address of Lie's is published in French, the language in which it was spoken. (In volume III the French articles were published in French, all others appearing in German.) Some verbal changes have again been made in the articles on reprinting; and a list of these is given on pages 561–582.

The notes and supplementary matter in volume III made up more than a third of the whole. The editor stated in that volume that volume V would require much fewer notes; but the event has shown that he was mistaken, the space given to supplementary matter in volume V being only a little less than in volume III. On pages 583–614 we have an account of the beginnings of the theory of transformation groups as set forth by Lie in his letters to Adolph Mayer in 1873 and 1874. Pages 615–755 are given to the editor's notes on the separate memoirs (and include the address already mentioned). These notes contain numerous matters of detail, explanatory remarks, suggestions and cross references, together with a few discussions of considerable length (such as that on pages 643-668). An extensive index to the volume is given on pages 756–774.

The editorial work (here as in volume III) is marked throughout with evidence of that care and patience which belong only to a labor of love. It is done in such way as to render great service to all those who will have occasion to use the memoirs of Lie which are here reproduced. The next volume of the series which is to be printed is the sixth, and in the preface it is indicated that work upon it will begin immediately. We can not hope more for it than that it will be edited and printed with the same care as volumes III and V.

R. D. CARMICHAEL

Johannes Kepler. Mysterium Cosmographicum. Das Weltgeheimnis.
   Uebersetzt und eingeleitet von Max Caspar. Augsburg, Dr. Benno
   Filser Verlag, 1923. xxxi+150 pp.

The large increase in the number of students of mathematics and natural science who are unfamiliar with the Latin language makes it more and more useful and desirable to have the greatest works of the pioneers of modern science translated into modern tongues. Among these pioneers Kepler deserves a distinguished place, first because of his work in geometry, in which he prepared the way, through his "infinitesimal method," for the invention of integral calculus; and secondly because in astronomy he laid the foundation for the modern view of the solar system, through his famous three "laws."

Thus there is a real place in the literature of the history of science for such works as the one under review. The *Mysterium Cosmographicum* was Kepler's first work, and it attracted sufficient notice

to assure him of a permanent career as an astronomer. The translation
of this work is preceded by an interesting and valuable Introduction,
in which Dr. Caspar gives a discussion of Kepler's place in the history
of science, of his literary style and of the relation of the *Mysterium
Cosmographicum* to his other works. It is made clear that in this
fantastic-appearing mixture of science, pseudo-science, and mysticism
are found the germs, and more than the germs, of the great discoveries
of the author's later years.

Kepler's discussion of his theme, in spite of the fact that it is in
places labored and tedious, has yet a frankness and naiveté that give
it interest and charm. And the light which this work throws upon
the beginnings of modern astronomy is alone sufficient to repay the
time spent in reading it. Written but fifty years after Copernicus's *De
Revolutionibus Orbium* it very naturally begins with a discussion of
the relative merits of the Ptolemaic and Copernican systems, in which
the greater simplicity of the latter is the chief argument which Kepler
stresses. He then proceeds to explain his view of the orbits and motions
of the planets. He makes the distances of the planets from the sun
equal to the radii of the inscribed and circumscribed spheres of a series
of regular polyhedra. Mercury's orbit is placed inside an octahedron,
Venus outside it and inside an icosahedron; outside this, and inside a
dodecahedron, comes the earth; Mars is then outside this and inside
a tetrahedron; Jupiter outside this and inside a cube, while lastly the
orbit of Saturn is drawn about the cube. Kepler gives ingenious
reasons why the order of the solids should be just this and no other.
Thus, the cube must be the outermost, "since the number of sides of
the cube, six, is a perfect number." After detailed statements of the
numerical relations that exist among the sides and radii of the five
solids, he attempts to show that the relative distances of the planets
are in agreement with these computations; and while he naturally finds
discrepancies of various magnitudes, he has a ready excuse for each,
after considering which he is able to convince himself that he has
found the true explanation of the relative distances of the planets, as
well as of the "fact" that there are exactly six.

The translation has been well done, to judge from numerous passages
which the reviewer chose at random and compared. The figures are
not well printed, the one on page 89 being actually incorrect; but other-
wise there are few misprints.

It would be a valuable contribution to the history of science if we
could have a number of translations into English such as this work
and the Ostwald "Klassiker" give to the German student. Not to go
farther, why can we not have an accessible English translation of
Newton's most important works?

R. B. McCLENON