Lithuania and the Carpathians, the only natural area he could locate was the Böhmerwald on Mt. Kubani near the Bavarian boundary. This had been preserved as a natural reservation by Count Adolph von Schwarzenberg and his family, and comprised an area of forty-six hectares (113.6 acres) embracing one major forest type.

The litter, humus and soil conditions in virgin forests may not be ideal—are often very poor from the view of commercial production, and could be bettered by cultural treatment—but certainly our intensive use of forest land has not reached such a point that we can not afford to reserve some areas of reasonable size in each vegetational, climatic or soil type, in a state of natural productiveness or unproductiveness. Our greatest luxuries are the millions of waste and devastated acres. As far as the national forests are concerned, it would not seem to require any great modification of policy, and surely but little financial deprivation to set aside areas in each type as permanent "control" areas in the government forest research program. It would not be necessary to lay out any exact plots, or carry out any elaborate studies at once. The areas should not be too accessible; but they should be catalogued and available for properly qualified persons to study under certain restrictions. No one can tell when such areas will be called upon to furnish solutions for the most practical kinds of problems. The types have been studied and classified with few exceptions, their locations are known, and men are available, well-fitted to carry out the project. It is obviously a function to be performed by some public agency, and the sooner it is done the better.

Henry I. Baldwin

Berlin, New Hampshire

WHEN IS MID-WINTER?

Although December 22 or thereabouts is the shortest day of the year, it never seemed to me that it was justly entitled to the name of "mid-winter." Recently I made a careful study of Weather Bureau records of St. Paul and Minneapolis to find out when, in the sense in which the term ought perhaps to be used, the real middle of cold weather occurs in this climate. It was found that the lowest average daily temperatures occur in January; in fact, the records showed that from the 10th to the 23rd of January, inclusive, the average temperature was 11° F. and that before and after these dates the daily temperatures were higher. As this did not give a satisfactory answer, the problem was approached in another way. It was noted that September 20 and May 18 both had average temperatures of 59 degrees. Between these two dates, it was assumed that, if the average daily temperatures were each subtracted from 60 and the differences totaled, the date before and after which the half totals equaled each other could properly be called the middle of winter. By this method of calculation, January 18 was found to be the date sought. Sixty degrees was chosen on the assumption that at about that temperature in the average year fires would be built and in the spring when the temperature had reached 60 degrees, fires would be allowed to die. Is it not fair to suppose that on January 18, in the climate of the Twin Cities, the coal pile should be half gone, if we may assume that on the average wind velocities and other conditions are no more effective before that date than after that date in eating up fuel? This date is not in accord with the old proverb, "Half your meat and half your hay should be in store on Candlemas Day" (February 2).

About midnight, July 19, exactly one half year has elapsed, and it is perhaps proper to apply the term "middle of summer" to this date, although from the 17th to the 25th the average temperature remains at its highest point of 73 degrees in the Twin Cities, which would bring mid-summer two days later by this process of reasoning.

It would be interesting to know when mid-winter, as above defined, occurs in such climates as Buffalo, New York, Florida, Los Angeles, Seattle and Southern England.

Charles H. Briggs

Minneapolis, Minn.

THE NEWTON BICENTENARY

The notable scientific distinction of 1927 being the fact that it is the bicentenary year of Newton's death, it would seem desirable to mark it, where possible, by tributes to his memory more real than merely literary and festival celebrations. The preparation of a revised complete edition of his writings is, it seems, not to be looked for, however appropriate and overdue such an undertaking may be; but a return to their direct study, and to the recital and employment of methods and results contained in them, that at least is practicable, and would be a generous homage on their part, if writers and teachers would adopt it.

One of his methods, with which a start might well be made, is Newton's theory of resistance—that theory which Cotes characterized as "his noble theory of resistances." Noble it undoubtedly is, yet none the less it has for long years been consistently passed over, if not forgotten, for too few of us read the "Principia" now, though we one and all allow it to be a scientific classic that can never die.

In place of Newton's "noble theory" we have substituted a so-called fluid-friction theory—imperfectly defined, little understood and based on fallacious reasoning.

To compare for a moment the two theories: our fluid-friction theory lays it down fundamentally that a fluid devoid of viscosity offers no resistance to uniform motion through it. This theory has now enjoyed a long scientific inning, but it has not yet enabled any one (to my knowledge) to calculate the resistances of bodies of the simplest form.

Newton, in his theory, lays it down fundamentally that a fluid devoid of viscosity *does* offer resistance, and that such resistance varies as the density of the fluid and as the square of the velocity of the body moving uniformly through it.

In the "Opticks" (Query 28)—in 1718 and therefore his matured view—he is more precise, and says the resistance of a sphere "which arises from the attrition of the parts of the medium is very nearly as the diameter, or at most, as the *factum* of the diameter and velocity of the spherical body together. (Thus anticipating what we call "Stokes Law.") And that part of the resistance which arises from the *vis inertiae* of the matter is as the square of that *factum.* And by this difference the two sorts of resistance may be distinguished from one another in any medium; and these being distinguished it will be found that almost all the resistance of bodies of a competent magnitude moving in air, water, quicksilver, and such like fluids with a competent velocity, arises from the *vis inertiae* of the "parts of the fluid." And a little later he again says:—"The resistance of water arises principally and almost entirely from the *vis inertiae* of its matter."

The calculation of any resistances by our fluid-friction theory being admittedly impossible, would it not be an appropriate tribute to Newton's memory to give his own *peregregia theoria* a place in his bicentenary year? Resistances *can* be calculated by Newton's theory to a high degree of accuracy, as was shown by Colonel Duchemin more than eighty years ago.

For another comparison, take the case of water flowing out through a one-inch circular thin-walled orifice. Calculating in the ordinary manner we obtain a figure which we may call 100, while we know that by experiment we shall get a figure about 62.5. We have accordingly to employ a coefficient of 0.625 before our result is of any value at all. Such a method scarcely deserves to be called scientific. The condition is really worse than this, for our coefficient is not even constant but must be varied as the diameter varies.

On the other hand, by Newton's theory the discharge for a one-inch orifice can be calculated directly to within the second place of decimals of the experimental amount. Surely we should be consulting our own practical advantage, as well as honoring Newton's memory, by at least finding a place for his theory—a theory which leads at once to a correct result—alongside one which is useless without what may be called a "judging" coefficient.

If it be asked why it is assumed that a fluid devoid of viscosity offers no resistance to uniform motion, the answer may be found in the first three lines of Lamb's "Hydrodynamics."

R. DE VILLAMIL

WEST HAMPSTEAD,
ENGLAND

SCIENTIFIC BOOKS

American Silurian Crinoids. By FRANK SPRINGER. Publication No. 2871, Smithsonian Institution, 236 pages, 32 plates, 1926.

MANY-SIDED Frank Springer, born in 1848 in Iowa, educated there and admitted to the bar in 1869, has long been America's foremost authority and the world's most prolific worker in the field of fossil crinoids. Beginning his scientific career in 1877 with an adopted son of Iowa, Charles Wachsmuth, their joint publications continued until 1897 (sixteen titles). Since then, Springer has carried on his studies of crinoids alone, and has added to his bibliography fifty-seven scientific titles, besides forty-six other miscellaneous papers having to do with law and public affairs. His results are fundamental in crinoid morphology and taxonomy. Since 1873 he has been a citizen of New Mexico, where he became one of the state's leading men and also amassed a fortune. A good part of the latter was used in getting together the largest collection of crinoids, blastoids and cystids anywhere, and after describing and illustrating these rarities as no other worker has, he gave them unencumbered to the nation through the Smithsonian Institution. Crinoids, and especially whole ones, are usually very rare fossils, but when good leads are gone after with pick, shovel and powder, as many have been under Springer's direction, the results are astonishing, as is again attested in the beautiful and monumental work under review. The drawings, by Kenneth M. Chapman, are very fine, and the half-tone reproductions are the best we have ever seen.

In "American Silurian Crinoids," 198 forms (seventy-four new) in sixty-three genera (seven Camerata are new) are discussed and illustrated, but not all these are of Silurian time, nor are all the American forms included. Rather is it the species found in Tennessee, Indiana and Kentucky that are dealt with,