way from the mid-point (as measured from the nucleus). If we take the radius vector at the mid-point to be unity then the radius at the end of the arc is 1.138. The angular velocity of the electron at the mid-point of the path is such that if it continued with this velocity it would travel through 105° 23′ during the time that it actually takes to move to the end of its orbit (*i. e.*, through 77° 58′).

By imposing the quantum condition that the angular momentum of each electron at the mid-point of its path shall be $h/2\pi$, it becomes possible to calculate the radius vector and the velocity in absolute units. The radius vector for the electron at its mid-point is 0.2534×10^{-8} cm. which is 0.8359 of the radius of the orbit of Bohr's model (0.3031×10^{-8} cm.). Even at the end of the orbit the radius (0.2882×10^{-8} cm.) is less than that of the Bohr model. The angular velocity at the mid-point is 1.431 times that of electrons of the Bohr atom. The number of complete oscillations per second is 24.63×10^{15}, which is 1.222 times as great as the number of revolutions in the Bohr atom (20.16×10^{15} per second). The total energy (kinetic plus potential) of the oscillating atom is 0.9615 of that of the Bohr atom. The ionizing potential of helium according to the new model should be 25.59 volts which agrees with Franck and Knipping's experimental determination within the limits of error given by them, but differs from the 28.8 volts given by Bohr's theory by nearly ten times the experimental error.

The oscillating model is thus not only satisfactory from a chemical point of view but is in quantitative agreement with the properties of helium. The fact that there can be no corresponding structure with three electrons is in accord with the fact that lithium (which has three electrons) is an element having totally different properties from helium.

The calculation for the hydrogen molecule involves greater difficulties. Bohr's model with the two electrons moving in a single circular orbit gives a heat of dissociation of about 63,000 calories, whereas experiment gives about 90,000. The calculations for helium have shown that the radius of the oscillating atom is considerably smaller than that of the Bohr atom, so that the force of attraction between the electrons and the nucleus is much (20 per cent. or more) greater. In the hydrogen molecule this increased force may result in drawing the two nuclei closer together thus increasing the stability of the molecule. Calculations of the orbits of the electrons in the hydrogen molecule are in progress.

The final results with a description of the methods of calculation will be published probably in the *Physical Review* and the *Journal of the American Chemical Society.*

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GENERAL ELECTRIC COMPANY,
SCHENECTADY, N. Y.,
June 5, 1920

ALFRED WERNER[1]

ALFRED WERNER, professor of chemistry in the University of Zurich, died on November 15, 1919, at Zurich, Switzerland.

Professor Werner was elected an honorary member of the American Chemical Society at the general meeting held in New Orleans, La., April 1, 1915. It is now desired to leave upon the permanent records of this society a tribute to his genius and indomitable energy, and to the wealth of the contributions which he made to our science.

Born at Mulhausen in Alsace on December 12, 1866, he was educated at the technical schools of Mulhausen, Karlsruhe, and Zurich. Later he studied with Berthelot at Paris.

His first published work of note was upon the stereoisomerism of organic compounds containing nitrogen. Applying these theories to the unclassified mass of complex inorganic ammonia compounds, he realized the inadequacy of accepted ideas of valence to explain their constitution. Largely from a study of isomers among these complexes, whose consti-

[1] Tribute prepared by a committee of the American Chemical Society consisting of C. H. Herty, H. L. Wells and Arthur B. Lamb.

tution could be explained only on a basis of stereoisomerism, he developed an extension of the valence hypothesis and introduced the concept "coordination number" of elements.

This conception was the stimulating cause of a great mass of researches which embodied the discovery of many new compounds, many new examples of isomerism, brought rational classification into the whole field of complex inorganic compounds and led by logical development of theoretical views to the discovery of optically active inorganic compounds. None realized more clearly than he that in his extension of the valence hypothesis he had not reached any ultimate truth but had merely added one definite stepping stone.

To the little laboratory in Zurich, with its all too limited equipment, he attracted students from every part of the world. Eventually adequate funds were placed at his disposal, with which was constructed one of the model laboratories of Europe. His fear at the time was that he might not be able to carry into the commodious new quarters the spirit which had permeated the old laboratory. This fear was groundless, as the character of the researches from the new laboratory abundantly proved.

In 1912 Professor Werner was LeBlanc Medallist of the Société Chemique de France. In 1915 he was elected an honorary member of the Chemical Society (London) and in the same year was awarded the Nobel Prize in Chemistry.

An indefatigable seeker after truth has gone to his rest. The example of his life remains a constant inspiration.

SCIENTIFIC EVENTS

THE UNITED STATES COAST AND GEODETIC SURVEY AND RECENT CONGRESSIONAL LEGISLATION

During the past session of Congress, the U. S. Coast and Geodetic Survey was benefited by provisions in three bills.

In the act making appropriations for the naval service for the fiscal year ending June 30, 1921, it is provided "That the superintendent of the Coast and Geodetic Survey shall have the relative rank, pay and emoluments of a captain in the navy, and that hereafter he shall be appointed by the president, by and with the consent of the senate, from the list of commissioned officers of the Coast and Geodetic Survey not below the relative rank of commander for a term of four years, and he may be reappointed for further periods of four years each.

In the act making appropriations for the sundry civil expenses of the government for the fiscal year ending June 30, 1921, it is provided "That the title of 'superintendent' of the United States Coast and Geodetic Survey is hereby changed to 'director,' but this change shall not affect the status of the present incumbent or require his reappointment, provided further that the secretary of commerce may designate one of the hydrographic and geodetic engineers to act as assistant director."

The third act which contains legislation affecting the commissioned personnel of the Coast and Geodetic Survey is one entitled, "An act to increase the efficiency of the commissioned and enlisted personnel of the Army, Navy, Marine Corps, Coast Guard, Coast and Geodetic Survey, and the Public Health Service, through the temporary provision of bonuses or increased compensation." This act provides for certain increases in salary for all commissioned officers varying in amount from $480 to $840 per annum. It contains the following provision affecting the commissioned force of the Coast and Geodetic Survey:

> That in lieu of compensation now prescribed by law, commissioned officers of the Coast and Geodetic Survey shall receive the same pay and allowances as now are or hereafter may be prescribed for officers of the Navy with whom they hold relative rank as prescribed in the act of May 22, 1917, entitled, "An act to temporarily increase the commissioned and warrant and enlisted strength of the Navy and Marine Corps, and for other purposes," including longevity; and all laws relating to the retirement of commissioned officers of the Navy shall hereafter apply to commissioned officers of the Coast and Geodetic Survey; *Provided*, That hereafter longevity pay for officers in the Army,