Medicine

First prizes (200,000 roubles each) to:

Alexei Abrikosok and Nikolai Anichkov, members of the Academy of Sciences of the U.S.S.R., for their studies on "Pathological Anatomy: Heart and Vessels".

Sergei Spasdkukopsk, of the Second Moscow Institute of Medicine, for well-known work in surgery and for the study "Actinomycosis of the Lungs".

Second prizes (100,000 roubles each) to:

Kolay Petrov, corresponding member of the Academy of Sciences of the U.S.S.R., for studies in oncology and the surgery of ulcers of the stomach and duodenum.

Sergeii Udin, chief surgeon of Sklifassovsky Institute, for his works "Notes on Field Surgery and Artificial Œsophagus", "Notes on Field Surgery", "Treatment of War Wounds with Sulphamide Preparations" and "Some Impressions and Reflections about Eighty Cases of Artificial Œsophagus".

Military Science

First prize (200,000 roubles) to:

Ivan Grave, of the Dzerzhinsky Artillery Academy, for the study "Ballistics of a Semiclosed Space".

Second prizes (100,000 roubles each) to:

Evgenii Barsukov, for the historical study "Russian Artillery in the World War".

Mikhail Dubinin, of the Voroshilov Academy of Chemical Defence of the Red Army, for studies in chemical defence.

History and Philosophy

First prize (200,000 roubles) to:

Vladimir Potemkin, Evgenii Tarle, member of the Academy of Sciences of the U.S.S.R., Vladimir Khvostov, jointly with a number of others for a work entitled "The History of Diplomacy".

Second prize (100,000 roubles) to:

Sergei Rubinstein, of Herzen Pedagodical Institute in Leningrad, for his book entitled "Foundations of General Psychology".

COSMICAL ORIGINS OF THE ELEMENTS

PROF. SUBRAHMANYAN CHANDRASEKHAR, assistant professor of theoretical astrophysics at the University of Chicago, described some results of his investigations of the origin and distribution of the chemical elements of the universe in a paper read during the fiftieth anniversary celebrations of the University of Chicago.

The formation of the lighter elements, including hydrogen and helium, can be accounted for at densities and temperatures not markedly greater than those found at present in the universe, but to account for the formation of heavier elements, such as oxygen, fluorine, neon, sodium, magnesium, aluminium, silicon, phosphorus, sulphur, chlorine, argon, potassium and their isotopes, in their present relative abundance, more extreme conditions are necessary. For the formation of the quantities of these elements in anything like their present relative proportions, the density of a 'pre-stellar' universe of one thousand to one hundred thousand grams per cubic centimetre and temperatures of $6-8 \times 10^9$ degrees seem to be required.

Under such conditions, however, the very heavy elements, like gold and lead, occur only in very small amounts; it thus appears that the pre-stellar stage must have originated at extreme densities and temperatures when the heaviest elements were formed. As the matter cooled to lower densities, the present relative abundances of the moderately heavy elements like silicon and sulphur resulted under conditions of a few thousand million degrees and densities ranging from one thousand to ten thousand grams per cubic centimetre. Finally, the elements lighter than oxygen were formed at a still later stage, when conditions were not very different from those now existing in stellar interiors.

In discussing the formation of energy in giant stars, Prof. Chandrasekhar stated that whereas the Bethe theory successfully accounts for energy production in the sun and similar stars, it fails to explain energy production in the giants. His own calculations show that the production of energy by the lighter elements, including lithium, beryllium and boron, will take place in a spherical shell rather than close to the centre—burning, so to speak, from the centre outward. The energy-generating spherical shell cannot get very far from the centre, leaving only the inner 35 per cent of the star's mass to provide energy; this, he believes, accounts for the presence of the light elements in the atmospheres of the giants.

The theory that supernovæ constitute an intermediate stage in which extremely heavy stars cast off much of their mass in their 'attempt to settle down as white dwarf stars' was put forward by Prof. Chandrasekhar. He pointed to the analysis by Dr. Minkowski, of the Mt. Wilson observatory, of the central star of the Crab nebula, which was identified as the result of a supernova in our galaxy, which 'blew up' in A.D. 1054. His analysis of Dr. Minkowski's results showed that this nuclear star is half-way between the supernova and the white dwarf stage; thus, it will be a white dwarf by approximately the year 2828.

According to the theory of white dwarfs developed by Prof. Chandrasekhar, the upper limit to the masses of white dwarfs is about twice the mass of the sun. Thus, he said, a massive star may undergo great contraction, bringing about the explosion characterizing the supernova.

RECENT RESEARCH IN OCEANOGRAPHY*

By DR. G. E. R. DEACON

THE papers in the most recent number of the *Journal of Marine Research* of the Bingham Oceanographic Laboratory, Yale University, for 1941 cover a wide field.

R. B. Montgomery has used four series of observations across the Straits of Florida near Habana to compare the calculated difference of sea-level between the two sides of the Gulf Stream with the figure given by the tide-gauge readings at Key West. The agreement was poor, and among the main sources of error new emphasis is given to the distortion of the picture of the density distribution which is inevitable owing to the change of tide as

* Sears Foundation for Marine Research. Bingham Oceanographic Laboratory, Yale University. *Journal of Marine Research*, 4, No. 3 (1941).