called to an editorial article with the above caption, in the *American Journal of Mining*, April 25, 1868, Vol. V., p. 264, which later became the well-known *Engineering and Mining Journal*. A comparison of what is accomplished now with the scientific view of that day, a little over fifty years ago, may prove interesting to the readers of SCIENCE.

In part, the article states:

> Inventors have puzzled their minds for ages to compass the problem of air navigation by machines or by flying men; and but little advance has been made. . . . It would of course be absurd to affirm that anything could not be done, in this age of the world; but while this feat may be accomplished to an extent "enough to say so," we are incredulous of any practical benefit of the thing to man. . . . The force which a man is able to expend in rapid ascension of heights, even with the firm earth under his feet, is very small; and we have never seen any principle elucidated which was able by apparatus to increase his power or lessen his gravity in proportion to it.
>
> The balloon remains; but that, if used, presents such a surface to the atmosphere that it can not be accurately guided without, by means of steam-boilers or other weighty machinery, storing up power for propulsion, in a manner of itself too cumbrous and heavy for successful navigation.
>
> So that, whether it is for his own personal flight through the air or the management of a great atmospheric ship, man seems to be hemmed in on every side by almost insuperable natural difficulties. And besides, even were all this obviated, who would run the risk of accidents at a great height above the earth, beyond the reach of help—but not of gravitation? It is an interesting problem, and may result in pretty scientific toys; but for real helpfulness to humanity we see but little in Aeronautics.

Taking the vast change that has been worked out in the life time of many of us, does it not afford encouragement to our young people to endeavor to solve the many problems lying before them, ere the next fifty years shall pass?

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KEEPING STEP

TO THE EDITOR OF SCIENCE: Sound travels about 1,060 feet per second at 0° C., or 265 feet in one fourth second. The soldier next the drummer steps with the drumbeat, the soldier 265 feet in the rear is one fourth second late and has his foot in the air when the foot of the front man is on the ground. This is because they march at 120 steps per minute (2 steps per second), which gives one half a step in one fourth second. Hence the soldier who hears the signal one fourth second late will fall one half step behind. I have seen this in columns turning into Victoria Street from Westminster Cathedral, at Lancaster Gate or Holloway Road, on Salisbury Plain, etc.

When tired out or on rough roads soldiers left to themselves do not keep step; but it is a remarkable fact that the only time they keep perfect step is when they are without sound signals. If the drum begins they lose perfect step at once and the feet are seen to strike the ground in receding waves as the sound passes down the line. If the drum stops, the men in two or three seconds get into perfect step again, and go with a sway and swing absent at other times. The French term it *rapport* or *esprit du corps*. Is there a mutual subconscious force passing between the men? In a short brochure of experiments in such matters to be found at public libraries I have suggested an explanation. Is it the right one? I should be glad to hear from American observers of the phenomena.

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QUOTATIONS

THE ORGANIZATION OF RESEARCH IN GREAT BRITAIN

IN a paper on the state organization of research, read at a recent meeting of the Royal Society of Arts, Sir Frank Heath, K.C.B., Secretary of the Department of Scientific and Industrial Research, succeeded in compressing into a few pages a lucid amount of the work of his department. His characterization of research in general is, so far as it goes, excellent, and ought to be taken to heart by the

public, but the treatment of a vast and complex subject which approves itself to one thoughtful man can not be expected to satisfy all his readers. If, then, we dwell upon points of disagreement, we are not the less conscious that Sir Frank's paper compares favorably with the lucubrations of most administrators.

In the earlier part of his paper he emphasized the novelty of the departure made by the government in 1915, and, without the assertion in so many words, rather implied that our government has handled the problem of national research with more courage and on more satisfactory lines than did that of the Germans. While we agree that the course followed here since 1915 was the best in the circumstances, we are emphatically of opinion that this is only true in consequence of past errors; that the idea inspiring the memorandum of v. Humboldt, quoted by Sir Frank Heath, is correct, and that the system of the German government was in principle thoroughly sound.

The German ruling caste appreciated the importance of scientific knowledge a century before ours, and conceived that the best way to foster research was to create a number of adequately equipped university departments; they believed that the multiplication of opportunities for disinterested investigation would lead to the production of trained minds capable, in Sir Frank Heath's words, "of extending the powers and capacities of man in relation to the world in which he lives." They had their reward; all that scientific ingenuity and foresight could do to safeguard the Teutonic hegemony was done there was no need of hasty improvisations. The German state system has perished in scenes of death and disaster, but of the many crimes and blunders committed by its makers, the neglect of science is not one. In this country, generations of neglect have compelled us to adopt in our hour of need an expedient which would not have found a single defender if proposed as a normal method of evolution. The courage of the government in 1915, which Sir Frank Heath extols, was the courage of despair; we could not then, we can not now, escape the penalty of a hundred years' sloth. It is too late to build from the ground on the German model, but we need not pretend that we have discovered for ourselves a better model, but should, with humble and contrite hearts, try gradually to improve our temporary structure into something like a real university system, keeping it free from such defects and abuses as in Germany that system revealed in practise; of these the worst was the prostitution of scientific appointments and scholarly reputations to the uses of political propaganda. —*British Medical Journal.*

SCIENTIFIC BOOKS

Bastardierung als Ursache der Apogamie im Pflanzenreich. Eine Hypothese zur experimenteller Vererbungs- und Abstammungslehre. By ALFRED ERNST, professor of botany in Zürich. Jena, Fischer. 1918. Pp. 650, with 172 figures and 2 plates.

The ultimate practical aim of the theory of mutation is avowedly to discover the means of producing new qualities in plants and animals at will and in arbitrarily chosen directions. Some investigators assume that one of the chief causes of mutation is to be looked for in crossing, whereas others think that crosses are far too rare in nature to have had any appreciable effect in the production of species, except for the polymorphous genera. Obviously the best way to decide between these two opinions is to study the influence of hybridizing on the origin of a new character. The author of this book has attacked this problem from a special side, proposing to try to induce a definite character, viz., apogamy, or the production of seeds and spores without fecundation, by means of artificial crosses. The book does not bring any new results, but a collection and discussion of the facts, available for the choice of the material and the method of experimentation to be used.

From this point of view it may be commended to the student of rich questions. It gives a full description of all known cases of apogamy, including algæ and fungi on one hand, *Marsilia, Antennaria, Alchemilla* and