# THE SCIENCE NEWS-LETTER

*A Weekly Summary of Current Science*

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## NOTHING IN MATTER, DECLARES SCIENTIST

Declaring that the most solid matter on earth is made up of openwork filigree atoms composed of nothing more firm than charges of electricity and spread out so thinly that they resemble more nearly the starry heavens where thousands of light years separate the stars, Dr. Willis R. Whitney of the General Electric Company, Schenectady, reviewed some of the modern disclosures on the makeup of matter before the recent meeting of the American Chemical society at Los Angeles.

"There is nothing more interesting than the continual change in fundamental theories regarding matter," Dr. Whitney said. "We still stand about where the metaphysician did when he questioned the independent existence of energy and matter."

The atom of the past generation, he said, was by definition indivisible. For many years it had been evident that the character of all chemical elements varied in a regular or periodic way with increasing atomic weight. Attempts at explanation were made by assuming that all the different elements were merely different multiples of the very simplest one, hydrogen. But this theory was never justified by its results because the atomic weights were not multiples of a whole number.

Sir Ernest Rutherford, the British physicist, showed that two lighter elements hydrogen and helium, can be literally knocked out of some of the simpler elements while heavier elements such as uranium, radiu, and thorium give off of their own accord helium particles, electrons and electro-magnetic radiations. The indivisible atom of bygone days had therefore to go, and give place to divisible atoms of complicated internal arrangements.

"We have now reached a stage," said Dr. Whitney, "where the actual picture of the structure of the atom is more intricate than any earthly geometrical figure, and more perfect than any known celestial system. The laws of astronomy have been called into play, and the super-celestial orientations are needed to explain the complicated, but not bewildering, the novel, but not embarrassing, internals of the atoms.

"The electron has now taken the place of the elemental atom of our fathers. We cannot claim that ours is simpler than theirs. Theirs was harder to pierce but ours is harder to understand. Roughly speaking, the atom of today is a positive electrical charge with the equivalent number of negative charges spaced in and around it.

Results showed that this steadiness test is not a reliable criterion of a man's ability to become a flyer. Some men who had a creditable flying record showed a poor score in the steadiness test. It was also found that with a little practice a man might make a good score in the test, but that men with flying experience did not make a better average score than those without any experience in flying.

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TABLOID BOOK REVIEW

BIBLIOGRAPHY OF AERONAUTICS 1920-1921, and BIBLIOGRAPHY OF AERONAUTICS 1922. By Paul Brockett. Published by the National Advisory Committee for Aeronautics, Washington, Government Printing Office, 1925. Volume 1920-1921, $.35.; 1922 $.25.

Literature on aviation for the years covered is conveniently listed in dictionary form. The Smithsonian Institution started this work of listing current literature on aeronautics with a volume covering material published prior to June 30, 1909. The National Advisory Committee for Aeronautics has covered the years following in four volumes, and now announces its intention to publish a bibliography annually.

REVERSIBLE VARIATIONS IN VOLUME, PRESSURE, AND MOVEMENTS OF SAP IN TREES. By D. T. MacDougal. Washington: The Carnegie Institution of Washington, Publication no.365. 90 pages. 1925

Prof. MacDougal's work is highly significant for plant physiology and ecology, because it offers actual field evidence for the validity of Dixon's hypothesis of the upward flow of the sap stream due to tension created by transpiration and transmitted through the slender water columns in the conducting elements.

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The city of Rome is planning the erection of a municipal bath house, built on the lines of the ancient Roman baths.

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Sheep-raising is on the increase in the United States; the lamb crop this spring exceeded that of last by 5.5 per cent.

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The eruption period of Old Faithful geyser, commonly stated to be exactly one hour, fluctuates between 55 and 75 minutes, with an average of about 63 minutes.

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The highest aerial tramway in the world, 15,000 to 17,000 feet above sea level, and having a total length of more than five miles, is used by a Bolivian tin mine.

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"Crookes called the electron the fourth state of matter, as it was neither solid, liquid, nor gaseous. Matter is at least not merely dry and hard, nor yet soft and wet. It is electronic and even celestial, whatever that may mean, and the most we know about it is that it is almost entirely space. It is as empty as the sky. It is almost as empty as a perfect vacuum although it usually contains a lot of energy. Matter is like a vacuum is which there are an enormous number of positive and negative electric charges, which, however, fill only an incredibly small portion of the space attributed to the matter. We may now say that every gram of all matter contains 600,000,000,000,000,000,000,000, electrons and an equal amount of positive electricity. The lightest atom has one electron outside of the positive center or nucleus, the second heavier has two, the third three, and soon, throughout the whole list of elements."

The actual smallness of the atom is impossible to realize, Dr. Whitney said. There are two hydrogen atoms to one oxygen atom in one molecule of water, and there are so many atoms of hydrogen in one small drop that if the atom were as big as a drop, they could cover the whole world with a foot of water; or if they fell as in the heaviest rainfall it would rain all over the United States for nearly two weeks.

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## DUTCH SCIENTISTS GROW CHICK EMBRYO IN GLASS

For the first time in history, the development of the embryo of a warm-blooded animal has been carried on under such conditions that it can be watched continuously. This feat has been accomplished by two scientists at the University of Leyden, Drs. J. P. M. Vogelaar and J. B. van den Boogert, who have placed common hen's eggs, with the shells removed, in small glass dishes in an incubator, and have succeeded in keeping the embryo alive and growing for five days. Hitherto the only way in which such embryos could be studied has been by placing large numbers of eggs in the incubator, and removing and opening them one by one at intervals. By this older method it has been possible to study closely spaced stages of development, but not to observe the growth as a continuous process, now made possible by the new way.

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## HARD LIQUOR BLAMED FOR COPPER POISONING

Examination of more than a thousand samples of distilled liquors on sale in Massachusetts showed that more than nine per cent. contained poisonous copper salts in varying amounts. These results were revealed by Dr. Hermann C. Lythgoe director of the Massachusetts Department of Public Health, and his collaborators, to the American Chemical Society. The experimenters studied the corrosive power of various kinds of fermented liquors distilled through a copper coil.

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Over three million pounds of yeast were exported from the United States during the year ending June 1925, and more than one and one half million pounds of baking powder.

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The olive and the avocado or alligator pear are the only two fruits on man's menu that are rich in fat.

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## PERMANENT POTASH SUPPLY IN NEW JERSEY GREENSAND

A thousand years' supply of potash for the American farmer, independence in the future from European supplies and the establishment of a new great industry in the United States are all possible as a result of a new process for making potassium sulphate from the great quantities of greensand found in New Jersey, Delaware and Maryland, Dr. J. W. Turrentine, C. W. Whittaker, and E. J. Fox, soil chemists of the U. S. Bureau of Soils, told the American Chemical Society meeting.

The process has been made economically possible by the manufacture of valuable materials such as alum, alumina, ochers, and glaucosil, a new earhty absorber as by-products. The new process is being demonstrated in the laboratories of the Electro Company at Odessa, Delaware. The method consists in extracting the raw material with sulphuric acid. The greensand deposits, which are practically at the surface, can be worked with steam shovels, and Dr. Turrentine said that they are ideally located with respect to water or rail transportation, labor supplies and markets

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## PITUITARY GLAND NOT NECESSARY TO LIFE

There has been some controversy among scientists as to whether or not the pituitary gland is necessary to life. The pituitary is known to exert an important influence in the growth of the body and many scientists have claimed that the little pea sized gland is vital to life itself. Now comes a report from Dr. Walter E. Dandy and Dr. F. L. Reichert of the Department of Surgery of Johns Hopkins Hospital, to be published in the Bulletin of the Johns Hopkins Hospital, which states that the pituitary gland is not necessary to life.

Young dogs were used in the experiments, which were carried out in the laboratories of the Johns Hopkins Hospital, at Baltimore. Since the gland is about the size of a pea and is located at the base of the brain, it is rather inaccessible. From difficulties experienced during operations the authors were led to the conclusion that previous experiments may have led to false conclusions because the experimental animals died as a result of injuries due to the operation rather than as a result of removal of the pituitary gland.

It was found possible to overcome the handicaps of operation by making use of the remarkable discovery of Weed and McKibben that the injection of a concentrated salt solution into the veins before operation withdraws fluid from the brain and causes it to shrink in an astounding manner, yet without any appreciable injury. After this shrinking of the brain, the removal of the pituitary is much easier.

Using this new method of operation, a number of dogs were anaesthetized and the pituitary gland was entirely removed. Not only did most of the dogs recover from the operation, but they also continued to live without exhibiting any unexpected symptoms.

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Three states, Minnesota, Michigan, and Alabama produce nearly 95 per cent. of all the iron ore mined in the United States, Minnesota alone supplying about 60 per cent.

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## FREUDIAN SCHOOL NEEDED IN AMERICA

The establishment of an international psychoanalytical foundation to be headed by Prof. Sigmund Freud would be highly desirable, is the opinion expressed by Dr. William S. White, well known psychopathologist and superintendent of St. Elizabeth's Hospital at Washington, D. C.

The foundation which is planned by the followers of Prof. Freud of New York City would bring the activities of the Freudian analysts under a central organization. It would have charge of the maintenance of the present psychoanalytic clinics and educational institutions in Berlin and Vienna, and is expected to lead to the establishment of such institutions in the United States. The foundation would also publish psychoanalytic literature and conduct a publicity campaign to dispel misconceptions of the Freudian theory and to combat the activities of "fake" practitioners.

Dr. White suggests that inexpert analysis of dreams and mental states in this country has not been due so much to deliberate quackery as to the lack of opportunity for psychoanalytic training.

"I have not met with many analysts of dreams and to whom the term 'quack' could properly be applied," says Dr. White. "There are undoubtedly a good many people who are making analyses who have not been technically trained, but who are doing the best they can with such information as they have and such technique as then can develop. I am constantly being asked where one can get training in psychoanalysis and having to reply that there is no place in this country. There has never been any opportunity here for systematic instruction and the method cannot be learned successfully by the average person from the literature.

"Because of this fact, and the added fact that physicians in the United States have been mainly out of personal touch with the Europeans, especially during the war undoubtedly errors of technique are numerous, and of course among a large number of readers all sorts of misunderstandings exist. An international foundation would do much towards improving the understanding of psychoanalysis and towards offering opportunities for training - both very highly desirable aims."

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## TROPICAL SCIENTIST ADVOCATES ALCOHOL MOTOR FUEL

Making motor alcohol from molasses and the juice of the sugar palm is now only a matter of cost because technical difficulties in the manufacture as well as in the use of the fuel by standard automobile engines have been solved, J. P. Foster, chief chemist of the Maui Agricultural Company's sugar factory in Hawaii, reported to the 70th annual meeting of the American Chemical Society . The advantages of this new motor fuel are said to be easy starting, elimination of knocking and freedom from carbon troubles. The alcohol is denatured by the use of ammonia, pyridine or aniline which also neutralize the acidity of the fuel and the substances left over after burning.

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The naval or seedless orange was first found growing as a sport variation in a grove in Bahia, Brazil.

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## PRODUCE STARFISH EMBRYOS WITH ONLY LIGHT FOR FATHER

Young starfish and sea-urchins from unfertilized eggs, with nothing but light to start their development, have been produced by two University of Chicago zoologists, Dr. Ralph Lillie and Miss Margaret Baskervill. Following the experiments o the late Dr. Jacques Loeb, who atartled the world some years ago by producing embryos of sea-urchins, frogs and other lower animals by chemical and mechanical treatment of unfertilized eggs, the Chicago experimenters endeavored to obtain the same results without the use even of chemicals . Dr. Lillie made the eggs of starfish and sea-urchins develop by exposing them to sunlight in the presence of eosin, a substance that fluoresces in the presence of light, for periods of fifteen to twenty-five minutes. Miss Baskervill obtained the same results without the use of the fluorescent chemical by subjecting the eggs to ultra-violet rays.

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## ICE AGES HAD HOT SUMMERS

Sizzling hot summers are shown by a Swedish geologist, Prof. Gerard de Geer, of the University of Stockholm, to have occurred occasionally even in the glacial ages when all the northern continents, including the North American, were covered by a thick ice blanket. Such variations in temperature from one year to another are read by him in the many thousands of clay samples which he and his pupils have collected in different parts of the world, including the United States. By their differences in thickness and color the layers of clay show exactly how much ice was melted by the sun's heat during the year they were formed and thus record not only the earth's age, but also its past temperatures as clearly as the rings of a tree show by differences in thickness which seasons have been wet and which dry.

Upon retiring from his professorship in the University of Stockholm, Baron de Geer has now been enabled through the generosity of some of his Swedish friends to found a separate institute in Stockholm as part of the University and devoted wholly to research work in his particular branch of geology, that of geo-chronology, or the study of the earth's age. He has been in the United States twice to collect clay specimens.

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## EAT VITAMIN A AND LIVE LONGER

That vitamin A, found in butter, cod liver oil and many other substances, may increase the span of life, was shown by experiments on rats, reported by J. A. Hansbrough of the University of Florida, at the American Chemical Society meeting. Rats that were fed on distilled water and white corn alone, which is known to be unsuitable for normal growth and health and lacking in vitamin A, amino acids, and a number of necessary mineral substances, lived only anaverage of 60 days. When the missing salts were added to the diet, rats lived an average of 68 days. When casein was added supplying themissing amino acids, rats survived 87 days, but when butter was added to the diet of plain white corn, the rats began to live on forever, at least as far as the experimenters have been able to determine, for they are still alive and healthy at the end of 223 days.

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# SCIENTISTS FIND SEAWEEDS LIVE ON FILTERED RAINBOW

By Dr. Frank Thone,
Science Service Staff Writer

Most people realize, in a vague sort of way, that all common plants must have light. But because the full light of day is available to all the plants one usually sees, no one gives much thought to the subject. Certain Russian and German physiologists experimented, a generation ago, with the effects of various colored lights upon plants, and discovered, among other things, that common plants conduct most of their food-making processes with the help of the orange section of the spectrum, that they use yellow light less, and green and violet light hardly at all. But all these colors are present in ordinary sunlight, and sunlight is always present; so scientists for the most part have been willing to let the plants take their own choice, and to devote themselves to the more practical study of factors that might be lacking or need control, like water and fertilizers.

Lately, however, some attention has been focussed on a class of plants that do not get the benefit of all the rays present in ordinary daylight. These are the kelps, or giant seaweeds, which were of much practical importance during the war as sources of fertilizers, explosives, and other chemicals. These plants live under water; and as everybody knows, light loses part of its power at relatively shallow depths, and at greater depths is extinguished altogether. While itis not possible to increase or control the amount of light that the commercial kelps get, a knowledge of light conditions in the sea is one of the items that needs to be figured with in any attempt to get at a basis for intelligent use and conservation of our kelp resources.

Seaweeds as a whole are divided into three color-classes, green, brown and red. Each class has a very definite distribution according to depth. The green seaweeds grow in water from tide-level down to four or five feet at the lowest, the browns (which include most of the economically important varieties) in water from three to one hundred feet deep, and the red seaweeds, which are usually small and insignificant plants, at depths greater than one hundred feet. These zones overlap each other, of course, but on the whole are very distinctly recognizable.

That there should be such a zonation is interesting enough, but when we examine the effect of water on light that penetrates into it the plot begins to thicken. Water not only reduces the intensity of light, but it also takes out some colors more quickly than it does others. If a narrow beam of sunlight be split by means of a prism into a spectrum of band of the seven primary colors and the latter then be allowed to fall upon the surface of water, the depth to which the the different colors will sink before going out altogether will be found to be very slight at the red and very deep at the blue-violet end. Red light hardly penetrates at all, orange reaches a depth of about five feet before being reduced almost to zero, yellow sinks to a depth of nearly a hundred feet, while green, blue and violet light penetrates to greater depths. If now we compare the depth limits of the various rays with those of the seaweed classes, we find a most interesting correlation. The green seaweeds stop at the depth where the orange light stops, the browns reach the limiting depth of yellow light and no farther, while the reds live in the deeps to which green light sinks. It is of especial significance further to note that each class of seaweeds is of the color opposite or complementary to that of the light that characterizes its particular depth-zone, the green plants growing where they can get red and orange light, and vice versa.

However, one does not need to depend altogether upon a correlation. Direct tests have shown that the green seaweeds use mostly the orange and red-orange rays, as do ordinary plants. The browns can use these rays also, but to a less degree; they show their best activity under yellow light, and very little under green. Finally, the reds use hardly any orange light, even when supplied with it artificially, show only partial activity under yellow light, but are very active under green. All round, it is about as clean-cut a piece of adaptation as one can find anywhere in nature.

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## WATER POWER AIDS NITROGEN FIXATION

The process of imprisoning nitrogen in solid compounds from air by means of the electric arc is made possible in the state of Washington through the use of cheap electrical power, according to Prof. H. K. Benson and W. L. Beuschlein of the University of Washington, who spoke before the meeting of the American Chemical Society. Ninety-four per cent of all the electrical power in Washington state comes from water power as compared with thirty-four per cent. for the entire United States. Municipally owned plants in Tacoma and Seattle are connected with the highly developed privately owned plants in other parts of the state and are organized to dispose of surplus and seasonal current.

The only arc plant in America for fixing nitrogen is in Washington and has recently enlarged its capacity for supplying the American demand for sodium nitrite. The yield is about two ounces of nitric acid per kilowatt hour. The process consists of oxidizing the nitrogen in the air by means of powerful electric arcs, which is then absorbed by sodium hydroxide forming nearly pure sodium nitrite and water. When the water is evaporated, the nitrite is ready for shipment.

Another process for permanently connecting the nitrogen of the air with something solid on earth is that of splitting water by means of electricity into oxygen and hydrogen. Air, which is four-fifths nitrogen, is then added to this mixture, the oxygen removed and the mixture purified. Then at the high pressure of 300 atmospheres, and at a low temperature, the mixture of hydrogen and nitrogen unite as ammonia, each nitrogen atom taking unto itself three little atoms of hydrogen, in the presence of a catalytic agent, a sort of chemical parson.

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## RICKETS CURING POWER OF FOODS NOT DUE TO ULTRAVIOLET LIGHT

Ultra violet light is not given off from substances such as cod liver oil, which contain the rickets-preventing vitamin D, when they are oxidized by exposure to the air or use in the body. Under such conditions they have the power of fogging a photographic plate, but this is due to the "Russell effect", a chemical phenomenon, and not to invisible radiation. This is announced by Prof. I. Newton Kugelmass and Dr. Irvine McQuarrie, of the Department of Pediatrics of Yale University.

In a previous preliminary investigation, Prof. Kugelmass and Dr. McQuarrie came to the conclusion that the effect was one of ultra-violet radiation, because the plate was fogged even when covered by a quartz screen. A piece of glass, however, protected the plate, and since ultra-violet light passes through quartz, but glass stops it, they supposed that these rays were given off by the cod liver oil. Now they find that it is due to other causes.

Many metals and other substances have the power of fogging photographic plates and they are all alike in that they have the property of obsorbing oxygen. Blood and other bodily tissues do it, and operate even if the plate is covered by celluloid, gelatine, or gutta percha. Glass, mica and aluminum, however, prevent the action.

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## LIGHT BEARING ETHER COMPRESSIBLE? SAYS PHYSICIST

The ether which is believed to pervade space and carry light may be compressible, according to the ideas of Dr. Ludwik Silberstein, of the Eastman Kodak Company's research laboratory, at Rochester. In a recent statement to Science Service Prof. Albert Einstein, of relativity fame, differed with Dr. Silberstein' s views, saying that the Stokes theory of the ether, on which Dr. Silberstein's is based, would not explain the astronomical aberrations. It was, he said, based on a mistaken idea that the velocity of the ether movement was deducible from a potential.

"Against Prof. Einstein's contention," says Dr. Silberstein, "a velocity potential of the ether motion as required for the Stokes theory of aberration becomes possible at once if the ether is assumed to be compressible. This was originally suggested by Planck, and was adopted by H. A. Lorentz, who based on it a perfectly satisfactory theory of aberration. All other phenomena then known were also covered by this theory. Whether the new experimental findings by Prof. Miller will necessitate a further modification remains to be seen."

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## OLD TRICK OF OCCULT USED IN MEDICINE

The use of the crystal, long dedicated to the service of the occult, as an instrument of scientific diagnosis has been suggested by Dr. Lee Edward Travis of Iowa State University. Crystal-gazing is away of making an individual day-dream by means of artificial conditions, and dday-dreaming is a border-line hypnotic state in which the individual exhibits certain interesting symptoms such as increased sensory acuity. He can, for example, hear softer sounds and perceive fainter colors than under ordinary condition.

Dr. Travis measured the sensory capacity of different kinds of insane patients while crystal-gazing. To say it in technical terms, he found their auditory threshold, or the faintest sound they were capable of hearing. Some patients, while crystal-gazing, possessed a lower threshold than usual, that is, they became hypersensitive to sound. Others possessed a higher threshold, that is, they proved resistant to the attempt to establish artificially a condition of reverie or of mild hypnosis. The first group consisted of psychoneurotic patients, such as hysterics; the second, of dementia precox or other shut-in types of patients. Thus by aid of the crystal a standardized objective test may be introduced into diagnostic work on psychotic or insane subjects.

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About half of the more than four million children who enter the first grade in the elementary schools each year fail to reach the second grade.

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## X-RAYS WILL SPEED LABORATORY ANALYSES

Rapid analyses of materials in the laboratory by the use of X-rays in a much shorter time than required by the older chemical methods, is promised by Prof. Urbain, of the Minero-Chemical Laboratory at the Sprbonne,in Paris. With the assistance of Eugene Delaunay, he has completed a series of tests of the X-ray method.

The apparatus used is composed of an X-ray tube; a lead screen in which a small slot has been pierced; a "selector" of tantalum, as a filter for the rays; a stand to hold the piece to be studied; and a detector to measure the intensity of the radiation received - the intensity being indicated by the displacement of an illuminated spot.

The material to be analyzed is placed in the beam, and when it is in good condition, the spot of light remains stationary; but if a fault in the material appears, the electrometer registers promptly. By recognized laws of physics, the deviation is proportionate to the amount of the fault in the matter. By this method, the smallest faults can be detected.

For actual quantitative work, the movable holder for the material is replaced by a small basin. By using, for example, distilled water as a base, and placing this first in the basin to set the "zero starting point", other solutions containing salts can be analyzed by straight calculations. For more than one salt in solution, more than one wavelength can be used.

The great advantages of this would be first for the speed of analysis, and second that a constant watch and check can be kept on the material used in manufacturing. M. Delaunay, who did the actual work, also says that there is no risk of error, which greater accuracy should prove invaluable.

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## STEADINESS TEST FOR AVIATORS UNRELIABLE

That more work needs to be done on tests to determine a man's fitness to become an aviator is shown by a report of work done by George Brammer of the Psychology Laboratory of Stanford University. A certain degree of steadiness in muscular control is assumed to be a necessary qualification for a man who would become an aviator. During the war a number of tests were developed which were calculated to determine the nerve and muscle coordination of the would be flyer before he was finally accepted for training in the art of flying.

In order to determine the value of this factor of steadiness tests were made upon men in the Air Service of the U.S. Army at Crissy Field, San Francisco. There were eighteen men and officers in the test group with from 110 to 1775 hours of actual flying to their credit. The same tests were given to eighteen students of the University of California who had qualified for the Air Service of the R. O. T. C., but none of whom had had any flying experience.

The test subject stood ina comfortable standing position,and by means of an apparatus known as the Ataxiameter the amount of body sway in one minute of time was recorded automatically. Tests were first made with the eyes open and then with the eyes closed.