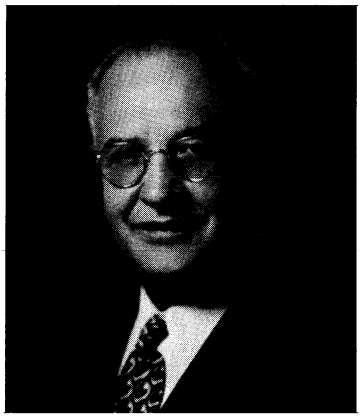
Jack Shores Supernaw

1899-1960



JACK SHORES SUPERNAW was born at Norwood, Michigan on May 24,1899 and died at Madison, March 2, 1960. Receiving his early education in Michigan, he was granted A.B. and B.Sc. degrees from Olivet College and graduated from the University of Wisconsin Medical School in 1927. Very active in medical groups, he was a Fellow of the American College of Surgeons and formerly chief of surgery at Madison General Hospital. He served as president of the Dane County Medical Society in 1942 and as chief of the Wisconsin emergency medical service during World War II. In the State Medical Society he was a member of the House of Delegates and acted as Chairman of the Veterans Committee of the American Medical Society.

His interests in wider fields led to membership in several technical societies including the Societé Astronomiqué de France, the American Astronomical Society, the Madison Mineralogical Society, and the Madison Astronomical and Geological Societies. He was affiliated with the American Association for the Advancement of Science, the Wisconsin Surgical Society, Alpha Omega Alpha, honorary medical fraternity, and joined the Wisconsin Academy in 1944. He wrote several articles and papers published in the Wisconsin Medical Journal.

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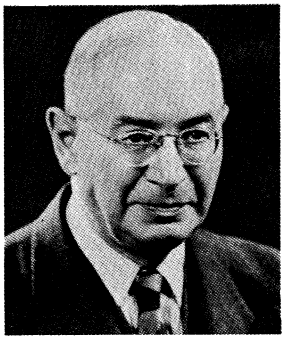

George Urdang 1882-1960

GEORGE URDANG, world famous authority on the history of pharmacy, died June 27, 1960 at Madison. He was born in Germany in 1882 and was a graduate of the universities of Leipzig, Berlin, and Halle-Wittenberg and also of Long Island University in the United States. Editor of a well-known German pharmaceutical journal from 1919-34, with four friends he founded the German Society for the History of Pharmacy in 1926, serving as director until 1934. A political refugee, he came to the United States in 1938 and had lived at Madison most of the time. Many awards and honors in the field of pharmacy were conferred upon him from this and several European and South American countries. He held the newly created chair for the history of pharmacy at the University of Wisconsin from 1947 until retirement in 1952. Professor Urdang joined the Academy in 1943. (See Retirement Profile, Spring 1958 Review.)

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Platz Studios

Frederick E. J. Wilde 1886-1960

FREDERICK E. J. WILDE, professor emeritus of history at the University of Wisconsin-Milwaukee, died on June 22, 1960 in Milwaukee at the age of 74. Professor Wilde was born in the town of Mequon of a pioneer Wisconsin family. He was educated at the University of Wisconsin, receiving his B.A. in 1911 and his M.A. in 1912. Until 1918 he taught at the University of Wisconsin with the exception of two years spent at the University of Pennsylvania as Harrison Fellow in History. In 1920, he joined the faculty of the old Milwaukee State Teachers College (now UW-M). He was chairman of the history department from 1926 until his retirement in 1956.

Under his leadership a highly capable department was assembled in Milwaukee. A specialist in European history, he introduced thousands of undergraduates to thousands of years of history. Also deeply interested in the history of ideas, he was one of the pioneers in the teaching of intellectual and cultural history in Wisconsin. His thorough scholarship, profound insights, combined with a subtle wit, inspired countless students. Recognized as one of the state's finest teachers, Professor Wilde's "writing was done on the minds of his students rather than in books." He had been affiliated with the Academy since 1957.

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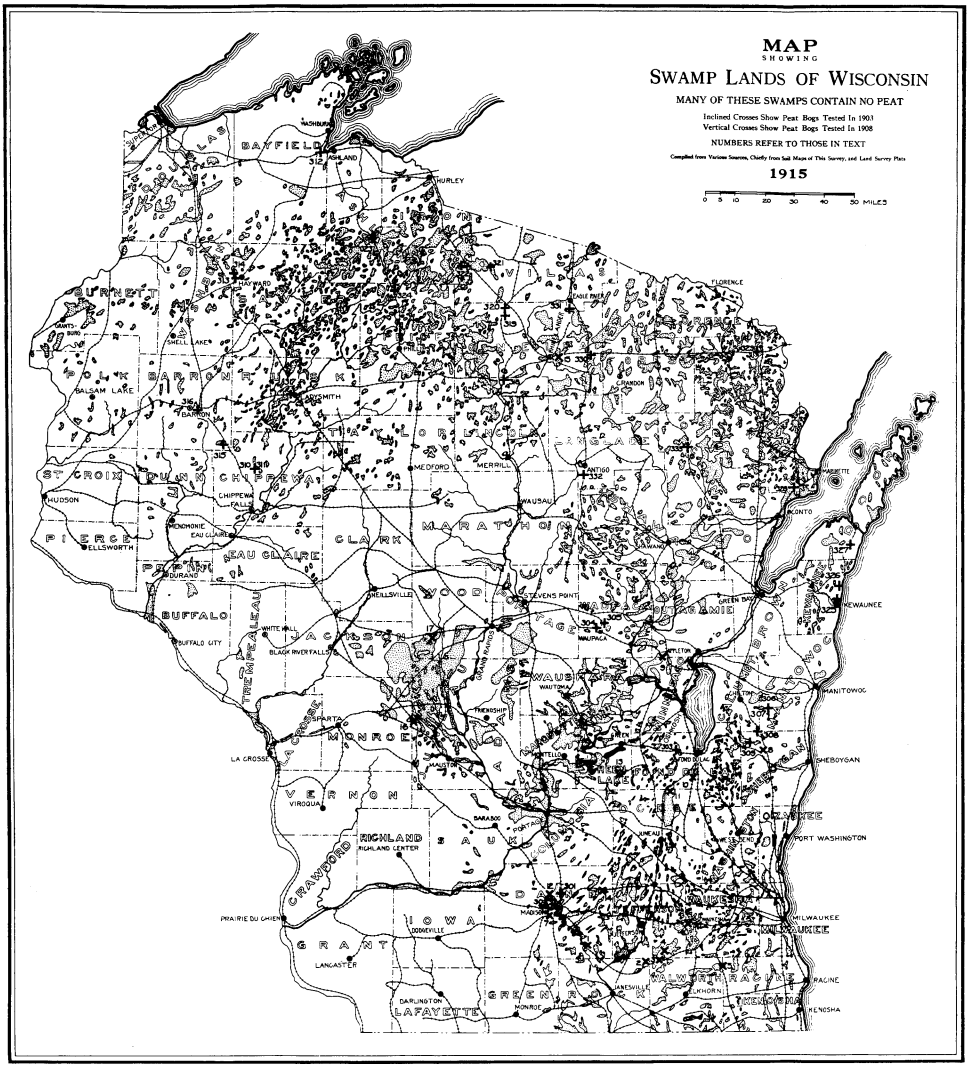

SWAMP LANDS OF WISCONSIN

from

"The Peat Resources of Wisconsin"

by

Frederick William Huels

Wisconsin Geological and Natural History Survey, Bulletin No. XLV
1915 Economic Series No. 20