denying this he seems to me to reduce the force exerted *by* the train *on* the locomotive to the quantity R alone; and since R is less than F, the pull exerted *by* the locomotive *on* the train, he thus abandons the doctrine that "all force is of the nature of stress," and that "the stress is measured numerically by the force exerted on either of the two portions of matter."

The quotation which Professor MacGregor makes from Poisson I shall not attempt to discuss at length; for I am not familiar with his writings, and do not know exactly what meaning he attached to the word *résistance*. If he used this word as I understand Professor MacGregor to use it, to indicate an *opposing force*, and if he was at the same time committed, as I understand Professor MacGregor to be, to the view that one force always implies an equal and opposite force, then I can only say that I think Poisson was wrong in one part or the other of his doctrine.

E. H. HALL.

Cambridge, March 5.

Comparative taxation.

While I cordially accept all Mr. Henry B. Gardner's statements in regard to the insufficiency of my study of the comparative taxation in Europe and America, I cannot accept his conclusions. He says, in fact, "The inadequate scope of the work has in large measure destroyed the value of the study." To this I cannot agree; and my witness is Mr. Gardner himself. My work has brought out his intelligent criticism, and has turned the attention of himself and of very many other persons to the importance of developing the science of comparative statistics, which is what I have aimed at.

It is very true that I have not attempted to compare the relative taxation of cities, towns, and other subdivisions of states in Europe with those of America; it is very true that some of the cities of this country are excessively taxed as compared to those of Europe: all the more reason for a complete study of the subject. Where are the materials for such an investigation? I have given, to the best of my ability, the relative burden of *national* taxation. I stated that this part of the taxation of countries should be considered separately from that of the towns and cities, for the reason that in Europe a very large part of the national taxation is expended for *destructive* purposes or for the support of privileged classes; while, with the exception of a few cities in this country, the revenues derived from local taxation are paid out for *constructive* purposes both there and here; and on the whole, in spite of the cumbersome nature of the collective work of cities, counties, and towns, the people of this country get about seventy-five cents' worth on a dollar for what they pay in municipal taxes.

Moreover, although Mr. Gardner may not be able to find exact returns of taxation in European countries corresponding to the *per capita* figures which I have submitted, yet I claim to have proved them after as complete examination as is open to a private and unofficial person who does not read German. I hold that the revenue of state forests, mines, and other instrumentalities of subsistence which are often controlled in Europe by governments, constitute as true a tax upon the people as if they had been assessed directly upon their property; and I am of opinion that I have understated the burden of national taxation in Europe rather than overstated it. Suffice it that the figures have attracted attention; and it may be that within one, two, or three years a complete comparison of national as well as state, county, and town taxation may become possible. I should be glad to see Mr. Gardner try his hand, not so much in criticising my work, as in preparing more accurate and more complete tables. EDWARD ATKINSON.

Boston, March 5.

On the flight of birds.

The wing is extended upward from the horizontal position by the deltoid and the latissimus dorsi muscles to a line which is perpendicular to the body, and is quickly again depressed to the horizontal position by the pectorales. This constitutes the first stage of the 'stroke.' 'Recover' is initiated by an inward rotation of the humerus, semiflexion of the wing at the elbow (the pinion remaining extended and directed obliquely downward and outward), and is carried well forward to a degree sufficient, when seen in profile, to conceal the head. In this position the primaries are semirotated so as to present the least amount of surface to the air in the direction in which the bird is moving. The impetus excited by the stroke carries the bird upward and forward. In the second stage of 'recover,' the humerus is rotated outward, the arm is quickly raised, the primaries restored to the position seen in the bird at rest, and the wing is a second time in the position for the 'stroke.' In the eagle and the hawk the legs are in the position of the 'stroke' when the wings are similarly placed. During the 'stroke' the legs move backward. This motion continues during the 'recover' of the wing, so that the time of the 'recover' of the wing is also that of the 'recover' of the leg. The action of both wings and feet, since both pairs act together, is what I propose to call 'synadelphic.'

The study of the flight was confined to the eagle, the hawk, the pigeon, and the parrot, in the series of instantaneous photographs taken by Mr. Edward Muybridge, under the auspices of the University of Pennsylvania. HARRISON ALLEN.

Philadelphia, March 7.

On the serpentine of Syracuse, N.Y.

An especial interest attaches to this rock for two reasons: 1°, because of the almost total absence of rocks of this class, or indeed of any intrusive rocks, from the undisturbed paleozoic strata of New York; and, 2°, because of the importance which has been recently attributed to it by Dr. T. Sterry Hunt, as affording evidence in favor of his chemical precipitation theory of the origin of serpentine.

The Syracuse serpentine was discovered in 1837, and was described by Vanuxem in his third annual report in 1839 (pp. 260 and 283), and in his final report on the geology of the third district in 1842 (p. 109). It is also mentioned by Beck, in his 'Mineralogy of New York,' as a 'dike or bed' (1842, p. 275). Dr. Hunt published an analysis of this rock in the *American journal of science* for 1858 (xxvi. p. 236), and has laid great stress upon it in his recent essay on the geological history of serpentines.

Through the courtesy of Prof. A. H. Chester of Hamilton college, the writer has been enabled to study a very complete suite of this rock and its associates, which was collected by the late Prof. Oren