Hay fever and asthma patients, the studies suggest, owe their sneezing and sniffling and breathlessness to having too little potassium in their tissues. The lack or deficiency of potassium, however, is probably a secondary result of some disorder elsewhere in the body. Disease or dysfunction of the adrenal glands, which are known to be largely responsible for potassium distribution throughout the body, is probably the underlying cause of such allergic conditions as hay fever and asthma.

Science News Letter, December 2, 1939

Early Cancer Diagnosis

A SIMPLE chemical test for early diagnosis of one kind of cancer in women is now available and should be part of the routine examination of the pelvis, Dr. Charles E. Galloway, of Evanston, Ill., told the meeting.

The test, devised by Dr. Walter Schiller, now chief pathologist at Cook County Hospital, Chicago, is for detecting cancers at the mouth of the womb, which make up about 75% of all cancers of the pelvis in women. It is very simple and is performed by painting the area with a water solution of iodine. If the area is healthy, it turns brown. If cancer is present, however, the painted area turns yellow or white.

The test depends on the fact that cancer cells do not contain glycogen, which is shown by their failure to stain with iodine. Loss of glycogen is one of the first changes to appear in the skin covering the mouth of the womb when cancer occurs at that location.

Other conditions exist which may also show up with this test and these peculiar forewarnings, Dr. Galloway pointed out, may be the forewarnings of the onset of cancer many years later.

Much earlier diagnosis of cancer, with consequent better results from treatment by X-rays, radium or surgery, will result, Dr. Galloway believes, if this test and examination of the area are made once or twice a year. For visual examination of the area, he pointed out, doctors now have an instrument, called the colposcope, which enables them to see the tissues and detect changes in them.

Science News Letter, December 2, 1939

Plans are being made to restore Atlantic salmon to suitable coastal rivers in New England.

Need for soil conservation in America was recognized by George Washington and other land owners of Colonial days.

ASTRONOMY

New Method of Testing Large Telescope Mirrors

Discovery by Argentine Astrophysicist Permits Astronomers To Test Disks Continually in Grinding

A NEW WAY of testing the accuracy of grinding for giant telescope mirrors, that saves two-thirds of the cost, labor and time necessary for this vital operation, has been developed by Dr. Enrique Gaviola, Argentine astrophysicist of the National Observatory at Cordoba.

The discovery, believed one of the most important in the century in the construction of telescope mirrors, allows a parabolic surface to be ground on a great glass disk directly and tested continually during the grinding.

For years astronomers have been grinding parabolic mirrors in a three-stage, tedious and costly process.

From their original flat disk, as made in a glass works, they grind a spherical concave surface. Next they take another piece of glass and grind it to an optically flat surface. And finally they use the "flat" to test the spherical surface as they slowly grind and figure it into the desired parabola.

"The amount of work, time and money necessary for this three-stage operation," says Dr. Gaviola, "is about three times the amount demanded by the parabolic mirror itself.

"All three surfaces have to be figured, tested and corrected independently and the optical flat has to be ground more accurately than the accuracy expected in the final parabolic mirror."

Dr. Gaviola, in a recent visit to the laboratories of the Mt. Palomar Observatory, where the great 200-inch diameter mirror has been in the process of grinding since 1936, explained the methods to astronomers there.

They praised its ingenuity but explained that they are so far advanced in their grinding, by time-tried methods, that they will continue to construct their mirror along the routine lines. At the most optimistic estimate it may be completed next year.

If the method had been available and proved successful five years ago, the Mt. Palomar mirror might now be in service and the giant telescope could have been constructed at a much lower cost.

Dr. Gaviola was led to the discovery of the new method, which uses a fine wire instead of a knife edge for testing, by sheer necessity.

In 1936 while at La Plata Observatory in Argentina he set to work to correct noticeable errors in the 82-centimeter Cassegrain mirror at the observatory.

"As we had no plane mirror of that size and no possibility of making either a flat or a Hindle spherical of 82-centimeter (over 2.7 feet) diameter it became necessary to find a new, simple method of testing the Cassegrain using only the available equipment. After some experiments a satisfactory method was devised," Dr. Gaviola explains.

As described in a joint report with Ricardo Platzeck of La Plata Observatory to the *Journal of the Optical Society of America*, Dr. Gaviola says the new testing method works on the basic idea that to test an optical surface an arrangement is needed that will form an image of some kind. If the image is good, a study of it tells the quality of the optical surface.

If the image is not good, as it naturally will not be in a new mirror just being ground, it is subdivided into a number of good images by decomposing the main optical surface into sufficiently small parts or zones by the use of screens. The image is usually a so-called "artificial star," a bright point of light, or light from a narrow silt.

The common method is to observe the diffraction of light reflected off the telescope mirror as it passes by a sharp knife edge. The disadvantage of a knife edge, says Dr. Gaviola, is that it does not give a symmetrical diffraction pattern. Systematic errors can easily be committed.

To overcome this handicap, the new method uses a fine wire as the diffracting object and the diffraction pattern is symmetrical on each side of it.

The diffraction pattern from the various zones of the telescope mirror (secured by suitable screens with carefully cut holes in them) are observed. From these observations the curve of the mirror surface can be calculated and the "high" or "low" spots, lying outside permissible accuracy can be ascertained.

It is possible to obtain accuracy only 1/100 the wavelength of light by the method, which is not only applicable to parabolic mirrors but to optical surfaces which depart considerably from a spherical shape. These forms, Dr. Gaviola states, have been avoided up to now for it is a rule of optical shops that "a surface can be figured as accurately and only as accurately as it can be tested."

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PALEONTOLOGY

Coal Mine Waste Piles Yield Beautiful Fossil Leaves

See Front Cover

BEAUTY is sought and found in about the unlikeliest of all imaginable places — the waste-heaps of soft coal mines—by George Langford of Joliet, Ill. For him it is not a profession but an absorbing avocation, for Mr. Langford makes his living as manager of a manufacturing plant in Joliet. His spare time he spends botanizing the forests of 250 million years ago, as represented by the fossil leaf-remains embedded in the nodules of hardened clay cast out with the shaly waste from the coal pits of central Illinois.

Finding fine leaf-imprints in shale nodules is not particularly new in itself. Thousands of them are in geological museums and private collections everywhere. The real contribution of Mr. Langford is the method he has developed for bringing out their full color and beauty, something not accomplished by the kind of handling hitherto employed. Leaf-forms that ordinarily show dull and colorless take on almost the sheen of living flowers.

A shale nodule is a more or less elongated oval lump of stuff that looks like hardened clay. Indeed it *is* hardened clay, solidified around a leaf, or twig, or insect, or other object that fell into the mud and became embedded there, ages ago when coal was in the making. If you turn it edgewise and give it a sharp rap with a hammer it will split apart, showing the convex or positive side of the leaf-print on the face of one of the halves and the concave or negative side on the other.

That is all that has been done with leaf-nodules hitherto—just split them open to show the contents. But in that state the leaf-prints are dull and rather uninteresting, due to their being covered with tightly sticking tiny mineral particles—literally the dust of ages.

Mr. Langford undertook to get rid of this millenial dust. His technique is something between a jeweler's and a dentist's. He uses the small, keenly pointed and edged tools of a dentist, plus a variety of brushes, to dislodge the mineral particles, and then carefully burnishes each small detail of the cleaned-up design by hand. No buffing wheel, however fine, is permitted to touch one of his precious specimens.

Most people, when they first see a Langford leaf-nodule preparation, imagine that it has been painted or enameled. This is not the case. No artificial color of any kind is added, no varnish, no shellac. A little colorless burnishing fluid is the only aid he employs. The colors are those latent in the minerals composing the specimen itself.

Mr. Langford states: "The stone of the strip mine nodules is very variable. All of it contains more or less iron. In some places it is a buff-colored and rather soft shale. Occasionally it is sandstone. The stone best suited for fossil preservation is very close-grained and hard, in varying shades of fawn, gray, light blue and dark blue.

"Weathering converts the iron content into oxide, producing red, which, combining with the stone colors, results in orange, brown, purple and other colors. It remained for us to develop these colors by accentuating them in the plants and suppressing them in the surrounding stone. The result is a fine reproduction of the plant in color, and of surprisingly lifelike appearance."

The plant remains brought out bv Mr. Langford's method are almost all leaves of ferns and fern-like plants, which were the highest forms of vegetation on the earth during the coal age. Higher flowering plants did not appear until much later. It is in the leaves, therefore, their delicate venation and smooth surface texture, that the greatest possible development of beauty must be sought.

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PHYSICS

"Magnetic" Mines Feasible, Say American Experts

FLOATING mines exploded by the changes in magnetic field, due to the near presence of an iron ship's hull, may be the new factor in renewed attacks by Germany against Allied and neutral shipping.

Accepting British press stories of "magnetic" mines as plausible, government and naval scientists in the United States privately speculated on how they work. Without much difficulty, they believe, it should be possible to create a firing mechanism for floating mines that would be set off by slight changes in magnetic field as an iron-hulled ship passed close by. Only when the ship was close—and hence vulnerable—would these mines go off. There would be no explosion at farther distances at which the mines would be harmless. And yet they would not have to make actual contact with the ship as do ordinary mines.

Dropping small mines from an airplane, as reported, is perfectly feasible and would be no different than dropping torpedoes from planes, as is now done. The only thing required would be explosives which are not set off by a jarring impact.

Press reports of magnetic mines that would be attracted directly to the iron hull of a ship with Machiavellian deadliness can be ruled out, say the scientists, unless Nazi ingenuity has succeeded in circumventing the rigid, fixed and well-known laws of magnetic attraction.

Basic trouble with this scheme is that magnetic attraction decreases inversely as the square of the distance so that any magnetic force at ten feet is only one one-hundredth of that at one foot. At twenty feet the attractive force would be only one four-hundredth, and so on.

It is pointed out that even if very intense magnetic fields could be created in a mine by highly magnetic alloys, or possibly by a compact electromagnet inside the mine, the mere presence of this potent field would make it extremely easy to detect such mines lying on the bottom or floating beneath the surface. There are many detecting devices, such as those used in geophysical prospecting, which could do this.

The idea of a magnetic firing mechanism is something else, however, and might explain the sinking of mine sweepers recently. Their iron hulls could set off such magnetic mines under the hull before the "sweeps" could gather them.

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