



WINGED HORSE

The great square of Pegasus may be seen in the east.

PHYSICS

Spectroscope Becomes Tool For Standard Medical Tests

Extremely Small Amount of Metal Impurities Can Be Detected With This Instrument; Aids in Research

FOR the first time in the history of medicine, standards depending on analysis with the spectroscope, science's most powerful research tool, have been accepted for a medicinal product by the American Medical Association.

This was reported to the Massachusetts Institute of Technology Spectroscopy Conference by Dr. Henry R. Kreider of the American Medical Association's chemical laboratory who related the spectroscopic requirements which riboflavin, or vitamin B₂, must meet to gain approval of the A.M.A.'s council on pharmacy and chemistry.

Heretofore, the standards for medicinal products have been determined largely by chemical and physical methods but the spectroscope, Dr. Kreider said, provides an "excellent means of standardization" and he indicated that it would probably find wider and wider use with passing time.

Small Amounts Found

Dr. Kreider stressed the ability of the spectroscope's powerful eye to detect extremely small but nevertheless therapeutically significant amounts of metals in medicinal compounds, whether they are present as impurities or as physiologically active ingredients.

In one case he described, a salve

claimed to contain mercury in organic combination baffled all attempts to detect the mercury chemically but the spectroscope quickly revealed its presence, although in an amount much smaller than that claimed.

The spectroscope has also been very useful to the laboratory in examining physical therapy equipment such as therapeutic lamps and ultraviolet ray lights, he declared, for it enables precise investigations of their emissions and easy comparison with standards.

Still another example of solving puzzling problems, accurately, quickly and cheaply, Dr. Kreider said, is the use of the spectroscope in testing portions of a patient's skin for metals, wherein a small piece of tissue is removed and examined under the spectroscope.

O. Ivan Lee and Thomas A. Wright, both of Lucius Pitkin, Inc., reported their comprehensive attempt to correlate the 2700-odd recognized minerals into an organized table which would enable the most precise and careful analysis.

The result is a simple but extensive chart of minerals, designed for daily use by the spectroscopist and mineralogist, a distinct contribution to the art of determinative mineralogy. It is the first set of tables of this nature in the field since 1925.

Used on Vitamin B₁

A significant chapter in the history of science was related here when Dr. A. E. Ruehle, of the Bell Telephone Laboratories, a member of the group whose research paved the way for the laboratory manufacture of vitamin B₁, the anti-neuritic vitamin, back in 1936, told the story of the research.

Dr. Ruehle was a member of the group working under Dr. R. R. Williams who applied the spectroscope to learn the manner in which the atoms of the vitamin are hitched together and thus provide the clue most badly needed for duplicating nature's handiwork in the laboratory.

Ultraviolet absorption spectra were particularly well fitted for this work, Dr. Ruehle pointed out, for not only does the delicate technique yield precise analyses, but it has the added advantage of requiring only minute amounts of the substance under investigation for these tests. This was a tremendous advantage over other analytical methods with vitamin B₁ because only small amounts are available for study.

In the research unusual and extensive use was made of absorption spectra in an effort to secure hints as to what products were formed in various chemical reactions with the vitamin, how the atoms in the vitamin molecule divided, and to confirm later chemical findings.

The vitamin molecule, it was found, can be chemically split into two parts and by comparing the tell-tale spectra of one of these and its derivatives with those of corresponding derivatives of a chemical known as thiazole, strong evidence was obtained that there was a so-called thiazole ring in the vitamin. This finding, incidentally, was later confirmed by the chemical synthesis of this part of the vitamin and was given by Dr. Ruehle as the first evidence of a thiazole derivative in nature.

Similarly the other portion of the vitamin molecule was shown by absorption spectra to contain a pyrimidine ring and it was indicated that at a certain place on the ring an amino group was substituted for another group. Use of absorption spectra also gave the investigators the first evidence of the manner in which these two rings were linked together in the vitamin molecule.

From this information Dr. Williams and his associates were able to establish absolute chemical proof of the manner in which all the atoms comprising the complex vitamin molecule are hitched to each other and furnished chemists

with the stepping stone to artificial manufacture of the vitamin a short time later.

Study Cell Respiration

An understanding of the problem of cancer may well lie in a better understanding of how the cells of the body breathe, for the abnormal cell growth which characterizes cancer is linked with abnormal respiration, Dr. T. R. Hogness of the University of Chicago told the Conference.

Reporting spectroscopic studies he has made of respiratory enzymes, Dr. Hogness emphasized the fundamental relationship between respiration and growth, adding the prediction that the keen eye of the spectroscopist, powerful scientific instrument, "will play a large role in our final understanding of cancer."

Earlier in his paper Dr. Hogness had explained how this "master key of science" had enabled marked advances in man's understanding of the role of the complex respiratory enzymes in bodily processes.

With older methods of attacking this important problem, he said, only the total effect of all cellular processes could be studied; but the spectroscopist has permitted the isolation and investigation of each individual step.

The fundamental problem of cell growth, he explained, will not be understood until the respiratory process of cells is known and that depends on knowing how enzymes function in the utilization of food and oxygen.

Dr. Hogness is studying the chemical reactions whereby sugar gives up hydrogen which combines with the body's oxygen to form water. Water and carbon dioxide are the two waste products in this system, one of the simpler transitions of the many involved in life.

The first three steps are known; how the hydrogen goes from sugar to an enzyme, to another enzyme and then to cytochrome-C, another enzyme. Dr. Hogness has studied the properties of this last substance in his quest for the next one, a major missing link in the chain. Indications are that it is a very heavy protein.

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● Radio

Every Friday at 7:30 p. m. EDT, 6:30 p. m. EST, 5:30 p. m. CST, 4:30 p. m. MST, or 3:30 p. m. PST, Science Service cooperates with the Columbia Broadcasting System in presenting over the Columbia coast to coast network a new series of "Adventures in Science" presenting dramatizations of important scientific advances and discussions by eminent scientists.

ENTOMOLOGY

Tons of Poisoned Bait Are Helping Grasshopper Control

POISONED bait—180,000 tons of it—is joining with the long wet spell of the early spring and summer to keep the nation's grasshopper-fighters abreast of these costly insect pests so far this season, officials of the U. S. Department of Agriculture state.

Through the great central area of the Middle West, Iowa, Wyoming, Nebraska, Illinois and South Dakota, hatching of grasshoppers has been greatly delayed by the weather. Danger points are in North Dakota, New Mexico, Texas and Oklahoma.

The grasshopper picture is changing rapidly, however, and spots which now seem to be under reasonable control may, very shortly, become a battle field between deadly bait and 'hoppers.

In all it is estimated that there are 15 different kinds of grasshoppers which annually rise up to plague the farmer. Each variety has slightly different habits and its own method of control.

The cool, wet weather of early spring and summer, for example, has helped

the farmer for those grasshoppers which lay their eggs along road sides. The wet weather has made the grass grow well in these breeding spots. The grasshoppers are thus eating this nearby food before venturing, later, into the neighboring fields.

Other grasshopper varieties which lay their eggs in the fields are, in contrast, essentially unaffected by growing grass on road sides, for their nearest food is the field crop itself.

While cool, wet weather delays hatching and stays, for a time, the danger period for grasshoppers' greatest damage, this delayed hatching taxes the piles of poison bait.

Where hatching comes along quickly and with most of the 'hoppers coming out all at once a single application of bait to the fields may suffice. In delayed hatching the grasshopper colony grows gradually and several doses of the poison are needed for control. The bait consists of a mixture of bran, arsenic and either sawdust or cotton seed hulls.

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PHYSICS

Incoming Cosmic Rays Are Predominantly Positive

SCIENTISTS believe they have an answer to the mystifying fact that the incoming cosmic ray electrons are charged with positive electricity.

The annihilation of the cores of atoms, containing only positive charges, and their conversion into cosmic rays is suggested as the cause, in a report of Profs. Robert A. Millikan and I. S. Bowen and Dr. H. Victor Neher of California Institute of Technology.

At the recent meeting of the National Academy of Sciences in Washington, the research trio told how their high-flying balloon ascensions in India, Texas, Nebraska and in Canada indicated bands of cosmic ray energies which can best be explained by the annihilation of common atoms like oxygen, nitrogen, carbon, aluminum and so on.

In their new report, (*The Physical Review*, June 1) they state:

"If there is, in fact, the possibility of the complete transformation of the mass of a nucleus into cosmic radiation, i. e., into oppositely ejected electrons (or less frequently into two oppositely ejected photons), since only positive charges exist inside the nucleus, the hitherto strange fact that the incoming electrons are certainly predominantly positive, quite possibly exclusively so, would perhaps be less surprising than it is at present."

The balloon research, they add, shows that the observed cosmic rays have never previously encountered matter as dense as the vaporous atmosphere of the earth in their age-long journeys through space. This rules out the possibility of cosmic rays originating inside stars.

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