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SOME PAPERS PRESENTED AT THE HARVARD TERCENTENARY CONFERENCE OF ARTS AND SCIENCES

BY DR. FRANK THONE
Science Service Staff Writer

BACILLARY dysentery, one of the great health hazards of tropical regions, which occasionally reaches into more northern parts, is still unconquered, scientists gathered at Cambridge to celebrate Harvard's Tercentenary were told on September 5 by Dr. Kiyoshi Shiga of the Kitasato Institute, Tokyo. Dr. Shiga more than thirty years ago discovered the bacillus or germ that causes dysentery. To-day he told with keen regret, in poetic, foreign-sounding English that made the regret seem more poignant, how, in spite of this discovery and a lifetime of subsequent research, the disease still defies the efforts of himself and other investigators to wipe it out. "Discovery of dysentery bacillus had stirred my young heart with new hopes of eradicating the disease and saving the sufferings of about one hundred thousand cases that occurred at the time," Dr. Shiga said. "Thirty-eight years had passed since this heart-throbbing event happened. Many thousand people still suffer from it year to year, and the hope that once had been thought would bring new light had disappeared as a dream of summer night." In the years that passed since the epochal discovery of Dr. Shiga's youth, much new knowledge has been gained about the disease. 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 mediumly severe cases, but less effective in severe cases.

DIABETES is not merely a matter of the health or sickness of a single gland, the pancreas; it involves many other glands and tissues of the body. That this disease is basically a disturbance of a balance among many gland secretions is the view of Professor Bernardo A. Houssay, of the University of Buenos Aires, presented before the conference. The pancreas, whose secretion, insulin, enables the body tissues to burn up sugar, is balanced conspicuously against the liver, in which sugar is manufactured and stored. If the liver is out of action, diabetic concentrations of sugar in the blood can not occur. Another gland important in the body's sugar balance is the front part of the pituitary, situated under the brain. The function of its secretion is opposite to that of insulin: It prevents too low a blood sugar content, as insulin operates against the accumulation of too much sugar. A similar sugar-maintaining effect results from the thyroid gland's secretion, and one of the tasks performed by the cortex of the adrenal gland. Nervous connections do not seem to have any important place in the whole blood-sugar picture. If nerves to the glands are severed the glands function any way, being stimulated by the hormones or "chemical messengers" from other glands.

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 his colleagues. 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 rôle not only against disease germs but in allergies, such as hayfever, and in drug idiosyncrasies, although investigators have not yet been able to demonstrate their presence in all cases. 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."

CHEMICAL isotopes 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 reported by Professor August Krogh, of the University of Copenhagen. Professor 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.

FROM another Baltic country came a report on investigations into the size and make-up of the protein molecule, among the largest and most complex of atomic aggregates. Professor The Svedberg, of the University of Upsala, 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. Professor 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.

THE mystery of plants' ability to capture sunlight and use its energy in forming food for all the world has been brought several steps closer to final solution by a German holder of the Nobel prize, Professor Hans Fischer, of the Munich Technical College. He reviewed at the conference his long researches on chlorophyll, the green synthesizer in plant leaves and stems, and told of its recent progress. The ultimate aim is the synthesis of this complex molecule, which will enable scientists the better to understand and control the vital processes of plants. Chlorophyll synthesis has not yet been accomplished, but Professor Fischer intimated that he hopes to get it done in the not too far distant future. Of perennial interest to physiologists and chemists is the relationship between the green pigment of plant leaves, chlorophyll, and the red pigment of blood, hemoglobin. A hemoglobin molecule consists of a huge lump of a protein molecule with four porphyrin rings attached, each with a single atom of iron at its center instead of the chlorophyll's single magnesium. The chemical basis of chlorophyll is a four-sided arrangement of carbon and nitrogen atoms, called the porphyrin ring. With some extra groups of atoms attached around the outside, one long atomic chain called the phytyl alcohol group tacked onto one corner, and a single atom of magnesium stuck squarely in the center, the porphyrin ring becomes the chlorophyll molecule.

CHEMICAL commanders in the bodies of embryo animals, giving orders that are received and obeyed by the developing parts, were described by Professor Hans Spemann, of the University of Freiburg, Nobel laureate. The mode of action of these commanders is known, and the places where they can be found during bodily development; but their exact identity remains a secret. Nobody has ever got one out, whole and separate, and made a complete chemical analysis of it—Professor Spemann is still digging at that part of the problem. When embryonic development begins, with the fertilized egg cell, there forms first a hollow globe of cells, with a tiny opening at one side, the blastopore. At this stage therefore there is neither head nor tail to the animal, nor much of anything to suggest where these regions and the other organs will eventually be. But Professor Spemann found that if he took a bit of the lip of the blastopore from one of these early-stage embryos, and transplanted it onto another embryo at the same stage, this transplanted bit determined a head-to-tail body axis. Since the second embryo already had its own blastopore, there were two axes, and a double embryo developed.

A SIMPLIFICATION of the problem of polarity in living organisms was offered by Professor Ross G. Harrison, of Yale University. He was led to the formulation of his theory by the phenomena which he has observed through many years of experimentation on very early embryo stages of spotted salamanders. Salamanders are little amphibian animals shaped like lizards, but really closer relatives of frogs and toads. The developing animal egg may seem on casual examination to have no head or tail to it, but long before such organs are externally visible the egg itself develops a decided top-and-bottom internal arrangement, with definite signs of right-and-left orientation as well. ''Head'' end is chemically different from the ''tail'' end, and there is a chemical and electrical gradient ranging through the space between them. Professor Harrison sees a theoretical picture of the protein molecules, which are known to be long, string-like affairs, and chemically different at their opposite ends, arranging themselves in parallel formation like soldiers in a regiment, so that the effects of their individual polarities become added together, to produce the greater polarity of the organism.

THE strange biology of multiple birth among insects was discussed by Professor 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. The phenomena is called ''polyembryony,'' or the condition of many embryos. When the insect's egg begins to divide, it first forms a mass of cells, such as constitute 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. Professor Silvestri is inclined to the opinion that since these insects are all parasites, developing from eggs laid in the bodies 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 Professor Silvestri belong to the large class of tiny, gnat-size wasps that lay their eggs in the bodies 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.