PHYSICS

Nature Not Game of Chance Prof. Einstein Contends

Says He Is Unwilling to Abandon Idea of Direct Representation of Physical Reality in Space and Time

PROF. Albert Einstein, famous for his revolutionary theory of relativity, affirmed his disbelief that "events in nature are analogous to a game of chance," despite the success of the quantum theory of physics that substitutes for all previous theories of the physical world the idea that it is not possible definitely to place events in time and space.

Speaking before the Eighth American Scientific Congress in Washington, Prof. Einstein admitted that science does not have any general theoretical basis for physics which can be regarded as its logical foundation. His attempt and the attempts of others, upon which years have been spent, to develop a field theory formulation that would embrace both the immense universe and the world within the atom, have failed.

"It is agreed on all hands that the only principle which could serve as the basis of quantum theory would be one that constituted a translation of the field theory into the scheme of quantum statistics," Prof. Einstein said. "Whether this will actually come about in a satisfactory manner, nobody can venture to say."

Science has greater security in its experimental contacts than in its logical foundations, he indicated.

"The word foundations," he explained, "in this connection does not mean something analogue in all respects to the foundations of a building. Logically considered, of course, the various single laws of physics rest upon this foundation.

"But whereas a building may be seriously damaged by a heavy storm or a spring flood, yet its foundations remain intact, in science the logical foundation is always in greater peril from new experiences or new knowledge than are the branch disciplines with their closer experimental contacts. In the connection of the foundation with all the single parts lie its great significance, but likewise its greatest danger in the face of any new factor. When we realize this, we are led to wonder why the so-called revolutionary epochs of the science of physics have not more often and more completely changed the foundation than has actually been the case."

The ability to predict just where something will be at some definite future time was called in question by the evolution of theoretical physics to which Prof. Einstein contributed so largely. Prof. Werner Heisenberg, German physicist, has convincingly shown, Prof. Einstein admitted, that "any deterministic structure of the nature is definitely ruled out, because of the atomistic structure of our experimental apparatus."

Yet Prof. Einstein is unwilling to believe that "we must abandon, actually and forever, the idea of direct representation of physical reality in space and time."

He promised to continue to strive for more knowledge which will allow science to predict the future as pre-Einsteinian theories of the physical world seemed to make possible.

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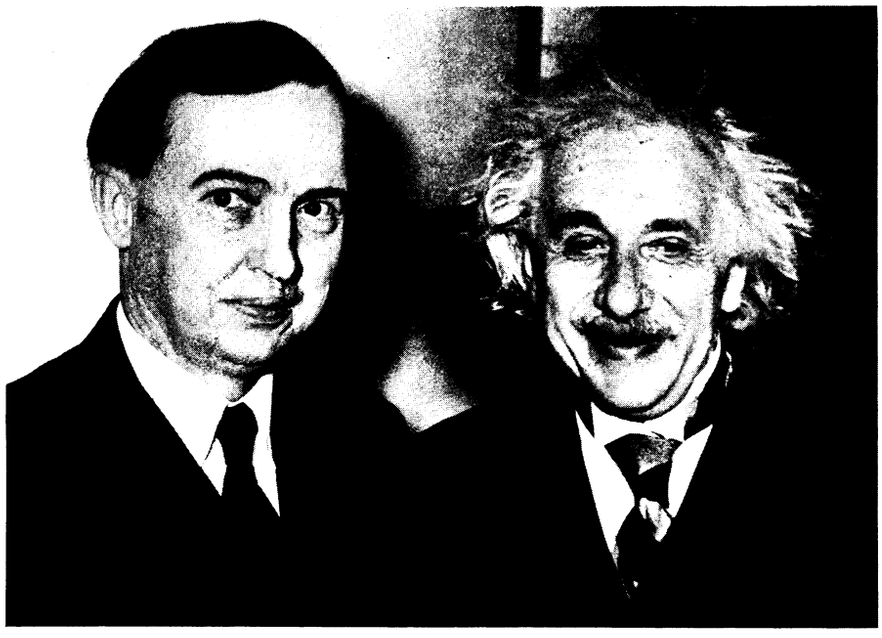

AT THE SCIENTIFIC CONGRESS

The Eighth American Scientific Congress heard special addresses by Professor Albert Einstein (right), of the Institute of Advanced Study, Princeton, and Dr. Harlow Shapley, director of Harvard Observatory and vice-president of Science Service.

PSYCHOLOGY

Parachute Troops May Be Psychological Weapon

PARACHUTE troops, if they are being dropped in disguise by the Germans behind their enemies' lines, may prove of much more value in the psychological "war of nerves" than for any possible direct military advantage.

If a single Nazi fighter, dropped suddenly in Dutch uniform or civilian clothes on the Dutch countryside, can arouse suspicions among the Dutch—can make them look with fear on every stranger and distrust their own defenders—the single parachute soldier can do more harm than can tons of propaganda leaflets, or hours of radio haranguing.

Psychologists who have studied the ef-

● Blighting Shadow

From the address of Secretary of State Cordell Hull on the first plenary session of the Eighth American Scientific Congress at the Pan American Union, May 13.

"We deeply deplore the fact that a blighting shadow of cultural eclipse has temporarily fallen on so many countries in other parts of the world. We are supremely fortunate that in this Hemisphere thought is still free, and science is still untrammeled. It is for us to see to it that they remain so—for our own sakes and for the sake of all humanity."

fects of propaganda on the minds of warring peoples have learned that actions speak much louder than words.

No whispering campaign could possibly have the power for setting up dissension, suspicion and fear that is stirred by the conviction that even one or two of the enemy have dropped from the sky in unknown locations.

If the Germans are able to divert even a small part of the energies of the British, French, Dutch and Belgians into a campaign of hate against the foreign-born or "suspicious characters" and make Dutch shoot Dutch, French shoot French, and English shoot English, then the parachute troops provide Hitler with an extremely potent new weapon in his war of nerves.

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ASTRONOMY

New Methods Will Change Accepted Distances in Space

Improvements in the Yardstick of the Universe May Change Estimates as Much as Thirty Per Cent

ASTRONOMY is improving its yardstick of the universe in order to make it a more accurate measure of vast astronomical distances The improvement may alter some accepted astronomical measurements by as much as 30%.

This was the news reported to the Eighth American Scientific Congress by Dr. Harlow Shapley, director of Harvard College Observatory, the man who first succeeded in providing astronomy with this valuable measuring technique.

Essentially the method depends on the so-called "period-luminosity relationship" of Cepheid variable stars, a certain type of star which fluctuates in brightness and derives its name from the constellation in which this type was first found.

The relationship, first found during a study of the Small Magellanic Cloud, by Miss Henrietta Leavitt of the Harvard Observatory in 1912, is simple—the period in which a Cepheid variable dims and brightens is related directly to its intrinsic brightness. Dr. Shapley later found this was true of all Cepheid variables. Thus by studying the period of such a star, astronomers can learn its absolute brightness and by comparing this with its apparent brightness, they can measure its distance. The yardstick has been of tremendous value for once an astronomer has found a Cepheid variable in a far-off galaxy, he can learn its distance and thus that of the entire galaxy.

There are various factors which affect the apparent brightness of a star as observed from this earth, however, which, if not allowed for, render measurements inaccurate. Dr. Shapley has just finished a survey of some 300 Cepheid variables in the Small Magellanic Cloud to learn what these factors are and how to allow for them. One of the important factors, he found, is that the light of a star is absorbed as it travels through this cloud to earth and thus may appear as much as half a magnitude less bright than it actually is. This was the first study of absorption ever made in an outside universe, although astronomers have made many studies of absorption in our own Milky Way. On an average, Dr. Shapley found, a star's light loses about a quarter of a magnitude in the cloud, but, of course, each star must be measured individually.

The thickness of a galaxy also affects a star's light (depending on whether it is on the near or far side) and a phenomenon known as "doubling," resulting from two stars in the same line of sight, also affects these observations.

Dr. Shapley estimated that because of this absorption and remaining uncertainties in the period-luminosity relation for the longest period Cepheids, the distances of some galaxies may be incorrect by as much as 30%. Relative distances will not be altered appreciably, however; nor do these studies require any major change in the accepted distances of the Magellanic clouds.

Dr. Shapley also called attention to the need for more study of the relations between period and luminosity for Cepheids of very short or very long periods, as well as the need for more dependable magnitude standards in the southern sky where many important studies of external galaxies are being made. Today's accepted magnitude standards have been established in the northern sky and comparisons of these southern stars involve the risk of a certain amount of error.

Dr. Shapley's discussion of this topic was most appropriate for the American Scientific Congress for the plates from which they were made were taken by Harvard in Peru. He also showed exceptionally fine photographs of a solar eclipse taken in Peru in 1936.

Science News Letter, May 25, 1940

CHEMISTRY—MILITARY SCIENCE

"Sleeping Gas" (If Used) May Be Methyl Bromide

THE "sleeping gas" used by the Germans in capturing a fortress in Belgium—if they used such a gas—may very well be methyl bromide, a heavy liquid that produces anesthesia, paralysis and even death if it can be distributed in air in sufficient concentration.

This is the suggestion of Dr. Theodore Koppanyi, professor of pharmacology at Georgetown Medical School. Methyl bromide is a material available in millions of pounds quantities in any industrial country since it is widely used in chemical manufacture.

Distributed in a closed fortress or air raid shelter by a shell explosion or some other means, it is believed that a concentration of the chemical could be built up in the air that would be effective in putting soldiers to sleep. If enough were introduced it might kill them.

Instead of the methyl bromide, the Germans may be using some related compounds, such as acetyl bromide, propyl bromide, or other higher esters. All are heavy liquids.

The anesthetic properties of the bromides have been known since about the 1880s. Once they were used in medical anesthetic mixtures, but they have been largely replaced by better and more efficient chemicals in operating rooms.

The idea that acetylcholine could be used as the Germans are supposed to have used the sleeping gas is declared to be impossible. This chemical found in the human body is not only a relatively rare one but it is a crystalline solid. Scientists do not see how it could be put into a fortress or used otherwise effectively even if it were available.

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Among the fruits which Comanche Indians dried in the sun and stored were *persimmons,* wild grapes, wild plums, and fruit of the prickly pear cactus.

Cod-liver oil for medicinal purposes must be rendered from fresh cod livers immediately after the fish are caught, whereas technical grades can be produced with less trouble and more cheaply.