GENERAL SCIENCE

Harvard Conference Hears Scientists From Many Fields

How Embryonic Development is Determined, Cause of Hayfever, Nature of Cosmic Rays Are Some of Topics

Rarely is it possible to listen to such an assemblage of notable men of science as recently gathered at Cambridge, Mass. See SNL, Sept. 12, for the first installment of highlights of this conference.

EMBRYOLOGY

Prof. Hans Spemann—Chemical Organizator

CHEMICAL commanders in the bodies of embryo animals, giving orders that are received and obeyed by the developing parts, were described by Prof. Hans Spemann of the University of Freiburg, Nobel prizewinner.

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—Prof. 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 Prof. 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.

Prof. Spemann gave the name "organizator" to the unknown substance or influence emanating from these tiny tissue transplants. He found that there were other critical points of growth, in later development, that possessed organizators of their own, influencing the whole embryo, or limiting their effects to particular regions or organs as they formed. He was able to produce organizator reactions without transplanted tissues, using only extracts from various kinds of animal material or even chemically pure organic compounds. There is competition or interplay between these various regional organizators, and this determines development.

The obedience of the developing animal parts to the organizators' orders is not blind and slavish. The growing organs have something to say on their own behalf. Thus, if a bit of skin is transplanted to where the brain is to form, the skin-tissue will change its nature and form brain-stuff; but it will be the brain of the kind of animal it came from, not of the animal species into which it was planted. Similarly, if the side of a toad embryo head is planted onto the head of a newt embryo, it will grow fast in its new place, but will produce jaws and other head parts of the toad type, not those of a newt. That is to say, whatever command is issued by the inductors of the host, the response is executed by the transplanted tissue in the manner provided by the inheritance of its own species.

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PHYSIOLOGY

Sir Joseph Barcroft—Why We Breathe

TAPPING an embryonic sheep on its snout with a glass rod furnished a group of scientists with an explanation of the rhythm of breathing. The experiments and the way in which they explain the fundamental nature of this breathing rhythm were described by Sir Joseph Barcroft, Cambridge University professor of physiology, at the Harvard Tercentenary celebration.

Scientists have considered three different explanations for the rhythmic in-and-out of air which they call respiration but which is breathing to most of us. According to one explanation, breathing in starts a message to the brain which checks the inhaling phase and starts the exhaling phase of breathing. This exhaling, in turn, sends a message to the brain that checks the exhaling and starts the inhaling phase.

According to another explanation, there is a continual urge in the central nervous system, which includes the brain, to breath in, but the act of inspiring sets up sensory impulses which check the effort. The lung then passively returns to its unexpanded condition, which takes care of the exhaling. According to this explanation, the brain and central nervous system is the essential seat of breathing and does not merely act as a telephone exchange.

Central Nervous System

The third view is that breathing is due to rhythmic activity of the central nervous system. The sheep embryo experiments, undertaken with another purpose, unexpectedly furnished support for this view, Sir Joseph said. Sir Joseph and his associates were seeking the solution to another scientific problem, that of how the first movements of the unborn young of mammals start. Do the ordinary movements of legs and arms and other parts of the body arise from generalized mass movements of the whole body, or do the localized movements develop into generalized motions all over the body? Sir Joseph and associates sought the answer by studying the large and slowly growing embryo of the sheep. They found that the mass movement is built up from localized movements and when built up can be resolved into localized movements which have definite significance and purpose.

A stimulus such as tapping the sheep's snout with a fine glass rod starts a localized movement of the snout and head. Later this stimulus sets up rhythmic movements through the whole body, mass movements which start with the local stimulus to the snout. At a still later stage, these rhythmical mass movements break down and more localized ones appear in response to the stimulus, such as straightening and stretching of tail and limbs. At first these stretching movements are spasmodic, later they become rhythmic. At a still later stage, the lamb fetus is so lively that the rhythmic movements are practically constant and the fetus looks like an ordinary animal breathing naturally. A stimulus at this stage produces more energetic rhythmic movements that give the appearance of an animal out of breath as the result of effort.

The inference is that these rhythmic body movements, which may be elicited by a stimulus to the sensory nerves, show a rhythmic activity of the nervous system which would account for the