Lagrange knew the theorem only for the case of the subgroups of the symmetric group and that even for this case he had no satisfactory proof. Abbati (in 1803) completed the proof for subgroups of the symmetric group and also proved the theorem for cyclic subgroups of any group; but it was apparently more than seventy-five years after the publication of Lagrange's memoir (in 1770–1771) before the completed theorem became current (though it had appeared earlier in a paper by Galois in 1832). In this case we have attributed to Lagrange a theorem which he probably never knew or conjectured, on the ground (it would seem) that he knew a certain special case of it. In Hardy's paper we have a theorem referred to Lagrange apparently on the ground that he first published a proof of it though it had been in the literature long before. Somewhere between these two extremes lies the golden mean of proper practice in attaching the names of mathematicians to specific theorems; and this mean, in the opinion of the reviewer, is rather far removed from each of the extremes indicated.

R. D. CARMICHAEL.

Statics, including Hydrostatics and the Elements of the Theory of Elasticity. By Horace Lamb. Cambridge, University Press, 1916. xii + 341 pp.

Mathematics as ordinarily taught in our colleges and mathematics as used in this work-a-day world are birds of entirely different feather, and they do not flock together. This may perhaps be illustrated by a simple problem (No. 20, p. 178) from Lamb's *Statics*:

"Water is poured into a vessel of any shape. Prove that at the instant when the center of gravity of the vessel and the contained water is lowest it is at the level of the water surface."

Let us imagine a well trained sophomore attacking this problem. It is clearly a minimum problem involving integration. We measure h vertically upward from the bottom of the inside of the container, take the density as unity (or shall we keep it as ρ?), and let $A(h)$ be the area of the cross-section of the vessel. Then the center of gravity of the water is at a height

$$h_1 = \int_0^h \rho h A dh \div \int^h \rho A dh.$$

Let the mass of the vessel be denoted by M, and let its center of gravity be at the altitude h_0. Then the center of gravity of the whole is at the height

$$H(h) = \frac{Mh_0 + \int_0^h \rho hA dh}{M + \int_0^h \rho A dh};$$

and it is to be proved that

$$\frac{dH}{dh} = 0 \quad \text{and} \quad \frac{d^2H}{dh^2} > 0 \quad \text{when} \quad h = H.$$

I have assumed perhaps naturally that the student knows enough or too little not to use double or triple integrals, but knows too much not to use any. I have also assumed that he knows enough to write $h = H$, which I doubt.

Having thus stated his problem, perhaps he can solve it and perhaps he cannot, but probably he will get at least 50% for his statement, even if he has not proved anything except that his thorough course in calculus has developed a serious set of inhibitions whereby he is prevented from using his common sense on a simple mathematical problem.

Lamb's Statics is full of such disappointments for the student of mathematics. Indeed it may be feared that this is malice aforethought on the part of the author. (See ¶ 7 of his Preface). Nor would I seem to criticize mathematical instruction of others without being more precisely critical of my own. For twenty years I have taught or tried to teach not only mathematics of the canonical sort to all grades of students but mechanics and physics to Freshmen, to Juniors, to Seniors, and to Graduates. It is my own experience that despite my best endeavors my students will solve successfully with complicated mathematical machinery problems that I am confident they do not understand and will fail lamentably in the solution of simple common-sense problems where the canonical machinery is in the way. Perhaps we should teach less of the machinery, reduce things less to rule and formal procedure, and above all dwell longer on the simple fundamentals of our subjects of instruction. Mechanics is a particularly difficult topic for teacher and for taught. In our large engineering schools we are apt to take three shots at mechanics: once in the course in physics, once at some point of the course in mathematics, and once in applied mechanics. The material covered overlaps a great deal, but the points of view are often divergent. Might it not be that if we all got together, physicist, mathematician, and engineer, pooling our combined time, and cooperating at each phase of the work, we should accomplish a far better result?

Lamb's Statics keeps to the middle road of presenting the subject as a branch of natural science, largely deductive because of the paucity and simplicity of the fundamental laws. It is a work on physics rather than on engineering or mathematics; it should afford a fine introduction whether to applied mechanics of the more technical sort, to the theory of structures, to more advanced physical theories, or to analytic statics.

To show the breadth of treatment the titles of the chapters may be quoted: Theory of Vectors, Statics of a Particle, Plane Kinematics of a Rigid Body, Plane Statics, Graphical Statics, Theory of Frames, Work and Energy, Analytical Statics, Theory of Mass-Systems (centers of mass and moments of inertia), Flexible Chains, Laws of Fluid Pressure, Equilibrium of Floating Bodies, General Conditions of Equilibrium of a Fluid, Equilibrium of Gaseous Fluids, Capillarity, Strains and Stresses, Extension of Bars, Flexure and Torsion of Bars, Stresses in Cylindrical and Spherical Shells. This is a considerable program; it is well and consistently carried through —as should be expected by all who have known his other writings and particularly his companion volume on *Dynamics*, noteworthy for the same Greek characteristic σωφροσύνη.

These books, *Statics* and *Dynamics*, are not written for the writing; they are products of teaching, for they are based on lectures delivered at the University of Manchester. If the matter were taken slowly enough, satisfactory results would attend their use in our American institutions, provided our teachers had an all round interest in the elements of mathematics, of physics, and of engineering, and a fine contempt for superficial ground-covering in any of the three.

E. B. WILSON.

Principes usuels de Nomographie avec applications à divers problèmes concernant l'artillerie et l'aviation. Par Lieutenant-Colonel Maurice d'Ocagne. Paris, Gauthier-Villars, 1920. 67 pages.

This pamphlet, as the title indicates, is a short exposition of nomography in which the illustrations are taken from artillery and aviation. Nomography is the general theory of the graphical representation of equations of any number of vari-