SCIENCE NEWS

SOME PAPERS PRESENTED AT TORONTO

(Science Service, Dr. Edwin E. Slosson, Director)

FROM the structure of a worm to the constitution of an empire was the scope of the presidential address of Professor F. W. Gamble, of the University of Birmingham, delivered before the Zoological Section of the British Association for the Advancement of Science. His guiding theme was the new theory of bodily control, worked out by Professor C. M. Child, of Chicago, which has captured the imagination of the younger generation of zoologists and opened to them a promising field of experimentation. Child worked mostly with planarians, the flat, soft, slimy, worm-like creatures that you find when you turn over a stone in the stream. They are the simplest of creeping things, but a head and a tail can be distinguished and Child found that the head end was the point where the chemical processes of life were most active and that the activity tapered off toward the tail. But when the planarian gets too long for the head to keep the whole length in due subordination, a new center of activity starts up in the hindward half which finally breaks away from the parent body. Then the tail end grows a head and the head end grows a tail, and so the one becomes twain. Now it seems that Child's "hypothesis of metabolic gradients," to give its proper name, is applicable to higher organisms and groups of organisms, perhaps even to human society. In the development of an egg into an embryo the particular point in the protoplasm that is most energetic gets ahead of the rest and eventually becomes the head of the creature, while the more sluggish masses fall into their proper stations and become the various organs. Among the coral colonies, the head or apex, so long as it remains strong enough, keeps the other branches from budding off, but when the shoot grows too long for such centralized government, a remote bud may start up and secede to form an independent colony. But although the apex in all cases is the most vital center, yet it is also the most susceptible to poisons and easily killed. In that case a new head may arise from the reserve and comparative inactive basal substance, as in the case of worms, but in the case of highly organized and differentiated bodies or societies this is impossible, and so the whole perishes. As Professor Gamble puts it: "Life under dominance tends to exhaustion whereas isolation leads to a renewal of activity at a lower level of complexity," and he calls attention to instances in the history of the world where a primitive people, long isolated by remoteness or caught in some back-water, has come forward to give new life to a decadent civilization. These are but a few of the many thought-provoking points in this fertile and far-reaching paper, which proves, as Professor Gamble suggests, that experimental zoology may give lessons to practical politics.

GERMANY has lost her chance, what little chance she had, of recovering her African colonies by trading off for them the formula for curing the sleeping sickness. For France has now the same remedy, or, as the druggists say, "something just as good." Bayer 205 has a rival in Pasteur 309. Such was the announcement of H. H. Dale, head of the department of pharmacology of the National Research Council, London, in his presidential address before the Section of Physiology of the British Association for the Advancement of Science. Here is a case where a coal-tar compound plays an important part in international politics. For when Africa had been partitioned by the European Powers, they found much of their territory becoming uninhabitable by the spread of the sleeping sickness, which devastated a belt two thousand miles long and in places one or two hundred miles wide, stretching up the Congo from the Atlantic almost to the opposite ocean. The disease was discovered to be caused by a little creature with a long name, Trypanosome, an infinitesimal wriggler, which is carried by the tsetse fly and infects the blood of man and beast. German chemists set about to find a drug that would kill the creature without harming its host and after fifteen years of effort succeeded. But meantime Germany had lost her African possessions to her conquerors, France, Britain and Belgium, and so had no sleepers to cure. The formula for Bayer 205, or as it is now called "Germanin," was kept secret, but it was intimated that it would be disclosed if the Allies would return the German colonies. This involved an extensive real estate transfer, for the German African possessions amounted to a million square miles, or a third the size of continental United States or habitable Canada. So the Allies showed no eagerness to buy the recipe at this price, but set their own chemists at work on the problem, following such clues as could be obtained from the pre-war Bayer patents. And now Fourneau, working in the Pasteur Institute, Paris, has found that his three hundred and ninth preparation has "similar and probably as valuable properties" as Bayer's two hundred and fifth. Injected into the blood it will not only free the animal from the trypanosomes in a few days, but render it immune to further infection for months afterward. At any rate, this previously incurable and fatal disease seems to have finally been conquered, and vast areas in the tropics may now be opened to settlement. Dr. Dale also told of the war against other animal parasites by the invention of salvarsan and similar arsenical and bismuth compounds. The oldest of all such specific remedies is quinine, which destroys the malarial parasite. Dr. Dale holds that in all such cases the drug does not act directly by killing off the parasite but, as was supposed by Ehrlich, works in cooperation with the natural defences of the body by making the blood uninhabitable to the invader.

THE bankruptcy of the scientific materialism of the nineteenth century was the theme of Professor William McDougall's presidential address to the Section of Psychology of the British Association for the Advancement of Science. In the days of Spencer, Huxley, Tyndall and

Weismann it was held that life and mind, as well as the inanimate world, could be completely accounted for on the physical principles that determine the action of a machine. Every atom of the brain was then supposed to pursue its predetermined course impelled by physical forces. But if the mind could not exert any influence on the operations of the brain without violating the law of the conservation of energy, consciousness, which seems all-important to us, must be an idle and superfluous accompaniment to chemical processes. But the modern view of the physical universe, as set forth by Einstein, Eddington and Soddy, is very different from and less embarrassing than the old mechanical conception, for, as the speaker said, "The atoms are gone, matter has resolved itself into energy, and what energy is no man can tell, beyond saying that 'it is the possibility of change, of further evolution.'" The modern psychologist, according to Professor McDougall, should postpone consideration of the old physical and metaphysical puzzle and start out from two indisputable and practical facts: first, that sometimes men do create new things in art, science and literature, and, second, that when a man strongly desires an end and perceives certain bodily movements to be a means to that end, these movements follow upon that desire and that perception. "The most fundamental need of psychology," said Professor McDougall, "is the adoption without reserve of the conception of purposive striving as valid, useful, nay, indispensable, and therefore true. We should now easily find the courage to be anthropomorphic in describing man." In short, he holds that it is time that psychologists should cease imitating the methods of the other sciences and should boldly claim "self-determination," or "at any rate dominion status for their science." William McDougall came to Harvard in 1920 after training and experience in the universities of Manchester, Cambridge, Oxford and Göttingen, and he has made the chair of psychology a factor in American thought as it was in the days of his predecessor, William James. He criticizes with equal energy all three of the leading schools of psychology, the behaviorists, the introspectionists, and those who attempt a compromise by adopting both these opposing points of view and putting them in parallel columns. But to Professor McDougall "the life of man is one long series of purposive strivings. And even in his dreams, as we now realize, thanks to Professor Freud, the striving goes on, bringing what strange and partial satisfaction it may to the buried, thwarted and denied tendencies of his nature."

Is race suicide due to natural or artificial causes? Is a declining birthrate a menace or advantage to a nation? These were questions discussed by economists of the British Association for the Advancement of Science. The director of the London School of Economics, Sir William Beveridge, pointed out that the fall in the birthrate was no gradual trend toward less fertility, such as has been ascribed to later marriages, the cityward movement of population and other causes, but a definite biological revolution which can be located as beginning about 1881. Up to that time there had been no serious decline in the birthrate of western Europe or any other part of the world for which the census exists; from that time forth it became almost universal. "The sudden development of birth control at that particular date was not," the speaker inferred, "due to any increase in the need for control, but to improvements in the means of control, to invention and exploitation of new powers over nature, like those given by chloroform or gunpowder, but unlike them in being driven underground by public opinion and the law. The fact that birth control developed, not when or because it was particularly needed, but when and because the means of control happened to be improved, *i.e.*, as the result of an underground invention, makes it all the more important to study scientifically and discuss frankly all the possible effects of control under varying conditions, on health, on numbers, on the quality of population and on social institutions." The birthrate remained high in Roman Catholic countries such as Ireland and Italy where artificial means of limiting births are opposed on religious grounds. The only Protestant nations keeping up the big family custom after 1881 were in thinly populated Scandinavia. In Holland the Catholic provinces of Limburg and North Brabant and the very sparsely peopled province of Drenthe are the only ones in which the birthrate fell by less than twenty per cent. in the last fifty years. This sudden and dramatic change from big families to small makes the period of the 1880's, according to Sir William Beveridge, one of the crucially significant turning points of human history. That the decline in the birthrate has been accompanied by lessened mortality is a great gain in human happiness but the speaker pointed out that even this has its dubious side, since a community of stationary population with no great surging influx of new births becomes too readily a nation of conservative old men and women. An analysis of the British census by Professor R. M. MacIver, of the University of Toronto, confirms the common opinion that the most successful classes with respect to wealth and social recognition are the least successful in reproducing themselves. Dividing the British population into classes, with capitalists, employers and highly educated professions at the top and the unskilled laborer at the bottom, each step downward of the social scale shows an increase in birthrate although this is usually offset to some degree by a higher deathrate. Professor James A. Field raised the timely question as to whether eugenists were not on the wrong track in assuming that a relatively low birthrate among the prosperous classes was necessarily a sign of racial decadence. The economic virtues which lead to wealth are not at all the same as the biological merits in which the eugenist is interested. Our present competitive economic system makes children a handicap and often gives special advantage to qualities which from the biological point of view are valueless or worse. The eugenist is less concerned to multiply captains of industry or specialized geniuses than to encourage a normal type of sanity, soundness and all-round capacity.

THE new theory of mountain-building known as "isostasy" had the floor at Toronto. We used to think

that the earth's crust floated upon a sea of molten rock and that the contraction of the earth in cooling occasionally thrust up wrinkles of mountain ranges. But now-a-days the earth is regarded as solid all the way down, but increasingly plastic under pressure at lower depths. So as a mountain wears away from erosion, as all mountains do, it gradually rises since the pressure is removed, while the sea where the eroded rock is deposited subsides, until the two areas are balanced. That is, there is an undertow of viscous rock many miles underneath that adjusts the equilibrium whenever it is disturbed by superficial shifts. One of the causes of the rise and fall of land is the mountainous ice-sheets that have piled up and melted off in the successive glacial periods. Professor A. P. Coleman, of the University of Toronto, stated that ice was once piled up on Labrador thousands of feet high, while the ice-sheet over the central states was only a few hundred feet thick. As the ice melted along the margins of river, lake and sea, these beaches were pushed up from underneath by isostasy. Such raised beaches can be seen in Ontario and Quebec, Newfoundland, Labrador and the Maritime Provinces, often elevated hundreds of feet. The slow process of readjustment from the last glacial period is still going underneath parts of Canada. The eastern end of Lake Ontario is rising more rapidly than the western, and this floods the mouths of the Don and Humber rivers of the Toronto district. Professor Reginald A. Daly, of Harvard, also discussed the effect of the great load of ice formerly covering Labrador and Keewatin. The depression of this weighted area caused the rise of ring of land around it beyond the edge of the glaciated region. The same thing happens on a large scale and Dr. Daly held that "there is sufficient evidence to support the theory that an equally complete and perfect response to the gravitational forces took place when the continent was weighted down with huge masses of ice."

MORE than 400 years ago a man died in British Columbia and nature herself erected over his grave a tombstone on which she inscribed data concerning him. The tombstone was a tree. Anthropologists, digging under its roots, found a skull of unusually narrow type in which a hole had been bored, presumably so that it could be filled with some preservative material. How long ago did the red man practice this form of embalming his dead? For a time this question puzzled the scientists. Then they turned to the tree. Annual rings of growth indicating more than 400 years were found on the trunk. A still greater age for the skull is probable since the outside layers of this stump had been burned off. The studies leading to this interesting conclusion were conducted under the direction of Harlan I. Smith, of the Geological Survey of Canada, who addressed the Section on Anthropology of the British Association.

MICROSCOPIC analysis of cross-sections of fragments of a fossil fern have revealed the living anatomy of giant plants which flourished aeons ago, Professor W. T. Gordon, of King's College, London, announced to the British Association. Petrified stems the size of trees, twigs clothed with bark and buds with their leaves attached recently found in Haddingtonshire, England, show that this fern was much simpler than formerly supposed by botanists.

MUSHROOMS and their fungous kindred that grow in cellars have always been thought of as different from other plants, in that they need no light. But Dr. W. Robinson, of the University of Manchester, speaking before the British Association, has announced a paradox arising out of his experiments with fungi; for while these plants can and do grow in the dark, they still must have light at certain periods of their lives. Their reproductive processes require light. The species on which Dr. Robinson worked brought forth reproductive structures in the dark, but they were sterile, and spores capable of growth did not appear until the plants were subjected to light of a certain minimum intensity.

"WHERE light is intense, it is unusual to find acid soils," Professor J. L. Sager, of the University College of the Southwest of England, reported to the British Association. By analyses of soils from forests composed of trees affording varying amounts of shade, Professor Sager showed that the alkalinity or acidity of the soil is related to light intensity. Where there is much shade, as in thick spruce forests, soils are acid. Where the shade is less, as in larch forests, the topsoils are more alkaline.

GEOGRAPHY as taught in schools should deal with the world as a coherent whole, not as a number of independent fragments, Ernest Young, of the Committee on Education of Middlesex, England, reported to the British Association. Thus, he said, foundations of a sane internationalism can be laid. He urged the importance of giving each region a human interpretation.

VARYING the amount of cobalt added to steel changes its magnetic properties, E. A. Watson, Canadian metallurgist, told the engineering section of the British Association. Use of cobalt in permanent magnets, however, means increased expense. Only in rare instances would the new methods prove profitable.

CANADA has total water power potentialities of more than 18,000,000 horse power, of which 3,227,414 horse power is now developed and 750,000 under construction, J. B. Challies, director of water power of the Dominion Department of the Interior, told the engineering section of the British Association. The greatest part of the undeveloped water power, he said, is directly or indirectly the property of the crown.

THE deep gorge known as Red Deer Valley in Alberta has yielded more dinosaur skeletons than any other region in the world, according to Professor W. A. Parks, of the University of Toronto. At least 130 specimens have been hewn from the hills, the fifteen major specimens including remains of some of the largest animals that ever lived on land and some strange dragons new to science.