

ASTROPHYSICS

# Universe Not Running Down, Is Latest Hope of Science

Dr. Millikan's Retiring Presidential Address Before A. A. A. S. Traces Origin and Destiny of Physical Elements

**H**OPE THAT the universe is not running down and will not ultimately have the fate of a "heat death," with extinction of all its activity, was offered science by Dr. Robert A. Millikan, chairman of the Executive Council, California Institute of Technology and Nobel Prize Physicist, who delivered the principal address of the American Association for the Advancement of Science at Cleveland, as its retiring president.

After presenting his experimental evidence that the penetrating cosmic radiations are the signals coming to earth telling of the formation out of hydrogen of helium, oxygen, silicon, iron and other common elements in the intensely cold regions in the depths of interstellar space, Dr. Millikan suggested that "It may be that hydrogen is somehow being replenished there too from the only form of energy that we know to be all the time leaking out from the stars to interstellar space, namely, radiant energy."

This formation of the fundamental building block of all matter, the hydrogen atom, out of light and heat, is not a new idea. It has been advanced speculatively in the past, as Dr. Millikan said, "To allow the Creator to be continually on His job."

But recent advances in physics and astronomy, particularly investigations of the cosmic rays, offer a little more experimental hope that it is so. Dr. Millikan was careful to say, however, "It is not at all proved nor even perhaps necessarily suggested."

Referring to the contentions of Sir James Jeans, British astronomer, that the universe is dying, Dr. Millikan said further: "If Sir James Jeans prefers to hold one view and I another on this question no one can say us nay. The one thing of which you may all be quite sure is that neither of us knows anything about it. But for the continuous building up of the common elements out of hydrogen in the depths of interstellar space the cosmic rays furnish excellent experimental evidence."

The formation of hydrogen out of heat radiation is the "missing link" that must be demonstrated in order that the whole great universe will not in a distant future run down like a spent battery. That is why the idea is so interesting to scientists.

Dr. Millikan traced ten discoveries or developments made within the past hundred years which bear upon the question of the origin and destiny of the physical elements.

1. The discovery of the equivalence of heat and work and the consequent formulation of the principle of the conservation of energy.

2. The second law of thermodynamics, which is interpreted by some as necessitating the ultimate "heat death" of the universe, classically and simply stated in the Humpty-Dumpty rhyme. This led to the mediaeval theological suggestion of a deus ex machina to initially wind up or start off this running-down universe.

3. The discovery of the facts of evolution which showed that in the biological field at least the upbuilding from lower to high forms has been continuously going on for millions upon millions of years and is presumably going on now.

4. The discovery that the dogma of the immutable elements was definitely wrong. This came with the isolation of radium and other radioactive elements.

5. The discovery of the enormous lifetimes of the sun and stars, thousands and a half years, and the still greater lifetime of the sun and stars, thousands of times longer than the periods through which they could possibly exist as suns if they were simply hot bodies cooling off.

6. Development of evidence for the interconvertibility of mass and energy which suggested that the mass of the sun might be converted into radiant heat.

7. The discovery that all elements are built up out of hydrogen. This postponed the heat death of the universe at

least until all the hydrogen in the universe had been converted into the heavier elements.

8. Astronomers chafing under the time limitation thus imposed suggested that complete annihilation of positive and negative electrons within the atomic nucleus can take place, again extending the possible time span of this universe, this time a hundred fold.

9. Measurements by Dr. F. W. Aston, English physicist, on relative masses of atoms which supported Einstein's formula for the relation between mass and energy, showed atom building out of hydrogen and helium to be one of the two possible sources of energy other than the sun and the intensity of radiations that would be produced by atom building out of hydrogen and helium.

10. Discovery of the cosmic radiations which are evidences of the continuous building of the heavier elements out of hydrogen.

*Science News Letter, January 3, 1931*

A gateway has been erected at the site of Sir Walter Raleigh's colony in North Carolina in memory of Virginia Dare, first white child born in America.

A battleship takes on its food supplies, to the extent of about 100 tons, once a month.

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## FIRST REPORTS

From major scientific gatherings held this week in four cities are presented in this issue of the *Science News Letter*. Additional articles will be published in the issue of January 10.

### The Meetings Covered Are:

#### Cleveland—

American Association for the Advancement of Science and 50 associated organizations—throughout the magazine

#### Toronto—

Paleontological Society—pages 8, 13

#### Iowa City—

American Psychological Association and Archaeological Institute of America—pages 9, 10, 14

#### Cambridge—

Society of American Bacteriologists—pages 6, 10, 14

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