more, it was Morley who suggested that the entire apparatus be floated on mercury with an annular trough and float system which he devised. These great improvements enabled Michelson and Morley to employ a multiple-path optical system for their interferometer which lengthened the paths of the light beams by a factor of ten. As a result the anticipated fringe shifts predicted by the aether theory from the motion of the earth in its orbit would be 0.4 of a fringe, an amount which could not possibly have failed to be detected. The stone and mercury support also had the great advantage that the interferometer could be rotated continuously and observations made at all azimuths. As is well known, this famous Michelson-Morley experiment was completed in July, 1887, and gave a conclusive null result, which made it imperative that the far-reaching revisions in electrodynamics made by Lorentz, Poincaré, and above all by Einstein in the Special Theory of Relativity, should follow.

Following their work on the Michelson-Morley experiment, Michelson and Morley continued their collaboration on work (1887–1889) which established the feasibility of using light waves as the ultimate standard of length. Professor Michelson completed this work at Paris several years later, but an exceedingly important biproduct of their search in Cleveland while looking for a very narrow spectrum line suitable for the wavelength standard was the discovery of both the fine structure and the hyperfine structure in many lines of atomic spectra.

Toward the end of his career at Western Reserve University, Professor Morley collaborated with Professor Dayton C. Miller of Case. After the rather general acceptance of the Fitzgerald-Lorentz contraction hypothesis to explain the null result of the Michelson-Morley experiment, Morley and Miller devised a larger and more versatile interferometer which they used in 1904 to show that the same null result was found when the optical parts are supported by either sandstone, wood, or steel.

Three Dimensional Dynamics: A Vectorial Treatment. By C. E. Easthope. 227 pp. (Butterworths, England) Academic Press Inc., New York, 1958. $7.80. *Reviewed by T. Teichmann, Lockheed Aircraft Corp.*

While the vectorial treatment of analytical mechanics has become preeminent in American and many European texts, it has tended to have rough going in the British Empire largely perhaps because of the influence of the many important Victorian and Edwardian expositions on this subject which studiously eschew the techniques of Gibbs and Heaviside. The publication of this book seems to indicate that this opposition to vectors is at last dying out and that it is now becoming respectable in England to write each equation once only instead of three times.

The treatment here is essentially an undergraduate treatment of standard Newtonian mechanics specifically excluding the more advanced concepts of Lagrange and Hamilton-Jacobi theory. Within these limitations, however, the author has presented an extremely clear and usable picture of the methods of analytical mechanics. The text contains examples to illustrate all phases of the various general theorems and methods described. The chapters are generally followed by problems which illuminate the methods and challenge the reader without plumbing the depth of old-fashioned Tripos problems. A useful and significant portion of the book is devoted to the behavior of rotating bodies (more than half the book concerns such problems). In view of the present increasing interest in guidance and celestial mechanics, it seems probable that a thorough knowledge of this type of material will become the sine qua non of engineers as well as physicists, and this book can be recommended particularly to those who wish to refresh their knowledge of the subject with special reference to its practical application in missiles and satellites.

Roots of Scientific Thought: A Cultural Perspective. Edited by Philip P. Wiener and Aaron Noland. 677 pp. Basic Books, Inc., New York, 1957. $8.00. *Reviewed by L. Marton, National Bureau of Standards.*

The title of this splendid anthology is more informative than it appears at first sight. It heads what may appear first as just another book on the history of science. Actually the book is considerably more. As the editors pointed out in one of their prefatory chapters, "The historian of ideas . . . is interested not only in the logical, cumulative development of scientific thought but also in the extralogical components and their historical affiliations with other cultural developments in the history of the arts, of social institutions, of religion, and of philosophy." It is in the light of this illuminating sentence that one has to look at and analyze this volume.

The anthology consists of 33 papers which appeared earlier in the *Journal of the History of Ideas*. They cover the development of scientific ideas from the earliest classical times until the most recent evolution in cosmology. However, the emphasis is more or less on the sixteenth and seventeenth centuries. The articles are divided into four groups: the first is called The Classical Heritage, the second From Rationalism to Experimentalism, followed by The Scientific Revolution and From the World-Machine to Cosmic Evolution. Each group is preceded by a summary review of the whole era. Three of these summaries are written by the editors themselves and one is written by Crombie. The authors of the papers are representatives of the best history-of-science tradition: Moody, Koyre, Crombie, Randall, and many others. Some of these papers are considered classics of their kind and constitute a very interesting discussion of the subjects which they are treating. It is hard to pick out the best ones in such a galaxy of splendid papers, but I like best John Herman Randall, Jr.'s "The Place of Leonardo da Vinci in the Emergence of Modern Science", Edgar Zilsel's "The Origins of Gilbert's Scientific Method", Francis R. Johnson's "Gresham College: Precursor of the Royal