PHYSICS

Gravity and Electricity Are Merged in New Mathematics

Countryman of Einstein Uses New and Curious Geometry To Bring Together Diverse Fields of Physics

UNIFICATION of the laws of electricity and magnetism with those of the gravitational field, a problem upon which Prof. Albert Einstein and other mathematical physicists have been working, was given a possible solution by Prof. Cornelius Lanczos, visiting professor of Purdue University, who made his announcement before the American Mathematical Society meeting in Columbus, Ohio, last week.

This new "field-theory" promises to arouse great interest in science circles because of the recognized need of linking Einstein's theories of relativity with magnetism and electricity. Previous attempts, even those announced by Einstein some two years ago, have not been considered wholly successful.

Prof. Lanczos, who as professor at the University of Frankfurt, Germany, is a countryman of Prof. Einstein's, derived from the same principle two different functions, one of which leads to gravitation and the other to electromagnetism. Thus it appears that he has brought together the two diverse fields of physics that have heretofore developed so fruitfully along parallel lines.

The fascinating feature of Einstein's general theory of relativity, Prof. Lanczos said, was that it gave a satisfactory explanation of gravitation on purely geometrical grounds. For this purpose, a new and curious kind of geometry, called Riemann's geometry, had to be introduced into physics in place of the long-familiar Euclid's geometry.

Prof. Lanczos has made a further extension of the Riemannian geometry to physics. He makes the supposition that the "principle of least action," which has a very wide application in physical science, also exists in the Riemann space.

Two formulae result from this operation. One of these leads to the laws of gravitation, Prof. Lanczos said. The other gives the new and consistent explanation of the laws of electricity and magnetism.

Thus a new theoretical basis for physics has been set up which welds several diverse fields into a whole.

Previous attempts to generalize Einstein's point of view with respect to electromagnetism have met with great difficulties, according to Prof. Lanczos.

"At present, however," he stated, "no evidence has appeared which would tend to show a probable connection between this field theory and modern quantum theory."

Science News Letter, December 5, 1931

PHYSICS

Electromagnetism Explained By Riemannian Geometry

By PROF. CORNELIUS LANCZOS of Frankfurt University and Purdue University

> EDITOR'S NOTE: Prof. Lanczos explains that this problem can be really understood only by mathematical explanations. This review emphasizes the most essential features without becoming merely superficial. For people deeply interested in this matter, this summary can give a certain idea.

THE FASCINATING feature in Einstein's theory of general relativity is that some very general and logically satisfying points of view give a complete explanation of the physical phenomena of gravitation. The fundamental idea giving the key to the solution of the problem of gravitation was the introduction of a new kind of geometry called Riemannian geometry into physics in place of the Euclidian geometry. This geometry is governed by field-equations and corresponds in this way to the general feature of physics which is built up in its different branches upon field-equations. It was expected from the very beginning that electromagnetism must also have a place in this structure. It would be very clarifying if we could understand the peculiar character of "aether" to be an agency without any substance, if it should turn out that the laws of the aether are *geometrical* laws. Because even the absolutely empty space must be connected with a geometrical structure.

However, to generalize Einstein's point of view with respect to electromagnetism seemed to be connected with great difficulties. The fundamental quantity of the electromagnetic field, the field-intensity, shows a kind of symmetry which is not in accordance with the symmetry of Riemann's geometry. For this reason several attempts were undertaken to leave the Riemannian basis of geometry in order to construct a geometry upon a still more general basis. However, all these geometries do not possess the great inner consequence and logical necessity of Riemann's geometry. A really satisfactory solution by this means has never been found.

It seems that there also exists another way to find a solution of this problem. We can prove generally that Riemann's geometry is necessarily connected with a quantity which has a fundamental role in the theory of the electromagnetic field. It is not the electromagnetic field-strength but a quantity from which this can be deduced. This quantity appears
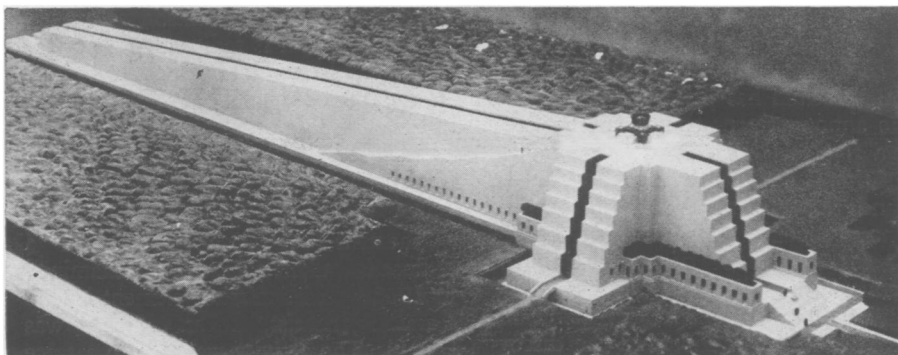
MEMORIAL TO COLUMBUS

Prize-winning design of a lighthouse and air beacon for the island Santo Domingo, the first land formally occupied by Columbus in the New World. It is the work of J. L. Gleave, of Nottingham, England, and because of its simple lines and stability against earthquakes won the $10,000 first prize in the international competition of the Pan-American Union. The memorial, together with a park and an airport, is expected to cost about $4,000,000.