SCIENCE NEWS

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EXPERIMENTS IN SEX CONTROL

ONE of the first apparently successful attempts at experimental sex control of warm-blooded animals has been reported from the zoological laboratories of Indiana University.

Through injection and absorption of female sex hormones into more than 900 chick embryos, the normal sex ratio has been changed from about 50 per cent. females to 64.78 per cent. females. With more complete control of experimental conditions, it seems possible theoretically to control almost without exception the sex of the embryos. This means sex reversal from male to female. The next step in the experiment will be to attempt the more difficult change from female to male.

The possibility of experimental sex control has long been a subject of scientific investigation. Sex reversal has been accomplished experimentally in the amphibians and other cold-blooded animals but has baffled science in its efforts on warm-blooded species, although Professor F. A. E. Crew, of the University of Edinburgh, has reported a female fowl which laid eggs and later produced sperm.

Working for the past two years on the general problem of the effect of endocrine gland preparations on the development of the chick embryo investigators at Indiana University developed a theory of sex control through injection of sex hormones. They took advantage of the known fact that the gonads or sex glands of the chick embryo are practically identical so far as structure is concerned until about the sixth day of development. At that time sex differentiation occurs. Injection of hormones was started on the third or fourth day, when theoretically the gonad could be changed. The extract was inserted into the air chamber at the large end of the egg. Absorption was accomplished through the allantois of the embryo, a vascular membrane which takes up the extract.

The heavy percentage of females developing from the artificially treated embryos, as compared with the normal 50–50 ratio, seems indicative if not a proof of sex reversal. In answering the question of why the 900 embryos of the experiment showed any males at all, it is explained that the allantois or absorbing tissue of many males develops so late that the extract of female hormones is not absorbed under the present experimental methods. Another reason for failure to bring about complete sex reversal is that the shell membranes in many cases are so dry as to absorb all of the extract before it reaches the allantois of the embryo.

Continuing the injections after sex differentiation has taken place in the chick embryo, it has been found that the extract of female hormones produces an abnormality in the male glands, but that the change is not sufficient to produce reversal, once sex differentiation has definitely developed.

ATMOSPHERE OF THE PLANETS

LIFE on the other planets, with the possible exception of Mars, is absolutely impossible. This has been shown by observations at Lowell Observatory on Jupiter and Saturn which show their atmospheres to consist largely of methane and ammonia, deadly gases not widely found on earth.

Dr. V. M. Slipher and Arthur Adel, of the Lowell Observatory, Flagstaff, Arizona, have clinched the argument by the use of evidence gathered by planetary spectrum photographs taken through telescopes and laboratory spectra of the gases.

Ammonia is the familiar stifling, strongly odorous gas, and methane is the deadly hydrocarbon gas often called firedamp or marsh gas. Violent explosions in coal mines result from methane. Ammonia is used in artificial ice machines. The atmospheres of Jupiter and Saturn may be visualized as like the interior of a gassy mine mixed with an exploded ice factory, all at the immensely low temperature of some 220 degrees below zero Fahrenheit.

If a trip could be taken to Saturn or Jupiter, the great cold and the deadly gases would snuff out life. And if oxygen were taken along for breathing purposes, there would be a terrific explosion as soon as it arrived. This fact is proof that no oxygen exists upon the two planets. Although Uranus and Neptune, the two planets next beyond, are too distant and small to allow as detailed telescopic inspection, their light makes the astronomers feel sure that they too have methane-ammonia atmospheres, with no possibility of life. This eliminates four out of nine planets as abodes of life.

Pluto, most distant and most recently discovered planet, is without atmosphere because like the earth's moon, and Mercury, the sun's nearest neighbor, it is too small and has too little gravity to hold on to gases.

Venus, with much atmosphere, can not have life unless it could exist without water or oxygen and thrive upon carbon dioxide, the waste product of respiration here on earth.

Life is more likely to exist on Mars than elsewhere in the solar system because it has visible clouds somewhat similar to those on the earth. The question of the existence of life-supporting oxygen is in dispute. It has water, but less than on earth. There seem to be seasonal changes. The temperatures vary from about 65 to 70 degrees Fahrenheit at mid-day to far below zero at night. Man could not live under such conditions, but some sort of odd lichens or fungi or strange Martian germs might.

The ammonia-methane composition of the atmospheres of the giant and distant planets was first hinted over two years ago by computations of Dr. Rupert Wildt, of Göttingen, Germany, using Lowell Observatory spectrographic observations. More recently, Dr. Theodore Dunham, Jr., of Mount Wilson Observatory, demonstrated conclusively the existence of ammonia. Dr. Slipher used the rich photographic data of Lowell Observatory, which

specializes on observations of the planets. These he compared with laboratory work at the University of Michigan on the way light is affected by high concentrations of methane. This gas was compressed so greatly that the light has a path equivalent to over a mile in length.

It is possible that Jupiter and Saturn may not have solid surfaces. Because of the great cold upon them the ammonia gas may freeze out in beautiful white crystals. One theory is that the different light-colored markings upon the two planets are due to great geyser-like wellings of the sub-frigid ammonia crystals.

The idea that the gigantic disturbances on the surfaces of Jupiter and Saturn are periodic and are in some way set off by the same unknown cause that influences the sunspots and the aurorae of the earth is advanced by Dr. E. C. Slipher, of Lowell Observatory.

THE NEUTRON

WHILE the newly discovered particle of matter, the neutron, has no electric charge that can be detected, it is thought possible that it may be composed of the close combination of a positive electric charge, the proton, and a negative electric charge, the electron. If this were true the neutron would not be an elementary particle but a stable combination of two things already known.

Professor Alfred Lande, of the Ohio State University, reported to the American Physical Society, meeting in Ann Arbor, that new considerations regarding the magnetic properties of atoms indicate that the negative charge is bound to the lighter of two things inside a neutron, while the positive charge is joined to the heavier part. Thus the neutron would be a particle which represents a working agreement between a proton and an electron.

The principal difficulty in considering a neutron as composed of an electron and a proton comes in a study of their weights separately and in combination. The sum of the masses of a proton and an electron would be 1.0072 plus .00055, or 1.00775. This figure is larger than the mass of the neutron, 1.0068, determined experimentally by Professor James Chadwick, of the University of Cambridge, but is smaller than the neutron mass, 1.010, as measured in Paris by Irene Curie and her husband, F. Joliot. If 1.010 is correct, physicists have been anticipating trouble, for they then would have two atomic objects weighing less in combination than their sum separately.

Dr. Lande's magnetic considerations, approaching the problem from another front, indicate that the neutron is a proton plus an electron and implies that the Curie-Joliot measures of 1.010 for the neutron mass may be in error.

DIET REQUIREMENTS OF AN AVERAGE MAN

DOES the average man doing an average day's work need to get more or less than 3,000 calories in his daily diet?

This is one of many questions in the field of nutrition which require further research, Professor Lafayette B. Mendel, of Yale University, told members of the American Home Economics Association, at the recent meeting of the society in New York City.

The 3,000-calorie requirement, now almost universally accepted, is based on precise scientific calculation of energy requirement made during the war. It is now under discussion because of the declining need of energy foods in this day of labor-saving devices. In England at present some favor increasing the calorie requirement to 3,400 with a reduction in the amount of protein foods. "This gives an incentive for further investigation into what the real working status of the coming generation is to be," Professor Mendel observed.

Another point requiring further research is the actual rôle of the vitamins in maintaining health. This is particularly important in relation to subacute disorders arising from partial rather than complete lack of certain essentials of diet. The malnutrition of certain types of alcoholism comes under this head. The problem of storage depots in the body for reserve supplies of vitamins, water, fats, mineral nutrients and other substances needs investigation. The conditions under which vitamin A is stored have already been examined and the results suggest that much of this vitamin may be destroyed in the digestive tract.

The value of roots, tubers, leaves and fruits is little understood. Fruitful field for research also lies in the direction of texture of foods, about which dentists are particularly concerned at present, and food allergy or sensitiveness.

ITEMS

LIGHTNING is to play the title rôle in an educational motion picture recently released by the General Electric Company. With sound features added lightning will flash across the silver screen, playing the part of both the natural phenomenon and the artificial one generated by man. The picture was made to illustrate the method of reproducing in the High Voltage Engineering Laboratory the terrific forces of lightning in order to study its effects and safeguard life and property.

Two small boilers, each holding less than eight gallons of water, have been found sufficient to drive a 133-passenger train over a German roadbed at a 68-mile clip. A report from the U. S. Department of Commerce indicates that the reason for this lies in the enormous pressure generated in these miniature boilers. It is 120 atmospheres, or approximately 1,700 pounds per square inch. In comparison, the working steam pressures on some of our largest American locomotives very rarely exceeds 250 pounds, while safety valves are usually adjusted to release the load on a boiler at around 205 pounds per square inch. The steam is delivered to a two-cylinder, piston-type engine turning at a rate of nearly 2,000 revolutions a minute. The new German train is streamlined and of light weight. It is expected that steam-driven trains of this type will eventually compete with the now popular diesel-driven types.