GENERAL SCIENCE

Faith Important in Science As Intuition and Reason

Retiring President of American Association Gives The Articles of His Personal Scientific Faith

FAITH is as important in the pursuit of scientific knowledge as intuition and reason, while "today the significance of science as a principal source of revelation is almost universally recognized."

This was the essence of the message of Dean George D. Birkhoff, Harvard's leading mathematician. As retiring president of the American Association for the Advancement of Science, Dean Birkhoff delivered the principal address.

"In the daring effort of the scientist to extend knowledge as far as possible," Dean Birkhoff declared, "there arises an aura of faith. It is this spontaneous faith that furnishes the most powerful incentive and is the best guide to further progress."

By faith Dean Birkhoff explained that he means "those heuristically valuable, more general points of view, which are beyond reason, and sometimes in apparent contradiction with one another, but which to the individual concerned seem of supreme importance as he endeavors to give his conclusions the widest possible scope."

Making a strong plea for an essentially religious attitude toward the problems of science and society, Dean Birkhoff announced the articles of his personal scientific faith:

1. It is desirable to accord reality in equal measure to all kinds of knowledge everywhere, and so to view the universe as broadly and impartially as possible.

2. In order to understand the various facts and their interrelations we must always use abstractions, that is, conceptual tools of a logical or mathematical nature.

3. The transcendent importance of love and goodwill in all human relations is shown by their mighty beneficent effect upon the individual and society.

Anyone is free to agree or disagree with these anticles of faith, Dean Birkhoff emphasized, because they are not verifiable experimentally or strictly demonstrable. In opposition to his belief that the levels of knowledge are to be taken as equally real, he states that there might be set the opposing belief that every fact is ultimately expressible in purely physical terms.

Dean Birkhoff presented to his scientific audience a "mind-nature spectrum," containing five ascending levels, mathematical, physical, biological, psychological and social. Each of these levels has its appropriate special language, Dean Birkhoff explained, and the basic concepts are number at the mathematical level, matter at the physical level, organism at the biological level, mind at the psychological level, and society at the social level.

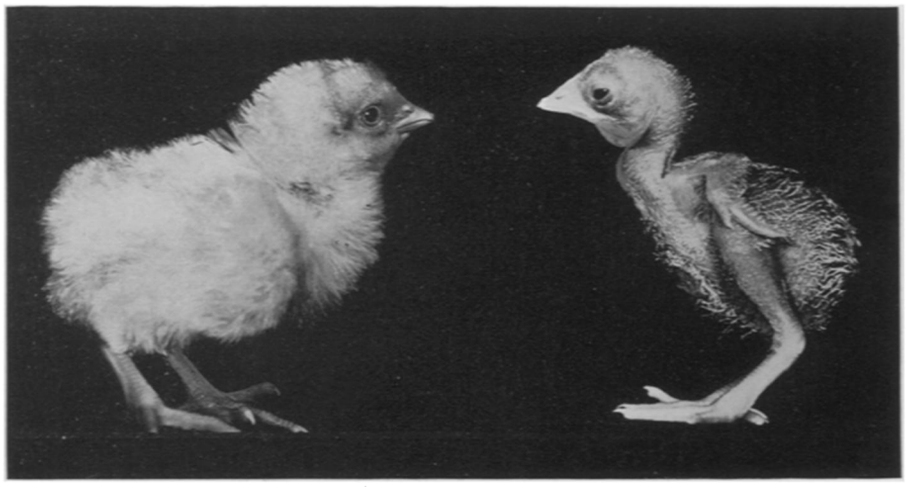
"If we choose to select one of these as somehow more real than the others, a great distortion arises in our point of view," he said. "For instance, if we regard the physical level as the most fundamental, we become materialists. But why make such an unnecessary choice? The languages of the various levels are essentially independent of one another, and the observed laws are best expressed in their own natural terms. Why mix up the levels of knowledge unnaturally? Does it clarify our idea of social justice to try to explain it in terms of the reactions between protons and electrons in the brain?"

As an example of the intimate relationship between philosophical-scientific viewpoints and actual advances in theoretical physics, Dean Birkhoff cited Einstein's gravitational theory of 1915.

He explained that Einstein took as his starting point the reasonable hypotheses that matter must condition space and time, and that, in parts of space remote from matter, elementary particles move with uniform velocity in a straight line. Einstein arrived at his field equations as the most elegant mathematical embodiment of these ideas. Thus there was obtained a quasi-geometrical theory of gravitation which in certain respects is more natural than the celebrated theory of Newton, while the predicted differences although excessively minute are in favor of the new theory. But Dean Birkhoff believes that Einstein's theory cannot be regarded as true in any absolute sense since it gives us at best a partial, highly idealized view of the physical universe.

The origin of life may be explained by the fact that chemical experiments upon large organic molecules such as are present in disease viruses, seem to indicate "an innate hospitality of actual matter toward the evolution of the living organism," Dean Birkhoff explained. But this, he explained, "can scarcely be called mechanistic." But he does believe it seems possible that we are on the verge of further refinements in our concept of matter.

A plea for further unification of the



NAKED CHICKENS

Oddly undressed chicks like the one at the left have appeared in a flock studied by Drs. F. B. Hutt and P. D. Sturkie of Cornell University and reported on in the Journal of Heredity. During adolescence they become even nakeder. Only at maturity do they grow a few feathers.