

## PHYSICS

# Stars and Atoms Linked

**"Geon" suggested as a new approach to problem of unifying gravitational and electromagnetic phenomena, a goal of Einstein's unified field theory.**

► A NEW body, the "geon," that ties together the familiar effects of gravitation and electromagnetism is the mathematical discovery of Dr. John A. Wheeler, professor of physics at Princeton University.

The geon is an attempt to unify in one concept the infinitesimal whirling world of the atom and the vast reaches of star-filled space.

Geons are "strange animals," Dr. Wheeler said. They cannot be seen nor touched. Although geons come in many sizes, only the very large ones have properties that are really well understood at present.

The name geon, he explained, is an abbreviation of the phrase, gravitational-electromagnetic entity. Large geons can be considered as lots of light in a ball held together by its own gravitational attraction, much as the earth, a ball of matter, is held together by gravity.

Dr. Wheeler bases his concept of the geon on the many parts of physics that are now well understood, such as the motions of planets, electromagnetic theory and Einstein's 50-year-old, "battle-tested" relativity theory.

His approach to the problem of unifying electromagnetic and gravitational phenomena is different from that tried by Prof. Albert Einstein. Development of a unified theory has been a major goal of physicists since about 1920.

Einstein attacks the synthesis in a purely mathematical model. Dr. Wheeler starts with what is now known and, based on this information, arrives at the properties of geons.

He used the University's electronic "brain" to help him in his calculations of their properties.

The simplest form of a geon, if drawn graphically, would look like a doughnut with a larger than usual hole. The doughnut itself would not be a continuous ring, but would consist of slices, in the ring shape but separated by gaps. This would picture the regions of strong electric field strength of the geon.

The radius of large geons is far larger than any known star. This stretches out the entity so thin that there is no known physical set-up to correspond to it.

Light from far-away stars passing close to the sun is bent by the solar gravitational field, showing the light responds to gravity's pull. The huge quantity of light in a ball that is a large geon would be held together by its own gravitational attraction, Dr. Wheeler found in his mathematical investigation of its properties.

He also discovered that geons have a

"free parameter," that is, they can vary in size or in radius for a given mass.

Since light interacts with light, as geons wander around within the closed ball, some of them would eventually scatter out. Thus they are not completely stable and unchanging, but their life-times would be long enough to have lasted for the age of the universe, now thought to be about five billion years.

Dr. Wheeler would like to investigate the properties of geons in smaller regions, such as the whirling mist that is an atom, to find out what quantum effects would enter. A quantum is a discrete packet, or unit, of energy representing the smallest indivisible quantity. All forms of radiant energy are emitted in quanta, the sizes of each such unit being proportional to the frequency of the radiation. Energy can vary only in multiples of the elementary quantum.

Quanta put restraint on the possible

masses geons can have. Dr. Wheeler estimates that the lower limit of a geon is about the mass of the sun itself.

Upper limit to geon size is "the linear extension of the universe itself," Dr. Wheeler stated in the *Physical Review* (Jan. 15), the journal for physicists in which he explained his theory.

For geons of small mass, quantum effects have to be taken into account. As the masses of geons become smaller, first one effect, previously unimportant, will become decisive, then another effect and so on, on down the mass scale.

Dr. Wheeler's theory is in line with the main current of modern thought about physics. That is, it is a particle theory rather than the field theory favored by Einstein.

There are only three mechanisms now known, Dr. Wheeler said, for the propagation of energy at the speed of light that do not have a characteristic mass associated with them. These are gravitation, electromagnetism and the neutrino. The concept of the geon is based on what scientists have learned about these three fields of force.

His ultimate aim, Dr. Wheeler said, is to get a predictable picture of the elementary particles that are now so puzzling to physicists.

Science News Letter, April 9, 1955

## MEDICINE

## Foresees New Health Group When TB Licked

► TUBERCULOSIS WIPED out "in the immediate future" and a new kind of local health agency supported by sale of Christmas seals are foreseen by Dr. Louis I. Dublin, statistician and consultant on health and welfare to the Institute of Life Insurance, New York.

What is left of tuberculosis can be wiped out in the immediate future through "the utilization of every ounce of skill and energy," Dr. Dublin declared at the meeting of the Onondaga Health Association in Syracuse.

He urged the National Tuberculosis Association and its thousands of affiliated societies to work vigorously to this end and then to approve the use of Christmas seals for "an ever-widening range of health activities."

"It would be nothing short of tragic if the Christmas seal withered as a source of funds along with the elimination of tuberculosis as a public health problem," he said.

"The local health agency I conjure up will have a number of divisions, each concerned with the principal conditions that call for preventive service under the direction of a highly competent and well-trained public health man. He will work directly with the local health officer and the local medical society, sharing in planning and acting as the interpreter to the people of the united effort to raise the level of health in the community.

Science News Letter, April 9, 1955



**CHEMICAL WARFARE TEST—**  
*Approximately 20 soldier volunteers each month from the Second Army area will help test new Chemical Corps equipment and techniques for protection against chemical warfare. Soldier is shown on treadmill device to test effectiveness of gear under battle conditions. The experiments will be conducted at the Army Chemical Center, Edgewood, Md.*