CONGRESS AT BRIGHTON.

POPULAR LECTURE

By ALEX HILL, M.A., M.D., F.R.C.S., J.P.

THE BRICKS WITH WHICH THE BODY IS BUILT, OR, MAN UNDER THE MICROSCOPE: A study of his Tissues and Organs.

(Illustrated by Photomicrographs.)

SYNOPSIS OF LECTURE.

THE plants and animals which consist each of a single cell, and are therefore invisible to the unaided eye, are far more numerous than the multicellular organisms which we can see. They abound in the sea, even within the arctic circle; in fresh water, and in the soil. Those which invade the body, as germs of disease, give cause for the varied activities of The Royal Sanitary Institute. Sanitary science is rapidly marking down all such organisms, and the recent history of medicine shows that when their habits are known means for their destruction or control are soon devised.

Every plant and every animal commences existence as a single cell. When in the course of its growth this cell attains a certain size it divides. By repeated division the seed cell is converted into a new individual; but at one of the very earliest, if not at the first, of its sub-divisions material is set aside for the formation of the seed cells of the next generation. By the time that an animal is born all the seed cells which will, under favourable conditions, develop into its progeny, are in readiness. Even the new-born animal is therefore but the guardian of a generation yet unborn. Until this law of the continuity of germ plasm was formulated, many of the facts of heredity were misinterpreted. Since the seed cell is set aside before the parent which bears it has begun, in any individual sense, to exist, the child is the offspring of the race rather than of its mother. A child is never a blend of its parents. In some of its characteristics it resembles its mother, in others it resembles its father. All characteristics which we can recognise as pure, *i.e.*, capable of isolation for purposes of observation, are polarized.

Fifty years ago the Austrian monk, Gregor Mendel, deduced this second law of heredity from the results of his observations upon different

varieties of edible pea. Crossing smooth peas with wrinkled peas, he found that in the next generation all their progeny were smooth. After that some were smooth, others wrinkled, in proportions fixed by simple numerical formulæ. Crossing tall and dwarf peas, he found that all peas of the first generation were borne on tall bines. Smoothness and roughness, tallness and dwarfness, are therefore polarized characters. They never blend, but reappear in either their positive or their negative form. The principles of mendelism are easily confirmed by crossing domesticated animals or florists' plants, because in such animals and plants certain characters have, by breeding, been made to stand out with sufficient conspicuousness for observation. The same statement is equally true of certain peculiarities of human beings, which are so outstanding as to be abnormal, *e.g.*, colour blindness, or the possession of an extra toe. Its application is, however, recognizable in such characters as the colour and texture of hair, the colour of eyes, etc.

Tissues and organs are formed by the repeated sub-division of such of the cells as are not required for the perpetuation of the race. All organs are composed of cells and the work which they do is the work done by each of their cells; whether these are fitted to make gastric juice, to store digested food, to yield muscular force, to transmit nervous impulses or to perform any other function. The liver is the larder of the body. Its cells are loaded, after a meal, with the products of digestion. Blood corpuscles, which last but a short time, owing to the wear and tear to which they are exposed in the circulation, are broken up in the spleen. They are consumed by large mobile cells, termed phagocytes. Phagocytes also destroy any germs which find entrance into the body juices. Even teeth are composed of cells which are alive and dependent for their nutrition upon the blood. Like other organs they decay, if not sufficiently exercised. A section of skin shows in the middle of its thickness a layer of uniform fused cells filled with keratin which constitutes a waterproof investment of the surface of the body. When owing to excessive friction the blood vessels are dilated and fluid is poured in amongst the deeper cells of the skin, the cuticle, from the thin waterproof layer outwards, is raised as a blister. The crystalline lens of the eye is also formed of elongated cells, or fibres, which arch from its back to its front, giving it the elasticity which enables it to change in shape when objects at different distances are looked at. Of all the tissues of the body the term "cell" is least fortunate when applied to nervous tissue. A cell of the brain is a speck of protoplasm drawn out into a number of processes, of which one, very long, is a nerve fibre. A nerve cell is a nodal point in a network through which the stimuli received by sense organs are appropriately distributed to muscles.