liver the principal address. The occasion of the dedication marks the completion of twenty-five years of service in the institution by Professor W. M. Cobleigh, head of the department of chemistry.

Dr. Harold Hibbert has been appointed assistant professor of chemistry in the research department of organic chemistry, Yale University, New Haven, Conn.

Dr. Louis E. Wise has severed his connection with E. I. du Pont de Nemours and Company, where he held a research position at their Jackson Laboratory, Wilmington, Del., and has accepted the position of professor of forest chemistry at the New York State College of Forestry, Syracuse University, Syracuse, N. Y.

Dr. Harlan H. York, head of the botanical department at Brown University, has resigned to take charge of similar work at the University of West Virginia, Morgantown, West Virginia.

Mr. G. H. Hardy, fellow and mathematical lecturer of Trinity College, Cambridge, has been appointed to the Savilian professorship of geometry at Oxford University.

Dr. John Cruickshank, pathologist to the Crichton Royal Institution, Dumfries, has been appointed Georgina M'Robert lecturer in pathology in the University of Aberdeen.

Professor C. H. Desch has been appointed professor of metallurgy at the University of Sheffield, in succession to Professor J. O. Arnold. Since September, 1918, Professor Desch has been professor of metallurgy in the Royal Technical College, Glasgow.

DISCUSSION AND CORRESPONDENCE

A SPLENDID SERVICE

Apart from the eminent contribution rendered to science and the Pan-American spirit by Dr. Branner in the publication of his fine geological map and monograph,[1] it is a particularly distinguished and generous service to common American interests made by the Geological Society of America at the expense of its own treasury. For the first time the Geological Society has ventured so far afield and freely invested its resources in what might seem at passing glance purely the scientific welfare of an alien country; but it is not to be denied that the claim of fraternity had no little to do with the attitude of the Geological Society toward this enterprise. The bond of geological brotherhood between the United States and Brazil has been a long and strong one. Out of the little village of Aurora on Cayuga Lake, New York, came the first impulse toward the establishment of this tie, when the generosity of the late E. B. Morgan enabled a Cornell professor and some of his students in 1871 to begin the systematic study of the rock geology of the Amazonas valley.

Thus started the Brazilian careers of Professor Charles Fred Hartt and his young associates, Orville A. Derby, Herbert H. Smith and John C. Branner who joined the work in 1874, and their labors are now a historical part of the development of geology on the South American continent. So perhaps it is eminently appropriate that an American Geological Society should now come to the help of one of these pioneers in Brazilian geology and enable him to summarize and commemorate the results of his own and his associates' life-long work in that country. Dr. Derby became a Brazilian subject; Dr. Smith, after a life of rich experience as a scientific collector, recently met a tragic end. Upon Dr. Branner has fallen the mantle, for during his active years he has been a frequent visitor to Brazil and an unremitting student of her geology. To him thus comes the privilege of preparing the first geological map of the whole area of that vast country so far as exploration has gone, and of setting forth the conclusions drawn by himself and by many colleagues and collaborators in this great field.

This note is not intended to be a review or critique of Dr. Branner's map. It is a most illuminating production, of necessity drawn on broad lines and with a few simple explanatory devices, thus intimating at a glance how much remains for future students of the

[1] "Outlines of the Geology of Brazil; to accompany the Geologic Map of Brazil," by John Casper Branner, *Bulletin Geological Society of America*, Vol. 30, No. 2, June, 1919.

science in this fertile land. We applaud the author on his achievement; others may express this appreciation more analytically; but in this paragraph we acclaim the high-minded attitude of the Geological Society of America in making so wise a use of its money and so excellent a contribution to the common good of the Pan-American States and to geological science.

J. M. C.

WEIGHT OF BODY MOVING ALONG EQUATOR

TO THE EDITOR OF SCIENCE: A prominent engineer, Dr. Carl Herring, recently proposed to me the following question: "Does a body in motion along the earth's equator weigh less (or more) than the same body at rest?" Since this question, in some form or other, has come up several times in recent discussions, the following solution, although entirely elementary, may be not without interest.

Let us picture the body as supported by a string from the roof of a train running westward at speed v along the equator, and let $S =$ the tension in the string.

The question then is: What is the relation between S and v?

Let V (= 1,038 miles per hour) be the absolute velocity of a point on the earth's equator (neglecting the motion of the earth in its orbit and the motion of the solar system in space). Then V-v is the absolute velocity of the train (eastward) in a circular path of radius R (= 3,963 miles).

Hence, by a well-known formula of kinematics, $(V\text{-}v)^2/R =$ the absolute acceleration of the body toward the center of the earth.[1]

Further, let $W =$ the ordinary weight of the body (that is, the value of the supporting force S when the train is at rest on the earth's surface), and $g =$ the ordinary falling acceleration (that is, the acceleration, with respect to the earth's surface, with which the body would begin to fall, from rest, if the supporting string were cut); and let $E =$ the force with which the earth pulls the body toward the center of the earth. Then E-$S =$ the net force acting on the body in the direction toward the center.

Hence, by the fundamental principle that forces are proportional to the accelerations they produce,[2] we have

$$\frac{E-S}{W} = \frac{(V-v)^2/R}{g}, \qquad (1)$$

whence

$$S = E - \frac{W}{g}\frac{(V-v)^2}{R}. \qquad (2)$$

To determine E, we note that if $v = 0$ then $S = W$, so that

$$E = W + \frac{WV^2}{gR} = (1.00345)W. \qquad (3)$$

Hence finally,

$$S = W\left\{1 + \frac{V^2}{gR}\left[1 - \left(1 - \frac{v}{V}\right)^2\right]\right\}. \qquad (4)$$

From these equations we see that as v, the westward train-speed, increases from 0 to V, the supporting force S will increase from W to (1.00345) W, which is its maximum value; as v increases from V to $2V$, S will decrease again from its maximum value to W; and if v is increased further to about 18 V, S will become zero.

For reasonable train-speeds, therefore (up to one or two thousand miles per hour!), *a body moving westward will require an increased force to support it against falling.*

For example, let $v = 60$ miles per hour. Then if $W = 1$ lb., we find $S = 1.000387$ lb., an increase of about 1/25 of one per cent.

[1] Dr. Hering's surprising statement in SCIENCE for October 24, 1919, implying that engineers do not generally recognize the idea of "acceleration" in a direction perpendicular to the path, is not borne out by an examination of engineering text-books, all of which (fortunately) define acceleration in the standard way as the rate of change of vector velocity. For further comment on Dr. Hering's paper, see Professor C. M. Sparrow's letter in SCIENCE for November 21.

[2] Reasons for preferring the form $F/F' = a/a'$ to the form $F = ma$ as the fundamental equation of mechanics may be found in two articles by E. V. Huntington: "The Logical Skeleton of Elementary Dynamics," *American Mathematical Monthly*, Vol. 24 (1917), pp. 1–16; "Bibliographical Note on the Use of the Word Mass in Current Text-Books," *ibid.*, Vol. 25 (1918), pp. 1–15; also in controversial papers in SCIENCE from December, 1914, to October, 1917.