Nicole Oresme and the medieval geometry of qualities and motions, by Marshall Clagett. University of Wisconsin Press, Madison, 1968. xvi + 713 pages. Plates, diagrams, bibliography, indexes. $15.00.

The principal work contained in this volume, Oresme's De configurationibus qualitatum et motuum, has never before been printed. It now appears in an edited Latin text, based on fifteen manuscripts of the 14th to 16th centuries, accompanied by a fully annotated English translation. Appendix I (pp. 526-575), gives similar treatment to relevant sections of Oresme's Questiones super geometriam Euclidis while Appendix II (pp. 580-621) presents the text and translation of an anonymous Tractatus bonus de uniformi et difformi of the latter half of the 14th century. Appendix III, giving a variant text and commentary of a part of the principal work, is followed by an extensive bibliography, indexes of Latin terms and of manuscripts, and a general index.

Preceding the principal work of Oresme is a 121-page introduction by Professor Clagett. Information concerning Oresme's life, works, and place in the history of science is followed by an extensive analysis of the De configurationibus and by a history of the doctrines contained in that work as they affected the thought of later medieval and early Renaissance philosophers and scientists. The introduction is of unique value partly because of Professor Clagett's unrivalled knowledge of medieval physics, partly because of his scholarly objectivity in assessing the sometimes over-enthusiastic conjectures that have been made in the past with regard to the influence of medieval writers on early modern physics, and above all because he has clearly set forth the inter-relations between the many phases of Oresme's own work in an integrated account of his wide-ranging genius.

Oresme, born near Caen, was a student at Paris in 1348. He probably studied there with Jean Buridan, whose particular interest in scientific questions he shared. His works included commentaries on several works of Aristotle, on Euclid and Sacrobosco, theological works, and treatises on astronomy and economics. His fame in mathematics is based largely on De proportionibus proportionum, in which the "ratio" of ratios is developed as an exponential relationship of ordinary ratios. Despite the lack of a convenient notation, Oresme in effect developed fractional exponents, discussed questions of commensurability, and used considerations of probability some three centuries in advance of the treatment of those topics in their modern dress. Oresme died in 1382.

The subject of the present work is of no less interest historically than that on which Oresme's mathematical fame is securely established. In this book, he deals with the representation of continuous quantities of every kind by means of geometrical figures. The application of such methods to problems of uniform change by English writers of the 14th century is well known; this produced the famed mean-speed (more properly mean-degree) theorem, or "Merton Rule", for uniform acceleration. In this previously unprinted treatise (which was however widely copied and circulated in manuscript), Oresme carries the subject much further. Changes in the intensity of any quality may be represented by the lengths of lines perpendicular to the line or surface representing the extension of the quality. Qualities are classified according to the figure suitably representing any one of them in extension and intension, whether that figure is a surface or a solid. Not only uniform change, but "simple" non-uniform change (four types) and "composite" non-uniform change (63 types) are identified. Oresme seeks applications of this scheme to the widest variety of phenomena, not only physical and sense phenomena, but cognitive and spiritual events. In the third and final part of his treatise, he turns to detailed questions of motion and develops theorems relating to infinite and infinitesimal speeds within closed boundaries of motion.

Professor Clagett's extensive commentary on the main text (pp. 437-517) relates Oresme's principal methematical insights to their modern notations, as well as to texts and commentaries on Euclid that were accessible to medieval writers, and to the relevant ideas of some of those writers. Their original texts are usually cited in evidence, so that this valuable commentary becomes itself a source-book of important extracts from medieval methematics not elsewhere easily available. The appendices likewise provide texts, as well as translations, of some supplemental medieval treatises related to configuration doctrine, the exploration of convergent series of certain types, and the treatment of uniform and non-uniform change.

Oresme's mathematical genius so far transcended that of his contemporaries that despite the early and widespread study of his works, evidenced by multiple surviving manuscript copies, two or three centuries were to elapse before other mathematicians fully attained some of his conceptions and pushed them further. As an example of this, Cantor cited the development of fractional exponents.

Professor Clagett, like all modern students of medieval mathematics, believes that Galileo's work on acceleration in free fall must have been rooted in mean-speed considerations drawn from the tradition to which Oresme was the greatest contributor. The principal work he has given us in this book is tantalizingly probable as such a source for Galileo, since it was composed in Latin (rather than in French, as was Oresme's astronomical work), and since four ancient manuscript copies are preserved in Italy (where no copies of the astronomical work can be traced). Yet he candidly grants that no connection has been established between Oresme's work and Galileo's. It is striking that Oresme commented specifically on the odd-number law that links squares to uniform growth, though not specifically for distances and times in local motion. On the other hand, Oresme was concerned with motion or change to a specific terminus ad quem and with rules that would permit indefinite increase of speed only within a bounded space. Whether Galileo began with those rules and extended them, or whether he arrived at true conclusions consistent with Oresme's by a quite different route, remains a fascinating topic of further historical research.

The overwhelming impression gained from a study of Oresme's work is one of astonishment at the progress he made under the handicap of a completely inadequate analytical notation. His perception that recourse to geometric figures made possible rigorous reasoning about conceptions of motion and change, and offered a means of their classification in precise ways, greatly extended the scope of applied mathematics beyond the geometry of Euclid. If others did little to extend that perception before Descartes, that in no way detracts from the importance of Oresme to our understanding of the history of mathematics, and particularly the history of mathematical physics.

Professor Clagett's scholarly care in editing, translating, and clarifying these texts is evident on every page. The University of Wisconsin Press likewise deserves praise for the production of an attractive and accurately printed book. I have noted but a single and trivial misprint in the entire volume.

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Das parallelenproblem im corpus Aristotelicum, by Von Imre Tóth. Archive for History of Exact Sciences, Vol. 3, No. 4/5, 1967. 173 pages.

This very extensive and elaborate study is concerned with the problem of