



ASTRONOMY

## Near Solution of Mystery Of Sun, Nebulae Elements

Nebulium Seems To Be Merely Ordinary Oxygen Disguised And Coronium May Also Be Oxygen But This Is Not Sure

AFTER years of study, astronomers seem now close to solving the problem of the identity of nebulium and coronium, "mystery elements" found in the distant nebulae and in the sun's corona, which is visible best at eclipse time.

According to a paper by a British astronomer, Clifford G. James, in the annual report of the Smithsonian Institution, just issued, the former seems to be merely ordinary oxygen in disguise. The latter may be oxygen also, though this is not yet certain.

Each of the 92 known chemical ele-

ments, when its vapor is made to glow, gives off a characteristic kind of light. This can be identified by the lines which appear when this light is analyzed through the prisms of a spectroscope. Thus it is possible to tell the elements that exist in the distant stars and the sun.

In 1868, Sir Norman Lockyer found a line in the light of the sun which could not be identified with any earthly element, so he called it helium. Later it was found on earth, as a light gas.

Four years before Lockyer's discovery, another English astronomer, Sir William Huggins, had found a strange green line in light from the distant nebulae in the sky. This was ascribed to a hypothetical element called "nebulium." Similarly when in 1869 Charles A. Young, then of Dartmouth College, found a mysterious line, also green, in the sun's corona, this was credited to another element, "coronium."

"In many cases," says Mr. James, "speculation overrode sound scientific method and it was suggested by good authorities that this celestial radiance might be due to primeval world stuff, the cosmic protoplasmic fluid from which the world had been manufactured in the

beginning. As new elements were discovered their spectra lines were matched with those of nebulium, but to no purpose. None were found to coincide. It gradually came to be accepted that the hypothetical nebulium was some familiar gas clothed in an unfamiliar fashion."

Explanation of nebulium came when Dr. I. S. Bowen, of the California Institute of Technology, showed that it is probably merely oxygen atoms excited to an abnormal state. The enormous energy required for this excitation seems to come from very hot stars, at temperatures up to 200,000 degrees Fahrenheit, associated with the nebulae. Under these conditions shifts of electrons in the oxygen atoms, which are "forbidden" on earth, can occur and these shifts give out the strange kind of light.

There is still some uncertainty about coronium, says Mr. James, but, "it is possible that it may be diffuse oxygen in an unfamiliar ionized state."

*Science News Letter, November 16, 1940*

MILITARY SCIENCE

## Shot May Supplant Shell As Anti-Tank Missiles

SOLID shot may supplant explosive shell as missiles for anti-tank cannon, Brig. Gen. R. H. Somers, of the Ordnance Department, U. S. A., told the Army Ordnance Association meeting in New York. Experimental firings have indicated that if the tough armor of a tank can be penetrated there is no real need for an explosion inside.

Anything that breaks through is practically certain to hit something vital within, because engine, transmission, fuel supply, ammunition, guns and crew are packed so closely together that a miss is virtually impossible. Solid shot has the advantage of being better able to smash through the increasingly thick armor of a tank; besides, it is considerably cheaper and can be made in less time.

While the Army's new 37-millimeter anti-tank gun was designed specifically for the job of combating tanks, any gun within shooting distance will be turned on the clanking monsters when they appear on the battlefield, Gen. Somers continued. The Army's modernized 75, with its split trail permitting wide and rapid traverse, is well adapted for anti-tank work, especially against "super-heavies" of the type that enabled the Germans to break the French front so quickly last summer.

Gen. Somers also spoke on new types of anti-aircraft cannon, especially the new

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