rhythm of breathing as well as for rhythm in other body activities.

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PHYSIOLOGY

Dr. Karl Landsteiner—Antibodies and Sneezes

THE SNEEZES of the hayfever sufferer, the hives of the person who is upset by eating fish, the rash or more severe reaction that follows taking a drug in persons hypersensitive to it, are all signs of a "very comprehensive and remarkable biologic phenomenon," Dr. Karl Landsteiner of the Rockefeller Institute for Medical Research told fellow scientists at the Harvard Tercentenary celebration.

Best known for his discovery of the blood groups, Dr. Landsteiner has investigated other features of blood, such as its mysterious antibodies which fight invading disease germs. From that he has branched over into a study of the body mechanisms for resisting other foreign substances, particularly chemicals taken into the body as drugs.

The antibodies, Dr. Landsteiner believes, play a defensive role not only against disease germs but in allergies, such as hayfever, and in drug idiosyncrasies, although scientists have not yet been able to demonstrate their presence in all cases of these conditions.

By means of these antibodies, circulating in the blood or fixed in body tissues, the body adapts itself to various chemical agents.

"If successful, this mechanism guards against infectious disease," Dr. Landsteiner said, "but when it miscarries it induces sensitivity to exceedingly small quantities of proteins or simple chemical compounds."

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CHEMISTRY

Prof. August Krogh—Isotopes a Tool

CHEMICAL isotopes, the seldom-met "twins" of ordinary atoms, are being used in Denmark to trace the course of water, minerals, and organic substances through the physiological processes of plant and animal bodies. Some of the results were revealed for the first time, by Prof. August Krogh of the University of Copenhagen, speaking before the Harvard Tercentenary Conference.

An isotope might be defined as a form of a chemical element that behaves chemically like its better known twin, but is different enough on the physical side to permit it to be detected by suitable physical means. Thus, it is possible to produce a form of phosphorus distinguished by being radioactive, whereas ordinary phosphorus is not. Or, the famous heavy hydrogen is twice as heavy as ordinary hydrogen, so that heavy water containing it can be detected by weighing it.

Prof. Krogh and his associates have been giving isotopes of various nutrient elements to plants and animals, and afterwards analyzing the tissues from various parts, to find out where the isotopes went. They found, among other things, that radioactive phosphorus traveled around plants a good deal more rapidly than had previously been thought to be the case. Also, radioactive phosphorus turned up in the dentine of teeth, which has always been thought to be pretty well cut off from the rest of the body.

Another series of experiments, using heavy water, showed that water gets around through the body of an animal quite rapidly, once it enters, and that any given quantity of water comes to be distributed pretty evenly throughout the whole body. Water-dwelling animal forms were shown to be capable of absorbing water through their gills, and also through their skins when these were not too thick.

Prof. Krogh stated his belief that of all types of isotopes, the radioactive ones would prove most useful in physiological studies because it is so easy to detect them. He said that powerful apparatus is now being erected in his laboratory for the preparation of new kinds of radioactive elements.

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CHEMISTRY

Prof. The Svedberg—The Protein Molecule

FROM another Baltic country came a report on investigations into the size and makeup of the protein molecule, among the largest and most complex of atomic aggregates. Prof. The Svedberg of the University of Upsala, Sweden, told of methods and instruments evolved in his laboratory, which include an ultra-centrifuge that can whirl solutions at a rate of from sixty to seventy thousand revolutions a minute. This separates out intimately mixed things, as cream is separated from milk in a cream separator, and permits physical and chemical examinations to be made of the parts.

Prof. Svedberg's results confirm the idea previously held, that protein molecules are relatively enormous, containing tens or even hundreds of thousands of atoms each, as against a mere half-dozen or dozen in common inorganic compounds, or a few scores or hundreds in the simpler organic molecules. Also, it was found that these huge molecules were not built up single atom by atom, but that whole blocks of atoms were manipulated at a time. That is, they were not put together a brick at a time, like a mason erecting a wall, but more like bolting together the whole sides of a knock-down house.

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MEDICINE

Dr. Kiyoshi Shiga—Dysentery Unconquered

BACILLARY dysentery, one of the great health hazards of tropical regions, which occasionally reaches into more northern parts, is still unconquered, scientists at Harvard's Tercentenary were told by Dr. Kiyoshi Shiga of the Kitasato Institute, Tokyo.

Dr. Shiga more than thirty years ago discovered the bacillus or germ that causes dysentery. Now he told with keen regret how, in spite of this discovery and a lifetime of subsequent research, the disease still defies the efforts of himself and other scientists to wipe it out.

In the years that passed since the epochal discovery of Dr. Shiga's youth, much new knowledge has been gained about the disease, he related. Almost a hundred different strains of germs that cause the disease have been discovered. The poison produced by the germ has been studied and found to rank next to the toxins of tetanus (lockjaw) and diphtheria in strength. An antitoxin has been prepared and found effective in mild and medium cases, but less effective in severe cases.

Carriers of the bacillus present an important problem, as they do in typhoid fever. Carriers of one type of dysentery bacillus have decreased, but carriers of another type have increased. The decrease Dr. Shiga attributes to the fact that another bacillus normally present in the intestinal tract has been able to overcome the Shiga type of dysentery bacillus, but has become accustomed to living side by side with the other type which consequently still flourishes.

"Suppresssion of carriers may be an important problem but suppression of the cases is more feasible," Dr. Shiga

declared. He recommends immunizing or raising the resistance of the general population, in countries where dysentery is a problem, by vaccination.

Here again, the scientists are checked in their efforts to wipe out the disease. A vaccine has been prepared against dysentery, and has been given by mouth to hundreds of thousands of people in Japan during the last ten years. Though the results are claimed to be favorable according to the statistics, Dr. Shiga said that "a careful consideration" is still needed before accepting this method of vaccination.

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PHYSICS

Prof. Arthur H. Compton—Electric Not Light

COSMIC RAYS are made up of electrical particles (electrons and possibly protons) and not of light particles (photons), Prof. Arthur H. Compton, University of Chicago Nobelist, told the Harvard Tercentenary Conference. He presented a carefully marshalled array of fact and argument in support of his thesis.

Physicists agree quite generally that electrical particles are actually detected at the earth's surface with specially constructed instruments. But it is also generally agreed that most of these particles are secondaries, that is, they have been kicked into activity by the impact of a primary source of energy arriving at great speed from outer space very much as a marble or a billiard ball is knocked spinning by the impact of the "taw" or the cue ball.

The disputed question has been whether the primary cosmic rays are light particles or electrical particles.

In support of his claim that primaries as well as secondaries are electrical particles, Prof. Compton cited the obedience of the cosmic rays to the pull of the earth's magnetic field. Electrical particles can be attracted by magnetism. Light particles can not. Again at great depths under earth and water, the cosmic rays lose energy and are absorbed in a manner characteristic of electrical particles rather than photons.

A few instrumental results have shown undoubted light effects. The supporters of the light particle theory have claimed these were due to photons from outer space that got clear through to earth without colliding with any particles and turning them into secondaries. Prof. Compton in rebuttal suggested that these light bursts were themselves secondaries given off by electrical particles rather than the other way around.

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ARCHAEOLOGY

Prof. Eduard Norden—Roman Crop Insurance

CROP insurance, now much to the fore as a politico-economic topic, interested farmers in the very earliest Roman days, too. It took the form of prayer for freedom from plant pestilences and other destruction in the fields —somewhat reminiscent of modern prayers for rain and against grasshoppers.

The earliest of these prayers, which is also the oldest known Latin hymn, was described in a new translation by Prof. Eduard Norden of the University of Berlin. It was chanted at field-edges by the Arval Brethren, a sort of pagan religious order, whose special job it was to pray for the welfare of the crops.

The hymn is addressed to Mars—who was oddly enough the god of agriculture as well as of war. It is not in the stately classic Latin of Cicero and Vergil, but in a rude early language very difficult to translate at all. In addition to its endeavor to placate "wild Mars," it also calls upon the lesser local divinities, the Lares and the Semones, and ends in a five-fold alleluja chorus of "Triumph! Triumph! Triumph! Triumph! Triumph!"

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GENETICS

Prof. Filippo Silvestri Polyembryony

QUINTUPLETS are nothing to get excited about in the insect world. To some species of small winged creatures, indeed, a mere five offspring at a time would seem rather close to outright race suicide.

The strange biology of multiple birth among insects was discussed before the Harvard Tercentenary Conference by Prof. Filippo Silvestri of the Royal College of Agriculture, Portici, Italy.

In this mode of "super-quintupling," most familiar to scientists in certain parasitic members of the wasp family, the number of individuals eventually resulting from the hatching of a single egg ranges from ten or fifteen to hundreds and even thousands, depending on the species concerned. Scientists call the phenomenon polyembryony, or the condition of many embryos.

When the insect's egg begins to divide, it first forms a mass of cells, such as constitutes an early stage in the development of any individual. But this cell mass does not proceed to organize and differentiate into the various body parts, in the ordinary fashion. Instead, it breaks apart into separate cells, or small groups of cells; these re-multiply into considerable cell-clumps, and then proceed to turn into larvae, which eventually change into the fully developed insects.

What causes this breaking apart of the original cell mass is still a point of dispute among biologists. Prof. Silvestri is inclined to the opinion that since these insects are all parasites, developing from eggs laid in the eggs of larger insects by their mothers, the presence of abundant fluid, rich in nourishment, may make the first cells more independent of each other than are the cells in comparable early stages of development in other animal forms.

Certainly polyembryony is an advantage to the species that practice it. It results in more rapid multiplication, and hence increases the chances of survival and spread for the species, in a world where its peculiarly selective habits of egg-laying impose pretty heavy handicaps.

To man, also, the process offers certain benefits. The insects described by Prof. Silvestri belong to the large class of tiny, gnat-size wasps that lay their eggs in the eggs of other insects, particularly caterpillars. Their larvae feed on the tissues of these involuntary hosts, eventually killing them and cutting short their careers of crop destruction. When a single egg releases from a dozen to a thousand of these tiny borers from within, the caterpillar's career is so much the shorter, and its possibilities of harm correspondingly the less.

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GEOLOGY

Prof. Arthur Holmes—Billions of Summers

GEOLOGICAL evidence that for nearly 2,000,000,000 years there have been no astronomically significant changes in the heat and dynamical relations between the earth and sun was presented by Prof. Arthur Holmes. Layers of clay laid down in the earliest known sediments so closely resemble the layers of the most recent deposits that Prof. Holmes is convinced that they were formed under seasonal variations as marked as those of today.

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