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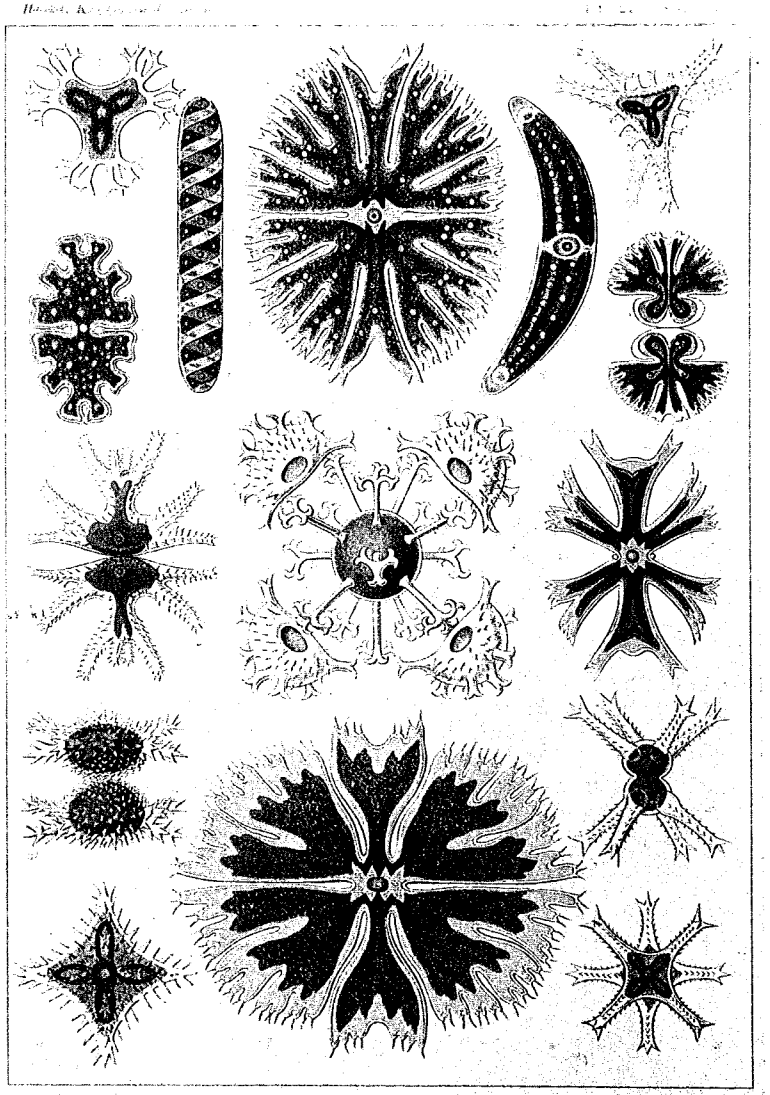

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Volume IV, Number 2

Contents for April - June, 1949
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POSSIBILITIES FOR BIOLOGICAL FIELD RESEARCH IN CHICAGO AREA

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By Wm. Westfall

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When thinking of field research in biology, the average person, and even the average scientist, pictures an expedition to darkest Africa or the Galapagoes Islands. Although you pass many varieties of trees and plants every day, you don't associate these plants with the botanist. The popular opinion that the botanist only studies rare orchids from the slopes of the Andes, or rare vegetation from Australia, is only too correct. The zoologist may know nothing of the common birds of his area, but he will know everything about the sparrows of the Galapagoes Islands. If you go into one of our great Natural History Museums, you can easily find an egg of the Great Auk or the kneecap of a long extinct reptile, but you will search in vain for the English sparrow, or a display showing the field mouse in its natural habitat.

Why travel thousands of miles to see strange animals when we have many unusual animals in our own area? A few of our scientists have taken the trouble to study our native plants and animals, but unfortunately very few. The results of their studies have, in general, not been published. Today we find ourselves in the unique position of having a greater knowledge of the Australian kangaroo than we have of the common opossum.

The Chicago area is practically a virgin territory sofar as investigation of the habits and distribution of our native plants and animals is concerned. Although all the species of our plants and animals have probably been discovered, their location has never been accurately described. There is great need for a list of localities where various species are commonly found. At present, the botanist or zoologist must rely upon his[1] personal knowledge to find colonies of a certain species.

In numerous books we will find statements like the fol - lowing: "No one has ever seen mud puppies courting, mating or depositing eggs under normal conditions". In August, the Massassuga, "the only poisonous reptile[2] of this area" is often seen crossing Portwine Road between Deerfield and Dundee roads. The significance of this summer activity is unknown". The significance of the coloration of many of our birds[3] is unknown. The full reasons for the carnivorous habits of certain of our Indian swamp plants are unknown. Perhaps more of our scientists will recognize the need for research in these fields and some of these problems will be solved.

The zoologist will find no great lack of animals in this area. There are no wild animals in this area larger than the Northern Coyote; but we do have an interesting marsupial, the Virginia Opossum[4]. There are nineteen members of the order Rodentis including the Small Eastern Flying Squirrel that possesses flaps of skin between the fore and hind limbs. This animal actually uses these flaps of skin in gliding from tree to tree.

The mink often enters the city limits of Chicago. Altogether, there are forty-four species of mammals that inhabit the Chicago area. The Chicago area, according to Pepoon, is bordered by[5] Lake Michigan on the east, The Waukegan[6] moorlands on the north, the Indiana-Michigan border on the south and the Valparaiso Moraine on the west. This area is also the home of fifty-one species of Reptiles and Amphibians, between 160 and 300 birds and an unestimated number of insects[7] probably numbering[8] in the thousands. The number of Worms, Mollusks and Protozoans has never been estimated. In fact, to my knowledge, there has never been a check list of these animals published for the Chicago area. There is plenty of material in this area for any zoologist.

The botanist will also find a wealth of material in this area. There are about 1,900 species of native flowering plants around Chicago. The number of lower plants, the fungi, algae and ferns, is unknown[9] but there are probably as many of them as in any comparable area. One would think that the civilization would cause a rapid decrease in the number of our native species but conversely there has been an increase in number in the past fifty years. Many species have been introduced accidently, when their seeds[10] dropped from freight cars or automobiles. Other plants have escaped from our gardens and are now indistinguishable from our native species.

The favorable junction of the prairies of the Midwest, the beech-maple forest of the East, the sphagnum bog habitat of the North and the presence of the unusual sand dunes of Indiana, are responsible for the large number of native plants. In a part of the Rocky Mountains, (including a National Park) long noted for its botanical possibilities, there are less than 1,000 species in an area equal to that of the Chicago area. The Indiana dunes have such a rich flora that entire books have been written on this region. Orchids and the fly-catching Sun

dew are found in the bogs of this area. Many plants unknown in other places are found in this region.

One of the most fascinating topics of biology is the topic of Ecology. Ecology is the study of the distribution and relationships of organisms. Why does the carnivorous Pitcher plant live in low nitrogen soils? Why do other plants inhabit soils of high acidity or alkalinity? How is the frog adapted to life in two media? These are a few of the questions that ecologists try to answer. This field is one of the newest and least investigated of all biological fields.

The botanist is usually interested in Ecology due towhat is called succession. If you watch a patch of ground long enough, you will find that the same plants do not come up every year. The flora changes and rechanges until a group of plants appear which are best adapted to the environment. This group, called a "climax" constantly reproduces itself until something changes the environment. There are several types of climaxes, such as the beech-maple forest, the prairie and the evergreen forest.

Animals depend entirely upon plants for food and a change in the plants of an area would probably cause a change in the types of animals present. Various plants seem to form "associations" with other plants of the same region. There are probably similar associations among animals although zoologists don't give them much notice. There are many problems of Ecology in this very area, such as the following: The newt is known to be numerous locally only in certain small ponds near Miller, Indiana. There is no reasonable explanation for the scarcity of the Red backed Salamander in the part of Illinois north of Chicago. These, and thousands of like problems peculiar to this area[12] could probably be solved by the application of ecological methods.

The application of special instruments and methods to problems of biology may give excellent results. Mr. John Ott of Winnetka has done some remarkable work with time lapse photography. This type of photography has the opposite effect of slow motion and speeds motion up greatly. The growth of a plant to maturity which takes months may be seen in a few minutes by this method. Many of our common plants and animals have never been photographed by any method. Mr. Ott is now working on the problem of the growth of cancer cells in cooperation with Northwestern University.

In 1872 Briggs tied a cloth bag[13] over his water faucet

and let the water run [14] for several hours. When he examined the sediment in the bag, he found forty-three species of diatoms. Today the water of Lake Michigan probably contains just as many of these microscopic plants which fortunately are harmless to humans.

The microscope enables the scientist to search an entirely new world. Last Spring, I examined a sample of mud and water from the South Pond in Lincoln Park.There were twenty-five species of diatoms, three species of nematodes, four ciliates, two flagellates, several other species of algae and several unidentified organisms in this small sample.[15] Even the water about us abounds with life.

There are some small organisms, quite common in this area, called slime molds. These animals (perhaps) are so low on the evolutionary scale that scientists cannot decide whether they are plants or animals. A little work by scientists may help settle this disagreement. These organisms may give us a clearer insight into the basic properties of life.

Conclusion: The Chicago area[16] compares favorably with any other similar area in this country (perhaps in the world) in number and variety of native species of plants and animals. There is room for much more work on the species of this area.

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AUTHOR'S NOTE TO OUT OF TOWN SUBSCRIBERS:

This article was written primarily for Chicagoans, but if you will substitute the name of your town wherever the word CHICAGO appears, the article will apply to your own area. I have heard rumors of some good material being found in other areas, so don't despair if your home is not in Chicago.

*****

FOSSIL DIATOMACEOUS DEPOSITS
IN THE UNITED STATES OF AMERICA

By M. Rasmussen, Amsterdam, N. Y.

First in importance and interests stands the beds underlying the City of Richmond, Virginia and vicinity, which are a marine deposit; and are found at depths varying from surface exposures on the slopes of the hills to fifty or more feet beneath at their summits. Their extent at the City of Richmond is about two and a half miles from north to south, by one and a half from east to west. At some points the infusorial is overlaid by beds of stiff blue clay containing many casts of Miocene fossil shells; while for most parts it is only capped by a stratum of ochreous earth from two to eight feet thick, containing Miocene fossils and the gravels, sands and clays of the Quarternary - the Pliocene strata not showing at Richmond at all.

On the road between Richmond and Tappahannock about forty-five miles to the northeast, this deposit crops out in many places, occupying everywhere the same geological horizon. Observations at Petersburgh, twenty-two miles south, and Wickham's, about the same distance north of Richmond, indicate that we may with confidence refer the whole of this great formation to the latter part of the Miocene Tertiary age. The lower part of the stratum usually rest conformably upon bed of dark blue sands and clays, under which lie the Jurassic strata; while beneath all are the gneiss and granite of primitive formations, which form the bed of James River from Mayo's Bridge up. The most purely diatomaceous part of the deposit lies a little below the middle of the stratum and is from two to three feet thick; above and below a gradually increasing admixture of sand and clay finally obliterates the Diatome.

On a slide of the smaller forms taken from the richest layer, about 70 distinct species have been noted, and the whole number probably exceeds any calculations yet made, as large numbers of the more delicate forms cannot help being destroyed or washed away in the process of cleaning and preparing the material for microscopic observation. The deposits at Richmond and at Petersburgh show the diatom forms most perfect. In all other Virginia diatom deposits which I have examined, the forms appear to have been much injured by chemical action, and the number of species smaller.

It is noteworthy that while the elevation of the coastline has been so extensive and gradual as to preserve the conformity of the strata, the whole is traversed by seams of a slate-like iron deposit from one to two or three inches in thickness at various angles to the plane of cleavage, as if some magnetic force had concentrated the iron which these minute marine organisms are known to secrete, to the total exclusion of the diatoms. Towards the edges of the strata, where the deposit thins out to a few inches thick, the diatoms are again lost; examination of many specimens of earth from these points have every characteristic of the diatom earth except its low specific gravity, have failed to show anything but fine sand and clay.

The City of Richmond is bisected by the valley of Shockoe Creek, about one-fourth of a mile wide. It is on the flanks of this valley and ravines flowing into it that we find the infusorial deposit occupying a plane ten to fifteen feet above the stream within the city; beyond the corporation, to the north, a branch of the creek cuts through the stratum for half a mile. Here, while the general character of the deposit is the same, certain variations in the species found on opposite sides of this valley leads one to infer that the principal features of the land were shaped before it emerged from the water. The characteristic forms of the Richmond diatoms are the same all over the field, but the relative proportions of the species vary in every locality. At a point in Howards Grove Valley, Triceratium Marylandica is so abundant that over one hundred specimens can be found on one slide; the same abundance of this form is shown in specimens from Eighth Street Tunnel but not elsewhere. A little way down the valley the same sort of preponderance was shown by Craspedodiscus.

At Petersburgh some of the largest and finest forms of Cosinodiscus are found; and at Nothingham, Md. Actinoptychus Heliopelta are very abundant.

Earths from artesian wells all along the Atlantic Coast from Long Island to Florida have shown hundreds of fine forms of marine diatoms from all depths, a few feet under the surface to a thousand feet or more, a proof that the Atlantic Coast has slowly been sinking for millions of years.

Wildwood, New Jersey artesian wells have shown exceptionally fine forms of depths 35 to 1060 feet. Longport,N.J. from 380 to 500 feet. Atlantic City, N.J.from 6 to 670 feet.

Brigantine Beach,	artesian	wells-from	471 to 620	feet.
Norfolk, Va.	"	"	25 to 625	feet.
Rock Hall, Md.	"	"	20 to 90	feet.
Crisfield, Md.	"	"	485 to 630	feet.
Lewes, Delaware	"	"	568 to 985	feet.
Egg Harbor City,N.J.	"	"	124 to 370	feet.

Other notable Fossil Marine deposits are at Los Angeles, California, Monterey, Calif., Santa Monica, Calif., San Louis Obispo, Calif. of which the Monterey deposit shows the most numerous forms and is second only to the great Richmond, Virginia deposit in interest for the microscopist.

Of Fresh Water Fossil deposits, we are abundantly supplied. Near Darlington, R.I. is a deposit two feet thick covering not less than four acres, composed of about 90 per cent diatoms and only eight to ten per cent sand clay and debris material. At Keene, N.H., is a great deposit the extent of which is not yet known. Similar deposits are found in hundreds of localities across the United States and Canada. The following show forms of unusual interest - Virginia City, Nevada; Salt Lake Desert, Utah; Houghton, Michigan; Cleveland, Ohio; West Point, New York; Herkimer County, New York; near northern boundary. Ipswick and Farmingham, Mass.; Newport, Eaton Place and Olneyville, R.I., Port Hope, Ontario.

Hundreds of other deposits could be mentioned, but above will give a fairly good idea of the extent of fossil diatom deposits in the United States.

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In a footnote, Mr. Rasmussen tells us:

> Personally I have cleaned diatoms, etc. since I was a boy in Denmark back in the early 1890's and in this country since 1896. During these years, I have obtained literaly thousands of collections from all over the world. An hour with the microscope, working on these wonders of nature, is now, as it has been in the past, one of my greatest pleasures.

NEWS FROM THE FIELD
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CANCER UNDER THE MICROSCOPE ON REGULAR TV CHANNEL

WASHINGTON, April 9 (Science Service). Television fans of the nation's capital have now seen for themselves the differences between cancer cells and healthy normal cells of the human body. They were able to do this through the twin eyes of the television camera and the MICROSCOPE in a program sponsored by the U. S. National Cancer Institute and the American Cancer Society over WMAL-TV.

Slides with tissue-paper-thin slices of normal and cancer tissues were first focussed under the microscope. Then the huge television camera was swung over and down onto the microscope eyepiece. As the televiewers looked, they heard Dr. William Ober, research fellow at the National Cancer Institute, point out the orderly arrangement and shape and small nuclei of the normal cells and compare these to the irregularly arranged and sized cancer cells with their larger nuclei. These differences, he explained, are what help the pathologist diagnose cancer.

The program is the first in which microscopic scenes have been televised over a regular television channel.

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BLOOD'S "POLICE" CELLS SURROUND TANTALUM METAL

CHARLOTTESVILLE, Va., April 9 (Science Service). Tantalum, the non-irritating metal now much used for skull plates, permanent bone braces and other surgical purposes, is nevertheless treated as an alien substance by those vigilant policemen of the blood, the white corpuscles.

What happens when tantalum comes into intimate contact with living body tissue is graphically shown in a new motion picture film made by Dr. Carl C. Speidel, University of Virginia anatomist. Funds for the motion picture were granted by the American Cancer Society. The film will receive its first public showing next Wednesday evening, April 13, at the meeting of the American Association of Anatomists in Philadelphia.

In making the film, Dr. Speidel used a technique which he has developed over a period of more than 15 years. An anesthetized tadpole is placed on the stage of a HIGH-POWER MICROSCOPE, and events in living tissue are studied and photographed in slow motion through its practically transparent tail.

Tantalum, in the form of sheets, fine wire and powder, was introduced into various tissues of the tadpole tail. Always its reception was the same. The white corpuscles hurried to the scene, and like human policemen forming a cordon in front of a crowd, they blocked off the metal from the rest of the tissues with a solid wall formed of their own bodies. Small isolated particles of tantalum powder are picked up and carried off through the circulation, but larger masses of the powder are walled off as if they were solid.

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DUST IS ATOMIC BOMB HAZARD, STUDY BEHIND IRON CURTAIN SHOWS

LONDON, April 11 (Science Service) -- Add atomic age hazards; DUST IN THE AIR.

This finding--of a new danger from an atomic bomb blast--comes from behind the Iron Curtain. The experiments were made in a laboratory near Prague, Czechoslovakia, not at the site of an A-bomb explosion.

C. Jech of the department of physics of the Radiotherapeutical Institute, Prague-Bulovka, reported his findings to the British scientific journal, Nature, here.

The radioactive gas, radon, was found to leave a deposit on glass, the scientist explains. His tests showed that this was caused by the radioactive atoms clinging to dust.

"It is reasonable to suppose that artificial radioactive atoms, for example, atoms left in the air by the explosion of an atomic bomb, will similarly be absorbed on (cling to) dust particles," concludes the Czechoslovakian scientist.

- * -

TROPICAL FOREST MOSQUITOES BREED IN MANY STRANGE PLACES

PHILADELPHIA, April 21 (Science Service) -- Mosquitoes in the dense forests of the American tropics deposit

their eggs in many strange places, Dr. Marston Bates of the Rockefeller Foundation told the meeting of the American Philosophical Society here this morning.

Like all mosquitoes, they must find water so that the larvae, or "wigglers", can swim; but water in at least spoonful quantities is to be found in places where a person from regions less rainy would never dream of looking: tree holes, bamboo joints, leaf bases, flowers, fallen leaves. Each mosquito species has its preferences and its special adaptations to these micro-puddles.

The adult insects also have their preferences, Dr. Bates pointed out. Such environmental factors as temperature, humidity and light, in the tropical forest, differ with height above the ground; and mosquito species adjust their preferred flying levels accordingly.

American tropical forest mosquitoes are structurally rather primitive, the speaker stated. However, this should not be taken as an indication that they actually originated there; it is just as likely that primitive mosquito types invaded the forests, found them to their liking, and stayed there.

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"DE-TAILED" BACTERIA STILL ABLE TO SWIM

WASHINGTON, April 20 (Science Service) -- The "tails" with which some species of bacteria are equipped are not needed for swimming, declares Dr. Adrianus Pijper of the University of Pretoria, South Africa, in the journal, Science, published here. He has been contending for some time that such bacteria swim by twisting and wriggling their way through surrounding fluid, and that their tails, or flagella, are merely something trailing behind them.

Now, however, he has gone a step beyond. He grew a lot of "tailed" bacteria in suitable broth, and deprived them of their tails by shaking them hard for 15 minutes. At the end of that time, microscopic examination showed that most of their tails had been amputated; yet the bacteria were swimming about, and lively as ever.

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YOU DO YOUR BEST SEEING WITH EYE'S INDEX POINT

WASHINGTON, April 27 (By Marjorie Van De Water, Science

Service Staff Writer) -- The center of your eye has an index point that is to your eye what the sensitive tip of your forefinger is to your hand. Your most exact and finest seeing is done with this index area in the center of the eye's fovea.

Although this important center in the eye has been known to scientists since Clerk Maxwell first discovered it in 1856, it has now been mapped for the first time, Prof. Walter R. Miles, of the Yale School of Medicine reported to the National Academy of Sciences here.

At the back of the eye in the center of a yellow pigmented section is a little depression which contains an area known as the fovea. At the center of the fovea, Prof. Miles located the index area, known to scientists as the visual fixation disk. When mapped out on charts by means of tests upon 20 men, using color filters, three concentric circles or ovals appeared. The visual fixation disk is a tiny, but well defined core, occupying four and one-half per cent of the entire area of the fovea.

The outer border of the disk is well-defined, contrasting markedly with the area outside it. The edge is about as sharp, Prof. Miles reported, as the edges of typed letters on a good carbon copy.

When you want to do any precise seeing you turn your eye so that this portion of the retina is turned directly on what you want to distinguish, such as the marking of a slide rule or the eye of a needle you are trying to thread.

The size of the disk, if it were projected onto a printed page held 14 inches from the eye, would be about the size of the capital letter "M". At workbench distance of 28.6 inches, the disk would cover an object a quarter-inch across. At floor distance of 57.3 inches, the projected disk would be a half-inch in diameter. When looking across a typical street 100 feet wide, it would measure nine inches.

The total retina, or light-sensitive back of the eye, is a semi-circle about 180 degrees from end to end. The visual fixation disk occupies only one-half of one degree of this semi-circle. This tiny part of the fovea contains from 1,200 to 2,000 cones, which are the bright light and color detectors for the eye. The cones in this area are longer and thinner than they are elsewhere and this difference helps to explain the importance of the area for sharp seeing.

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NEW INSECTICIDE PRODUCES HEREDITARY CHANGES IN CELLS

WASHINGTON, May 10 (Science Service) -- Benzene hexachloride, one of the powerful new insecticides, is capable of producing drastic hereditary changes in plants by multiplying their chromosome counts, after the fashion of colchicine. This is disclosed in the journal Science, published here, by Dr. Dontcho Kostoff of the Academy of Sciences in Sofia, Bulgaria.

Benzene hexachloride, known also by the longer chemical name of hexachlorocyclohexane was used in several forms in Dr. Kostoff's experiments, and applied to a number of plants ranging from corn and wheat to sunflower and mustard. Many of the new, giant, multi-chromosome cells were abortive, but large numbers of them were capable of reproduction, continuing their novel kind.

Dr. Kostoff sees two possible significances in his discovery. The first may be beneficial: "The effect of hexachlorocyclohexane is so striking that it can be used as a polyploidizing agent, especially when one considers that it is much cheaper than other such agents."

The second possible significance is not so good, and leads to a warning: "Such insecticides or fungicides, when applied, may increase hereditary changes in cultivated varieties ("pure lines), leading thus to more rapid degeneration of the highly bred, uniform varieties. This means that when such insecticides or fungicides are applied the seeds of the propagated varieties should be changed more often so as to secure new non-degenerated stocks."

Slightly over a decade ago Dr. Kostoff attracted the attention of geneticists, and of biologists generally, by his discoverey of similar effects produced by a different chemical, acenaphthene. He was at that time working in Moscow, at the Academy of Sciences of the USSR.

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"DAWN REDWOOD" POLLEN FOUND IN SCOTTISH COAL

EDINBURGH, May 14 (Science Service) -- Trees like the recently discovered Chinese "dawn-redwood grew in Scotland between 30 and 50 million years ago.

Fossil pollen grains like those of the living Chinese tree have been found in coal mined in the town of Mull, states Dr. John B. Simpson of the Geological Survey Office here, in the British science journal, Nature.

The fossil pollen grains in the Mull coal are practically identical in shape, size and microscopic structure with pollen brought out of the Metasequoia forest of China. Dr. Simpson has not been able to find coal-embedded pollens resembling those of either the coast redwoods or the California big trees. Nearest things to his Metasequoia pollen grains, he notes, are two species of cypress, one found in China, the other in the United States.

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MOUSE OVA WITH EXTRA CHROMOSOMES DEVELOP TO EARLY EMBRYO STAGE

EDINBURGH, May 24 (Science Service) -- Early-stage embryos of mice, with cells containing three times the basic number of chromosomes, have been obtained in experiments conducted by Drs. R. A. Beatty and M. Fischberg in the laboratories of the Animal Breeding and Genetics Research Organization here. Results are announced in the British science journal, Nature.

Plants and lower animals with doubled-up chromosome counts are fairly common in nature, and can also be produced artificially by treatment with chemicals, X-rays, temperature shock, etc. Mammals exhibiting this phenomenon, however, have never been reported.

Some time ago the American zoologist, Dr. Gregory Pincus, was able to get extra-chromosome eggs from rabbits to divide twice. Drs. Beatty and Fischberg, however, succeeded in getting their mouse eggs to continue dividing as far as the stage called the blastula, which consists of several hundred cells.

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EXTRACTING FOOD FROM YEAST

WASHINGTON, May 25 (Science Service) -- Getting valuable food and medicinal materials out of yeast without drastic chemical treatment is accomplished by a process on which Donald K. Alexander of Dolbeau, ue., has received patent 2,470,967. He mixed his yeast suspension with diatomaceous earth, then filters and dries the mixture, keeping it constantly agitated. The yeast-cell contents are thus released by mainly physical means, and can be washed out with a very mildly acid solution.

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HAIR IS 750 TIMES THICKER THAN THINNEST SCIENTIFIC SLICES

WASHINGTON, June 15 (Science Service) -- How thin is a slice? With a new method developed by the National Bureau of Standards here it is so thin that a stack of 750 slices would be as thick as an average human hair.

The Bureau's slicing technique was developed for study of thin sections of tissue under the powerful electron microscope. Terming the new advance "truly exciting," Bureau Director Edward U. Condon said that it "promises to be an important aid in such fields as cancer research." Researchers in biology, medicine, agriculture and even the physical sciences are expected to use the new super-thin slicing.

Here's how Bureau scientists cut world's thinnest slices:

The specimen to be sliced is embedded in a clear plastic (n-butyl methacrylate, similar to plexiglas or lucite but softer). This embedded specimen is mounted in a brass block and cooled by carbon dioxide gas. As the atmosphere warms the brass block, it expands for such a tiny distance that you cannot see the movement. After this expansion, the tiny bit of the specimen which protrudes is cut with a laboratory slicing device, called a microtome.

The slice is so thin that you can't see it edgewise under the most powerful light microscope.

This new method was developed by three Bureau scientists, S. B. Newman, E. Borysko and Max Swerdlow.

Chief advantage of these thin slices is for studies under the powerful electron microscope. Because the electron beam of this instrument has only slight penetrating power, specimens for study must be made extremely thin.

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OUR FRONT PAGE
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This is a reproduction of Tafel 24 found in Kunstformen der Natur by Ernest Haeckel (1899-1901).

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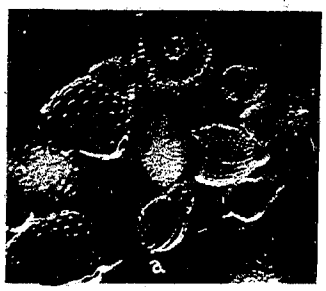
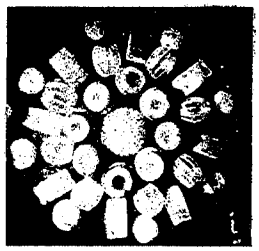
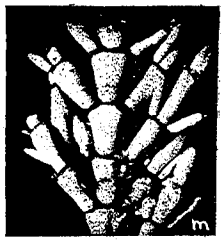
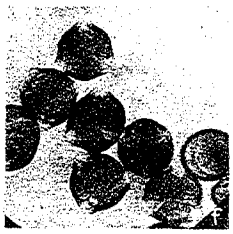
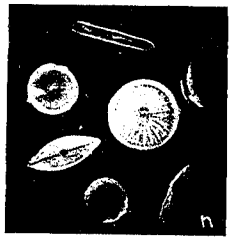
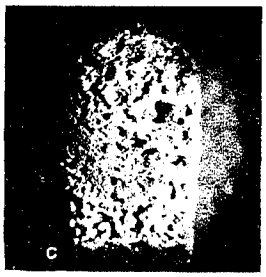
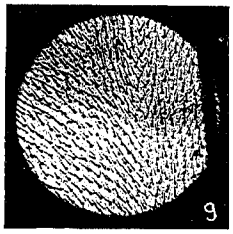
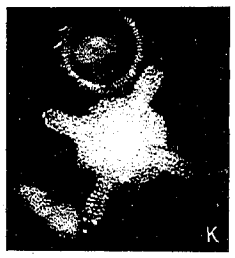
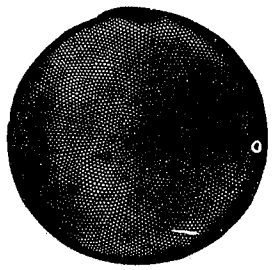
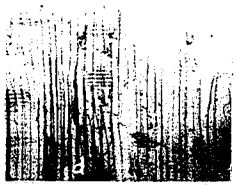
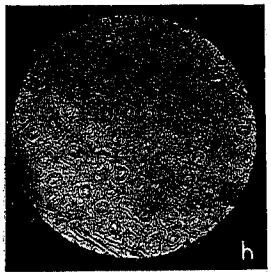
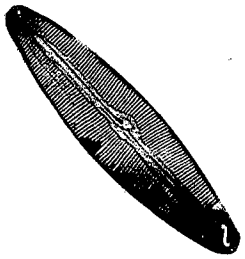
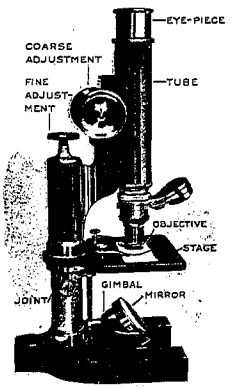




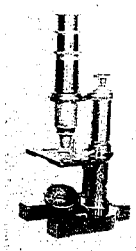




Here is the instrument you will want to use with each part labelled. Its cost is 1

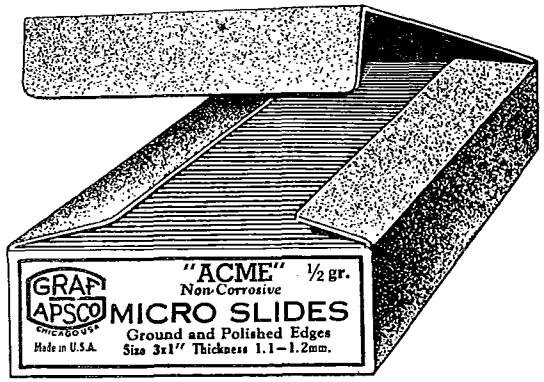
LEGEND:

a) Radiolaria Slide #82 (dark-field)
b) Diatom Slides #44 - #45 - #46
c) Burnt head of safety match
d) Section of wood (white-pine)
e) Diatom Slides #64 - #65
f) Pollen
g) Wing of Common Fly - showing hairs
h) Stomata - tea leaf
i) Eggs - Butterflys and Moths
j) Leg of Spider
k) Radiolaria - #82
l) Diatom slides - #52 - #51 - #41
m) Algae - from sea
n) Diatoms
o) Diatom Slides #33 - #15
p) Radiolaria - light field - #82



BIOLOGY SUPPLIES

MICRO-SLIDES



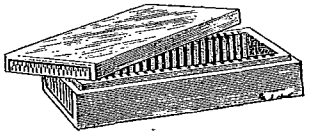
No. A1450
"ACME" MICRO SLIDES
A high quality slide made of American glass, ground edges, uniform thickness, 1.1-1.2 mm., packed ½ gross to box and cellophane sealed to protect against moisture and corrosion.
No. A1450—Slides gross $1.75 net

CLINICAL GRADE SLIDES
Also available in limited quantities are SECONDS of our No. A1450 slides. These are imperfect but useable and recommended for use on smears, etc.
No. 23—Clinical Slides, gr. $1.10 net

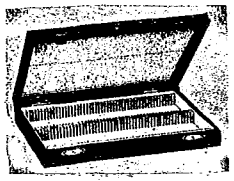
CULTURE SLIDES

No. A1471 No. A1475 No. A1476

No. A1471—1.5 mm. thick, 1 concavity...doz. $0.90
No. A1472—1.5 mm. thick, 2 concavities.doz. 1.50
No. A1473—3 mm. thick, 1 deep cor cavity. .Ea. $0.20
No. A1475—3 mm. thick, 2 deep concavities .Ea. 0.45
No. A1476—DEEP WELL SLIDE, 1 straight wall concavity..... .....Ea. $0.60



No. 43—SLIDE BOX, all wood with overlapping cover. Capacity, 25, 3"x1" slides.
Each $0.25



No. 45—SLIDE BOX, capacity 100, 3"x1" slides. Wood frame and cardboard backing. Overall size 11¼"x7½".
Each .....$ 1.25

COVER GLASSES

No. 1 Thickness

SQUARES	18 mm. 22 mm. 25 mm.	CIRCLES
$2.25 oz.		$2.90 oz.

22 mm x 30, 35, 40, 45, 50 mm rectangular.$2.25 per oz.
24 mm x 30, 35, 50 mm rectangular..... $2.25 per oz.

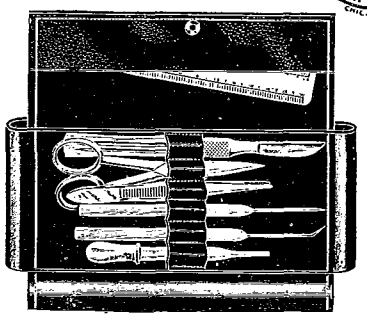
No. 2 Thickness

SQUARES	18 mm. 22 mm. 25 mm.	CIRCLES
$1.60 oz.		$2.00 oz.

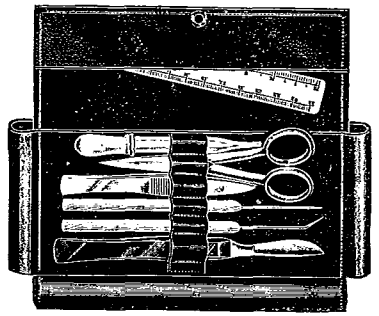
22 mm x 30, 35, 40, 45 or 50 mm rectangular$1.60 per oz.
24 mm x 30, 35, 40, 45 or 50 mm rectangular$1.60 per oz.
10% discount on 50 or more oz.

DISSECTING SETS and MAGNIFIERS

LOWEST PRICES GRAF APSCO CHICAGO U.S.A. PROMPT DELIVERIES



No. 2A—DISSECTING SET .....Ea. $1.90



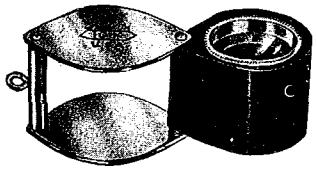
No. 3B—DISSECTING SET .....Ea. $1.40

No. 21A—DOUBLET MAGNIFIER, all metal mount, 10X, lenses optically centered. .....Each $2.75

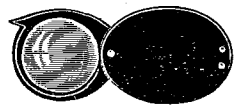
No. 30—READING GLASS

The finest Reading Glass at a popular price.

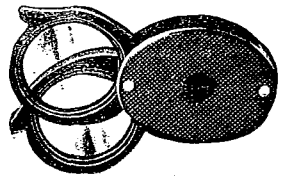
No. 30—2" diameter Reader	.....	Ea. $1.00
No. 30—2½" " "	.....	Ea. 1.15
No. 30—3" " "	.....	Ea. 1.30
No. 30—3½" " "	.....	Ea. 1.75
No. 30—4" " "	.....	Ea. 2.75
No. 30—4½" " "	.....	Ea. 4.00



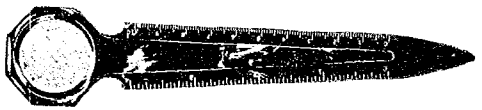
No. 19F—DOUBLET MAGNIFIER, 10X, folding in metal mount. Very popular in botany, geology, engineering, etc.
Each $3.25



No. 19A MAGNIFIER
Folding 5X magnifier, 25 mm. diameter lens in black vulcanite mounting.
Each. $0.50



No. 19B FOLDING MAGNIFIER. Like No. 19A but two 25 mm. lenses, 5X and 10X magnifications .....Ea. $0.75



No. 1920—COMBINATION MAGNIFIER, RULER, LETTER OPENER
Good quality lens, 1¼" diameter mounted in attractive plastic handle, magnification 4X, individually boxed. .....Ea. $0.55