where the 3_3 sub-group is being filled up; but in this case the symmetry is marred by the fact that chromium and copper have only *one* outer electron instead of two in the 4_{11} grouplet. In the elements of the rare earths, where the 4_4 sub-group is being filled with fourteen electrons, gadolinium occupies a central position in a series of fifteen elements ranging from lanthanum to cassiopeium; but in this case the central element is characterised by an extraordinary maximum of multiplicity, $r=17$, which is far in excess of the previous maximum values, namely, $r=4$ for nitrogen and phosphorus, and $r=6$ for manganese, or $r=7$ for the anomalous spectrum of chromium.

The culminating feature of Messrs. Lessheim and Samuel's monograph, in our experience, is found in a diagram of ionisation potentials (Fig. 1), which provides the most convincing proof of the real existence of electron-groups. The minima at Li^{+}, Be^{++}, B^{+++}, and C^{++++} show how easy it is to remove the whole of the electrons from the L level in lithium, beryllium, boron, and carbon; but, on attempting to remove one more electron, an immense resistance is at once encountered to the disintegration of the still complete K-shell, and the ionisation potential leaps up to a maximum. When once this shell is broken, however, only a feeble resistance is offered to its complete removal. Thus the two L electrons can be removed from an atom of beryllium by two increments of about 8 and 7 volts, but the removal of the two K electrons requires the successive addition of 138 and 46 volts to the previous total of about 15 volts. The most striking feature of these numbers is the drop of nearly 100 volts in the extra work that is required to strip the nucleus bare by the removal of one more electron when once the K-shell has been broken. Even the tiny duplet of the 2_{11} grouplet appears, however, to put up an appreciable resistance to disruption, since rather less extra work is required to remove an electron from the ion Be^{+} than from the neutral atom Be. Facts such as these provide ideal evidence in support of the main thesis of the electronic theory of valency, that chemical affinity in all its various manifestations depends on the superior stability of certain numerical groups of electrons when under the influence of a positively charged nucleus. In our opinion, this thesis now rests on an impregnable rock of experimental proof.

T. M. Lowry.

Christian Huygens, 1629–95.

Of all men of science whose lives were passed within the compass of the seventeenth century, none has a more lasting reputation than the Dutch mathematician, natural philosopher, and inventor, Christian Huygens. Born on April 14, 1629, three hundred years ago, at a time when the work of Kepler, Galileo, Napier, Gilbert, and Harvey was slowly gaining acceptance, he lived to read Newton's "Principia," and during the course of his career saw the rise of experimental science, the erection of famous observatories, and the foundation of our greatest scientific societies, the Royal Society and the Paris Academy of Sciences, of the latter of which he was the first foreign associate.

Huygens' birth, and his death on June 8, 1695, both took place at the Hague, and his tomb, like that of his illustrious countryman, Boerhaave, is there in St. Peter's Church. With advantages of birth, education, wealth, and position, Huygens possessed a studious and industrious mind, and an even and cheerful temper, and by the exercise of his brilliant intellect he raised himself to pre-eminence among his contemporaries. Trained in the law and for a short time attached to a Dutch embassy, he was all his life free to follow his own bent, and his long sojourn in Paris, where he enjoyed the seclusion of the Bibliothèque Roi, and his visits to England, no less than his investigations, discoveries, and inventions, led to his being esteemed by a wide circle of friends.

The life and works of Huygens have been published and republished, but reference can be made to only one or two of his great contributions to the advancement of knowledge. Attracted in his youth, like many of his fellows, to the construction and improvement of telescopes, on Mar. 25, 1655, Huygens discovered Titan, the sixth, but the first seen, of the satellites of Saturn, and then gave the true explanation of the curious appearance of the 'triple planet.' This discovery of Saturn's ring he made known in the form of a logogriph, which is reproduced by Grant in his "History of Physical Astronomy." In after years Huygens presented to the Royal Society an object glass of 122 feet focal length for an 'aerial telescope,' for the mounting of which Halley was commissioned by the Society to "view the scaffolding of St. Paul's Church" to see if it could be used for erecting the object glass.

From astronomy and telescopes Huygens turned to clocks, and on June 16, 1657, presented the first pendulum clock to the States General. Described later in his famous work "Horologium Oscillatorium," of 1673, a replica of the clock is to be seen in the Science Museum. Of that famous work, it has been said that it contained original discoveries sufficient to have furnished material for half a dozen striking disquisitions, while "the theorems on the composition of forces in circular motion with which it concluded formed the true prelude to Newton's 'Principia' and would alone suffice to establish the claim of Huygens to the highest rank among mechnaical inventors." This work, like his "Traité de la Lumière," in which he enunciated the undulatory theory of light, was written while he lived in Paris.

Returning to his native country in 1681, Huygens continued his writings, and his last work, "Cosmotheoros," was in the printers' hands when he was attacked by the illness which proved fatal. It is said that Flamstead recommended the "Cosmotheoros" to Dr. Plume, archdeacon of Rochester, who was so struck with it that he left £1800 to found the well-known Plumian professorship of astronomy at Cambridge.