The conditions for the invariance of f under a linear transformation are bilinear in the coefficients and therefore may be treated by rational processes. Similar remarks hold for a treatment of the remaining two forms by induction from $m - 1$ to m. The second set of canonical forms defines groups in an arbitrary realm whose structures were determined in the papers cited. Moreover, the second set proves more advantageous than the first set in the question of the representation of the linear groups as transitive substitution groups. The first set was employed in the *American Journal of Mathematics*, October, 1901. For the second set, the investigation becomes simpler and the results appear in a simpler and more natural classification.

Not only for these groups, but for other classes, it appears that the simplest methods are those applicable to an arbitrary realm, viz., methods which depend essentially upon rational operations only.

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THOMAS F. HOLGATE,
Secretary of the Section.

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VECTOR ANALYSIS.

Vector Analysis. A text-book for the use of students of mathematics and physics, founded upon the lectures of J. WILLARD GIBBS, Ph.D., LL.D., Professor of Mathematical Physics in Yale University. By EDWIN BIDWELL WILSON, Ph.D., Instructor in Mathematics in Yale University. (Yale Bicentennial Publication.) New York, Charles Scribner's Sons, 1901. 8vo. xx + 436 pp.

IT is well known that Professor Gibbs's " Elements of vector analysis," a pamphlet of 83 pages, printed in 1881–84 for the use of his students, although not published for general circulation, attracted somewhat wide attention. Thus, in particular, Mr. Oliver Heaviside adopted Professor Gibbs's system with but slight modifications and expounded it very fully in his " Electromagnetic Theory " (1893) ; this again formed the basis, to a large extent, of Professor Föppl's " Einführung in die Maxwell'sche Theorie der Elektricität, mit einem einleitenden Abschnitte über das Rechnen mit Vectorgrössen in der Physik " (1894). But vector analysis, as conceived by Professor Gibbs, is not merely a method