# SCIENCE NEWS

*Ccience Service, Washington, D. C.*

## NEW TYPES OF ATOM DESTRUCTION



COSMIC rays, already one of the most baffling mysteries of the world of science, are even more complex in their behavior than hitherto imagined. New ways, heretofore unreported, in which the penetrating rays can destroy atom nuclei by impact have been discovered by Drs. Carl D. Anderson and Seth H. Neddermeyer, of the California Institute of Technology. Dr. Anderson is well known for his discovery of the famous "positron," one of the fundamental particles from which all matter appears to be composed.

In a report to the American Physical Society through its journal, *The Physical Review*, the first full description of the recent high altitude experiments at Pike's Peak, Colorado, are as follows: (1) That the bundles of cosmic ray energy, known as photons, can disintegrate heavy atoms such as lead; (2) that light and tiny electrons can smash into the nuclear heart of atoms and occasionally break them up and make them eject massive particles; (3) that some of the disintegrations seem to be produced by the non-charged and piercing particles known as neutrons occurring as secondary radiation in the cosmic rays.

In the experiments tons of apparatus were moved from Pasadena by truck across deserts and up Pike's Peak in order that the identical equipment could be used at the two locations to give a most accurate comparison of results.

In an intensive program of research on the mountain top Dr. Anderson and Dr. Neddermeyer accomplished what was virtually a whole year of investigation in a few weeks. Thousands of photographs were taken with Wilson cloud chamber apparatus which showed cosmic rays destroying atoms and molecules. Use of the mountain top was prompted by the knowledge that much of the earth's atmosphere would be below the instruments so that the cosmic rays observed would be more powerful than in the Pasadena laboratory near sea-level.

While other investigators have taken measurements of cosmic rays at even greater heights, the Anderson-Neddermeyer research was the first in which actual photographs of the atomic breakdown were obtained.

## THE MASS OF THE STARS



NEW scientific evidence that the universe is expanding, and a stilling of the fears of those peoples who worry because the sun and the stars are "quickly" destroying themselves by turning their mass into the radiation they emit, is presented in the forthcoming September issue of *The Astrophysical Journal.*

M. Henri Mineur, astronomer at the Observatory of Paris, reports calculations showing that the stars of the Milky Way, despite their age of tens of thousands of millions of years, have only radiated away about one hundredth of their mass.

Thus if one takes M. Mineur's estimate that Milky Way stars are from ten to twenty billion years old, the apparent age of the universe, before all the mass is radiated away, would be about a trillion years. Compared to the life of a man who lives to be 75 years old the star galaxy which contains the earth and the Milky Way is only a baby, about nine months old, and cutting its first teeth.

Significant to astronomers is M. Mineur's calculations showing that the stars in the Milky Way must have been formed in the beginning with almost the same mass which they have to-day. Present-held theories of star evolution, therefore, must go by the board if the French astronomer's calculations and the observations on which they are based are correct.

M. Mineur says: "The upper limit we have found for the age of the stars is so small that, in so brief a time, the great majority of the stars can not have lost more than a hundredth part of their mass. We must therefore believe that the stars were formed with nearly the same masses as they have now, and that the differences in temperature and spectral type actually observed are due to the fact that the stellar masses were already different at the time of their formation.

"An evolution of the stars such as has been generally accepted is, then, impossible. Our result is, however, in perfect agreement with the theory of the expansion of the universe. G. Lemaître has suggested a hypothesis for the formation of the extragalactic nebulae based upon his theory of the expansion of the universe, according to which the age of the Milky Way would not exceed ten thousand million years."

The G. Lemaître referred to is the well-known Abbe Lemaître, Belgian astronomer who has frequently visited America and has been attached to the faculty of the Massachusetts Institute of Technology and also on the staff at Mount Wilson Observatory.

Abbe Lemaître's hypothesis on the expansion of the universe is now generally accepted among astronomers. It postulates that at some distant time in the past there was a gigantic explosion which sent the component parts of the universe into an expansion which is still going on. The various stars and galaxies are rushing away from one another with velocities as high as 15,000 miles per second.

## PLANT GENETICS

DR. GEORGE H. SHULL, professor of botany and genetics at Princeton University, has advanced two steps further in his study of the mechanics of heredity with the location and separation of two new strains of Lamarck's evening primrose.

One variety of the species, known as acuminata because of its long pointed leaves, first appeared recently in the experimental field of forty thousand plants. The other strain, called pollicata after the solid stem it grows between the ovary and style, appeared in 1932 and 1935,

but was not proved to be a separate and distinct strain until this summer.

The new plant is striking in that its long leaves almost completely lack the usual crinkledness of the primrose. Its characteristics are recessive, as is demonstrated by the fact that the acuminata appeared in only six out of 25 plants, indicating a one to four ratio for these characteristics in the offspring of the hybrids.

The pollicata first appeared for Dr. Shull in 1932 when it occurred as a gene mutation in pure bred material of Lamarck's evening primrose. Last year it appeared anew in another strain of this species, independent of its previous origin in 1932.

This indicated that the pollicata might be a latent characteristic of all primroses, rather than a new development, so Dr. Shull crossed this plant with all 25 different strains of his evening primrose.

The pollicata has now reappeared only in the offspring of the family in which it appeared last summer. None of the crosses with the other plants produced this solid-stemmed flower with "clubby" stigmas, proving that this is now another new strain of the primrose.

It is entirely possible, Dr. Shull explained, that the pollicata might be developed independently in any other experimental work in primroses, but to date this is the only example of this solid-stemmed variety, which is not even found among the wild relatives of the primrose.

The dry weather of the past few weeks has stunned the size of Dr. Shull's plants, but has not hindered the effectiveness of the bloom. The total number of plants growing this year is nearly three thousand larger than the number Dr. Shull has been able to handle any one year at a time since he began this experimental work in 1905.

## A NEW-FOUND DIET FACTOR

A NEW factor in the vegetable oils fed to baby chicks has been found by Drs. Marrianne Goettsch and Alwin M. Pappenheimer, of the College of Physicians and Surgeons, of Columbia University. When the new diet factor is lacking the chicks will literally lose their brains.

They fed pedigreed chicks on a diet which contained all the nutrients and vitamins known to be necessary, yet these birds persisted in ailing. After a short period of normal growth, they would begin to have nervous tremors, to pull in their heads after the manner of sick chicks, and to lose the power of coordinating their movements. Finally they would sink into a stupor which would end in death.

Autopsies all showed the same results. Parts of the brain had become swollen, soft and wet; appearing either pale or stippled with the blood of many tiny hemorrhages. As the disease progressed, the dead areas became more definite. Parts of the brain were actually being killed as, for some reason, the tiny blood-vessels leading to them were blocked, and blood was prevented from reaching the diseased parts.

Placed on various diets, the chicks still failed to become healthy, until to their ration was added a vegetable oil. The disease, which appeared only in chicks whose brains were actively growing, was prevented by the addition of corn, cottonseed, peanut or soybean oils and even the hard, artificially made "vegetable fats." Lard, however, actually seemed to favor the development of the trouble.

Other experimenters suggested that the condition was caused by the lack of the already known vitamin, $B_4$. But this is soluble in water, which the material in question is not. So it is probably a new vitamin.

So delicate is the new food-requirement that only by treating the petroleum ether used to extract it from the oil with sulfuric acid for a number of hours could it be brought to a pure enough stage to be used. When this purification process was not carried on, the minute impurities of the ether destroyed the effectiveness of the material.

## INDUSTRIAL EFFICIENCY AND SOCIAL ENVIRONMENT

THE effect of social conditions on the work of a group of five girls assembling telephone relays at the Hawthorne plant of the Western Electric Company, and another group of workers, have been studied by Dr. Lawrence J. Henderson, of Harvard University, and Dr. Elton Mayo, of the Harvard Business School. The results were reported at the opening session of a symposium at the Harvard School of Public Health.

The symposium is devoted to consideration of the effect of the environment on man and is one of the conferences on arts and sciences being held in celebration of the Harvard University Tercentenary.

Most of the symposium is given over to discussion of physical factors of the environment, such as temperature and humidity of the air and air-conditioning; poisonous gases and injurious dusts; air-borne disease, and the germs of hayfever-causing pollen of the air. These factors affect health, comfort and consequently efficiency. Social factors that are hard to measure and may even be overlooked are nevertheless a very real part of man's environment and have a measurable effect on his efficiency as a worker, it appears from the experiments reported by Drs. Henderson and Mayo.

The five girls, all experienced and expert assemblers, who took part in one of the experiments were observed over a period of five years. They worked in a special room; they were allowed to converse freely; their output was recorded minute by minute and day by day; their conversations, mutual relations, home situations and leisure activities were all noted. The study was made with the consent and cooperation of the girls.

Particularly interesting were the wave-like irregularities observed in output. These waves lasted sometimes for months, sometimes only for a few minutes. They were not related to any change in physical circumstances, such as temperature or the worker's own physical state. The speed of work, however, did vary markedly with changes in the girls' feelings towards each other, towards their supervisors and towards the group as a whole.

A change in seating arrangements, which separated two friends and generally disturbed the neighborly relations of the group, lowered the output. When one of the workers, after several years, left the company and was

replaced by another girl, even though the latter had a friend in the group, a disturbance in the group's tone was noted for three months. Drop in output was noted at the beginning of the economic depression. As the leader of the group put it, "We lost our pride." It was also noted that when one girl was dispirited and for this or some similar reason slowed down in her work, her neighbor or best friend also slowed. A reverse effect was noted between two girls who were unfriendly. When one worked fast, the other worked slowly and *vice versa.*

Another study of a group of men working in the general workroom of the same plant showed again how the social forces in the group affected the work output.

Drs. Henderson and Mayo caution administrators against too many and too rapid changes in work arrangements. These changes may be logically expected to increase efficiency, but if they upset the workers' social relations and work routines, they will decrease efficiency because they upset the worker's feeling about his work and the world he lives in.

## PRE-SHRUNK PAINT

"PRE-SHRUNK" paint has become a reality. Contrived with the help of soybeans and tung nuts, this latest product of industrial research in new farm crops has two results. It has altered previous knowledge of how paint should be made and further bears promise of solving the problem of weathering in this commodity.

"Pre-shrunk" paint is another of those curious unforeseen accidental discoveries which give constant zest to the life of the research chemist. This one happened in the laboratory of a South Bend manufacturing plant where tung oil's possibilities as a "vehicle" for paint were under investigation.

For use in paint tung oil requires a delicate high temperature treatment. The process, however, is often marked by failure because if the heat goes too high the liquid will change to a solid within a matter of seconds. For thirty years chemists have known how to control that trouble so the tung oil can be used in varnish. But, until recently use of tung oil in paint has been limited.

How the trouble was overcome and pre-shrunk paint evolved was described by M. F. Taggert, director of research for the South Bend concern.

"After trying all practical mixtures of oil," Mr. Taggart stated, "we found that a mixture of 45 per cent. soybean oil with 55 per cent. tung oil was the best combination to prevent solidification in the high temperature treatment required to make the tung oil usable in paint.

"In one particular trial we started with 775 pounds of the oil mixture which is equivalent to 100 gallons. This was raised to the suitable temperature with no difficulty, but in measuring up we discovered that although our mixture still weighed 775 pounds we only had 97 gallons of the liquid. Somehow there had been a shrinkage of three gallons, this being indicated by an increase in specific gravity exactly equivalent to the seemingly missing portion.

"Inasmuch as raw oils shrink during weathering, this pre-shrinking of the soybean-tung oil combination contributes to a longer life of the paint."

This accidental discovery, Mr. Taggart continued, immediately caused the scrapping of all previous knowledge of how paint should be made. Another problem arose, however, involving the question of what type of pigments and in what proportion of those pigments the new oil combination would work best.

Using the new "vehicle" with its peculiar "pre-shrunk" property, the chemists then went to work on hundreds of paint formulae. One pigment at a time was at first used, then pairs of pigments, and so on through the gamut of available pigments until eventually the one formula was determined in which the "pre-shrunk" quality of the oil can be utilized to the best advantage.

## ITEMS

DEATHS exceeded births in France during 1935, according to *La Science et la Vie.* Births during the year numbered 638,881, and there were 658,357 deaths—a morbidity excess of nearly 20,000. During 1934 births exceeded deaths by about 43,000. Unemployment and rising cost of living in France are blamed for the situation. At the same time Germany showed an excess of 480,000 births over deaths during 1935.

A MOTION picture entitled "Hay Fever" has been prepared at the Mayo Clinic as an aid to hay fever patients. The film, Dr. L. E. Prickman explained at a recent staff meeting, is intended to teach the patient "all the little details by which he can lessen the severity of his symptoms" and thus improve the results of desensitization treatment—details which the busy practitioner can not always find time to discuss with every patient.

CLOSE your eyes and let some one touch your arm. Now, can you point directly toward the spot touched without opening your eyes, or do you need to look at your arm first? Dr. Theodora Mead Abel, of the General Education Board, reports to the *American Journal of Psychology* that usually children do better with their eyes closed, but adults generally want to see. Individuals physically mature, but in the moron level of intelligence, are more like children than grown-ups in this respect.

BY measuring the water levels in the Great Lakes for the last century, it has been discovered that the great farming and grazing area in the North Central United States is near the bottom depth of what appears to be a 46-year snow and rainfall cycle that is associated with the variations in the radiation coming from the sun. Dr. Charles G. Abbot, secretary of the Smithsonian Institution and expert on the solar cycles of radiation, states that the droughts of 1934 and 1936 constitute striking evidence for the now-celebrated 23-year weather cycle which he first announced three years ago. The drainage areas of the North Central section have the local peculiarity of having their least precipitation at double this 23-year cycle.