

EMBRYOLOGY

Eggs of Opossum Photographed To Show Earliest Life Stages

Natural Selection Shown at Work, Eliminating "Unfit" at Fertilization and During Early Growth

See Front Cover

EGGs OF a very primitive type of mammal, the common American opossum, have been studied and photographed by Dr. Carl Hartman and his associates of the Department of Embryology, Carnegie Institution of Washington, in their Baltimore laboratory. They have succeeded in obtaining these early life stages at several points of development, from unfertilized and just-fertilized eggs to the earliest divisions of the body into the beginnings of nervous system, muscles, etc.

It takes trained eyes and critical searching to find the eggs in their first, unfertilized state. They are then only about the size of poppy or tobacco seed, and of just about the same color as the much-wrinkled walls of the uterus, or reproductive cavity, into which they have been discharged from the ovaries. Yet careful hunting succeeds in locating them, and equally careful gathering methods get them out.

Architectural Outline

Immediately after fertilization by the spermatozoa, the eggs enlarge rapidly to several times their original diameter, and become somewhat clearer in appearance. They are then said to be in the primary vesicle stage.

On the surface of the vesicle appears a scarcely visible white line or streak. It is caused by a thickening or condensation of the living, actively growing protoplasm, and is known as the primitive streak. It is a sort of architectural chalk-line, showing where future building is to take place, for it marks the site where the new animal's body will begin to develop.

One of the most interesting of Dr. Hartman's photographs shows a group of 22 cells at this early stage of development. Seven of them have been fertilized and have grown normally; four, though fertilized, show dwarfed or retarded growth; eleven remain unfertilized and show no growth or development at all.

Dr. Hartman cites this as a case of

natural selection at work even before birth. The eleven unfertilized eggs apparently lack some necessary factor of vitality from their very formation. They are the wholly unfit, and will come to nothing. They are life-seeds that fall by the wayside.

The four eggs that are fertilized but fail to grow normally represent genetic stock that "has something"—but not enough. It is doubtful whether they will develop into young animals at all; more likely they, too, will die before birth and their substance be resorbed into the parent's body.

The seven that have been normally fertilized and have grown to full size stand a good chance of coming to birth as young opossums. Seven would not be an extraordinary litter for an opossum. But even part of these may not come through. Thus death lies in wait for life even before we are born—for this same kind of natural waste goes on before birth in all animals, including ourselves.

A later-stage photograph in Dr. Hartman's collection is even more striking,

though taken at a considerably lower magnification. It shows, as he says, "the eggs in the basket they came in;" for it is a picture of the uterus of one of the animals opened, showing the vesicles, increased in size, each bearing the recognizable beginnings of body structures.

To be sure, these objects, shown in higher magnification in a third photograph, do not look at all like even the youngest opossums. Garden slugs are about the only familiar animal form they at all resemble, and that resemblance is only of the faintest and most superficial sort. Yet opossums they will become, for they bear within themselves the still mysterious substances or forces that constitute biological predestination toward 'possumhood.

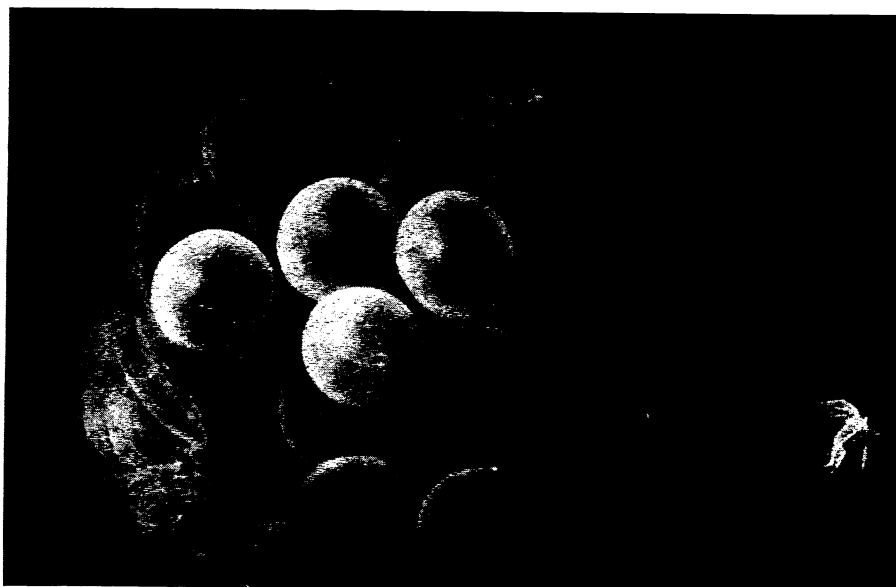
Science News Letter, July 10, 1937

ASTRONOMY

Major Disturbance Due On Planet Jupiter

A GREAT disturbance on the planet Jupiter to occur during the next few months was predicted in a communication to the American Association for the Advancement of Science from Dr. E. C. Slipher of Lowell Observatory, Flagstaff, Ariz. It will take the form of a series of intense dark spots in the giant planet's equator. A small faint marking gives warning of the approaching spots, judging from a similar event in 1920.

Radio communication over long dis-



"IN THE BASKET THEY CAME IN"

Female opossum's uterus, cut open to show a number of the eggs, each with an embryo in very early developmental stage.

tances by short waves will have frequent interruptions as the sun becomes more spotted in coming months, Dr. A. G. McNish of the Carnegie Institution of Washington predicted to the American Association for the Advancement of Science. Magnetic storms here on earth

caused by variations in the ultra-violet light from the sun are the cause.

But when the sun begins to recover from its spots a few years hence very shortwave signals which now span the Atlantic will become useless for long distance transmission.

Science News Letter, July 10, 1937

GENERAL SCIENCE

Odd-Sized Subatomic Unit Suggests Universe Not Uniform

Airplanes Make Static That Deadens Their Radio; Deafness A Drawback to Writing, A.A.A.S. Learns

THAT the universe may not be uniform with regard to the fundamental building blocks of matter is hinted in the report on a recently detected particle in cosmic rays, presented by Dr. J. C. Street of Harvard University to the American Association for the Advancement of Science meeting in Denver. From beyond the Milky Way are imported as part of the cosmic rays constantly penetrating particles not found on earth. They are responsible for the showers in the cosmic rays. The new particle is five to fifty times heavier than the familiar unit of electricity, called the electron, but it carries the same electrical charge.

Magnetic storms here on earth cause a variation in the intensity of cosmic rays recorded on delicate instruments, Dr. R. D. Bennett of the Massachusetts Institute of Technology reported.

A year-round cosmic ray recorder will be installed in America's highest scientific laboratory on the 14,256-foot peak of Mt. Evans near Denver, Dr. Joyce C. Stearns of the University of Denver announced. The high altitude laboratory, built to withstand winds of 150 miles per hour, begins its second summer this season. The question as to whether cosmic rays can affect the course of evolution will also be studied by exposing fruit flies on the peak this summer.

Only Ideal Conditions

The next time you complain about the weather, saying, "It's too hot—or too cold—or too dry—or too wet," say instead, "I'm lucky to be alive." Realize that so far as scientists now can say conditions like those existing on the earth are about the only kind in which life can exist. And this is not particularly because of lack of knowledge about the

laws of science which operate elsewhere in the universe.

Such was, in effect, the message of the distinguished British chemist, Prof. Nevil Vincent Sidgwick of Oxford University, in the Maiben Lecture before the American Association for the Advancement of Science.

Prof. Sidgwick showed that out of the possible billion-degree range of temperature which can exist from the coldest depths of interstellar space to the centers of flaming stars, chemical molecules—and therefore theoretically life itself—can exist only between 6,000 degrees absolute, temperatures like those of the surface of the sun, and the temperature of liquid air at 100 degrees above absolute zero.

Actually 6,000 degree temperatures are twice as hot as electric arcs, made by man, and far above those temperatures that can support life. Greatest temperature restriction of life, said Prof. Sidgwick, is the necessity that organisms have to have some liquid to act as a lubricant. Water is this lubricant, so life cannot exist where the temperature is consistently below water's freezing point or hotter than water's boiling point, a range of 100 degrees Centigrade.

Other restrictions on life, declared Prof. Sidgwick, are that it must occur on the surfaces of planets if radiant energy is to be utilized. Also it will have to occur on a planet of just the right size. If the planet is too small, like the moon, all its atmosphere will fly away into space; if the planet is too heavy it keeps too much of its atmosphere. The thick clouds prevent the planet from getting the radiant energy from its parent star and it is too cold to permit life.

Of the planets of the solar system Prof. Sidgwick said, "The moon is much too

small for life to be possible; Mercury is probably too small and too hot; Jupiter and the outer planets too cold. The only places in the solar system where life is possible seem to be the earth and our two neighbors, Mars and Venus."

Planes Make Static

When an airplane flies into a cloud the pilot begins to have trouble with static in his radio reception. This has always been blamed on electrically charged water drops or snow crystals in the cloud; but experiments reported by H. M. Hucke, experimental engineer of United Air Lines have shown the cause of the trouble to lie in charges already gathered on the surface of the plane and discharging through the trailing edge.

These experiments, performed on a new \$75,000 "flying laboratory," have already led to the development of a system for discharging the static from planes flying through charged clouds, which is expected to improve plane-ground communication very materially.

Plants Need Zinc

Sickly folk have long been told they need iron; now it is the turn of sickly plants to have zinc prescribed for them. P. L. Hibbard of the University of California told of his investigations of soil zinc in connection with the plant diseases variously known as rosette, little-leaf, and dieback.

There is very little zinc in ordinary soils, he reported; between one and ten parts per million, as determined by extraction with weak acetic acid. The midpoint of this range seems to be what is needed for plant health. At less than five parts of zinc per million of soil, it may become necessary to add zinc to the fertilizer formula.

No Drawback

Objections to separating bright pupils from dull ones in special classes, on the ground that the dull ones would acquire inferiority complexes and the bright ones become "swell-headed," were found to be ill-founded in studies reported by Dr. Lillian G. Portenier of the University of Wyoming. The bright pupils who were already properly adjusted in their social attitudes showed no change for the worse, she found, while the dull ones showed marked improvement. The same groups were followed up for twelve years, and the good effects of separating them at the outset were apparently persistent throughout.

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