out the characteristic features of the subject with the utmost faithfulness; the topics range from thunderstorms to valley formations, and through a great variety of field and garden forms of life. Amongst such a feast of good things it is invidious to select, but we may mention the articles on British carnivores and rodents, on the grasses and sedges, on the "cryptozoic" fauna, and on certain British trees, as among the most attractive. The physiographical papers by Dr. Lockyer, Mr. M. Duncan, and the late Mr. Lomas are of great interest. No more fascinating work could be easily suggested that would appeal to the eye with such success as this volume does, and though the text is of unequal merit, it has throughout the advantage of being the work of trained observers in the field.

(3) By this new volume of Prof. Farmer's "Book of Nature Study" the student is introduced to plant life. The headings of the first four chapters seem to us remarkably chosen. They may be summarised thus:—Seeds and seedlings, the bud and its growth, vegetative methods of reproduction, the importance of hairs. Surely this is a very inadequate and unequal manner of treating the subject. Miss Laurie has, however, described the objects under discussion well, and the illustrations are good. May we point out that two of the experiments could not be got to work as described and figured? An incompletely described experiment is worse than useless in an elementary book. On p. 40 (Fig. 29) carbon dioxide would enter by the lower edge of the bell-jar, and thus vitiate the experiment. One inch of water is, of course, needed. Fig. 30 (p. 50) represents an experiment which even the author would find physically impossible to set up in the manner described. Sufficient stress, furthermore, is not laid on the fact that all parts of the plant breathe. On p. 56 the storing function of the stem is not referred to. We must, in fact, state that the four chapters give one an inadequate idea of plant life. Prof. Lang's chapters on some flowering plants require no comment. We have here a few flowers, or, rather, complete plants carefully described. The types chosen are readily obtained, and thus every student can have a living plant by his side when working through the descriptions in the book.

RESEARCHES AT THE NATIONAL PHYSICAL LABORATORY.

VOL V. of the Collected Researches of the National Physical Laboratory, which has recently appeared, consists of reprints of thirteen memoirs emanating from the laboratory, and extends to 266 pages. Engineering subjects are answerable for about eighty of these pages, while the rest are about equally divided between electricity, metallurgy, and cosmical physics.

Of the engineering memoirs that dealing with wind pressures is of great importance. By experiments on plates and on lattice-work structures, both in natural winds and in pipes within which a uniform flow of air was maintained, it is shown that the pressure is proportional to the square of the velocity, and further, that the actual pressure on a lattice-work structure when exposed to the wind may be found by observations taken on a small model placed in a pipe through which a uniform current of air is flowing.

A second memoir of interest to engineers is that on a new fatigue test for metals. The material tested is in the form of a ring, which is kept rotating about its own axis under pressure by means of three rollers which bear on its outer surface. Under a

test of this kind the superiority of nickel steel rails for railway work is well brought out.

In the electrical section, one of the most important memoirs deals with the history of the standards of electrical resistance kept at the laboratory. The ultimate standards are of mercury in glass, and were first set up in 1902. They show no change in the interval, but many of the secondary standards have increased in resistance by a few parts in 10,000 since they were constructed, some ten, others twenty, years ago. Some of the secondary standards have, however, proved more satisfactory, those of platinum, some of those of platinum-silver, and some of the manganin ones, appearing to be unchanged.

As the result of a comparison of the new electric current balance of the laboratory with the standard ampere balance of the Board of Trade set up fourteen years ago, it appears that the two agree to within 1/100th part of 1 per cent.

In the metallurgical department the alloys of lead and tin have been investigated in considerable detail, both thermally and microscopically, and the eutectic found to be 37 per cent. lead, 63 per cent. tin. A new method of determining the phosphorus in phosphor tin has been also worked out, and promises to be both shorter and much more convenient than the older methods.

Only a portion of the work of the department which deals with cosmical physics is recorded in this volume. This portion consists of a discussion of the magnetic declination as recorded at Kew during the years 1890-1900 in the light of, or, rather, the obscurity provided by, the multitude of theories of terrestrial magnetism now in the field. It is shown that the records are incompatible with any theory which regards magnetic disturbances as directly dependent on the area of the sunspots visible at the time. From the report of this department we note that at Kew the mean declination during 1908 was $16^{\circ} 16' W.$, the mean dip $67^{\circ} 1' N.$, and the mean horizontal force 0.1852 c.g.s. units. By the end of the present year it is hoped that the new observatory at Eskdalemuir will be in full working order, many of the recording instruments being already installed.

From this short summary it will be seen that vol. v. is well worthy to rank with its predecessors, as a contribution to science of which the nation may feel proud.

C. H. L.

JOHN REID, 1809-1849.

UNDOUBTEDLY 1809 was an *annus mirabilis*. Nineteen hundred and nine is, therefore, the hundredth anniversary of the birth of certain great ones in letters, in politics, and in science. Several epoch-makers have their statues in the intellectual Valhalla of the nation, but it would not be well if we allowed the statues on their pedestals to make us overlook the busts in the smaller niches. One of the busts in the Hall of Shades is that of the Scotsman, John Reid, born April 9, 1809, the son of a cattle-dealer, dying July 30, 1849, Chandos professor of anatomy and medicine in the United College of St. Salvador and St. Leonard in the University of St. Andrews. Forty-nine years only intervened—they were filled with the activities of a strenuous Scottish character.

John Reid, the sixth child of Henry Reid and Jean Orr, his wife, was born in the little town of Bathgate in Linlithgowshire, the same in which two years later James Young Simpson, the epoch-maker, first saw the light.

From his native parish school, Reid passed, at

the age of fourteen, to the University of Edinburgh. In 1824 he entered for the classes of humanity and Greek; in that year "Richard Owen, Lancaster," was a fellow-student. In 1825 Reid "signed on" for the class of chemistry, and thus entered the faculty of medicine; two years later, "James Simpson, Linlithgowshire," did the same thing. In 1825 the third Munro was in the chair of anatomy, which he was to occupy for forty-eight years, and William Pulteney Alison in that of the "Institutes of Medicine," a subject he taught from 1821-42. From the former, Reid got the least, from the latter the most, inspiration which as a student he received from his teachers.

Early in his studies, Reid showed a preference for anatomy and physiology, and as these formed part of the one and "final" examination for the degree of M.D. (there being no M.B.), Reid dissected from the beginning to the end of his student days. He graduated on August 7, 1830, his Latin thesis being "De aneurismate."

Reid was, therefore, dissecting during 1827 and 1828, the very years in which the Burke and Hare murders were committed. It is believed that "the rooms" both at the University and at Dr. Knox's (Surgeons' Hall) were supplied by the miscreants just named.

His parents had hoped that Reid would study for the Church of Scotland; after having graduated, he himself thought of a surgeonship in the Royal Navy; but neither the Church nor the Navy was to have him whom Science had marked for her own.

Early in 1833 Reid received an invitation from Dr. Knox to become his assistant at Surgeons' Hall, so large had the classes there become. Prof. Monro's dullness had driven the majority of the students over to Knox's rooms. For three years Reid demonstrated for Knox, and so laid for his subsequent physiological researches that surest of all foundations—a sound knowledge of human anatomy. For the session 1835-36, John Reid was one, and J. Y. Simpson was the other, of the presidents of the Royal Medical Society, which presidentship has always been regarded as the "blue ribbon" of the Edinburgh Medical Societies.

Towards the end of 1836, Reid received a most gratifying invitation to succeed Dr. Fletcher, lately deceased, as extra-academical lecturer in physiology. The requisition was signed by no fewer than eighty-six persons, one of them being later the well-known writer on physiology, Dr. W. B. Carpenter, of London University. They asked him to accept the lectureship, for, by so doing, they said, he would "increase the reputation of this city as a school of medicine." "The zeal and success with which you have hitherto prosecuted physiological investigations being already well known to the public," Reid replied to this flattering invitation in the most modest way, and immediately consulted Prof. Alison. Alison not only advised him to take the step suggested to him, which virtually transformed Reid into Alison's own rival, but he proposed him for the Fellowship of the Royal College of Physicians of Edinburgh, into which learned body he was admitted on October 4, 1836.

During 1835 and 1836 Dr. Reid published papers upon obliteration of the vena cava superior at its entrance into the heart; phlebolites; peculiarities of the foetal circulation; monsters; mesenteric glands in the whale; transposition of abdominal viscera; venisection relieving the heart; and the anatomy and physiology of the heart.

During the next two years Reid carried out the most important of his experimental researches—

namely, that into the functions of the ninth, tenth, and eleventh pairs of nerves. Hughes Bennett tells us in his "Memoir" that between 1836 and 1838 he performed upwards of one hundred experiments on animals in order to unravel the functions of the so-called "eighth pair of nerves." A copy of this paper lies before me; it extends to sixty-two octavo pages, and consists of a thorough investigation into the activities of the glossopharyngeal, the pneumogastric, and the spinal accessory nerves. After giving a full account of the French, German, and Italian literature accessible to him, he details the experimental procedures employed to arrive at an understanding of the functions of the many branches of these three great nerve-systems. When we consider the technical difficulties under which he worked, having no stimulus more satisfactory than the galvanic current or chemical or mechanical irritation, no anæsthetics other than prussic acid and morphia, and the knowledge of no procedures known as antiseptic, we are amazed that he discovered so much and of so elusive a character. This work on the nerves was his *magnum opus*, probably the last important piece of work in physiology anterior to the introduction of the stimulus of the "interrupted current" from the laboratories of Germany. It is curious to notice the absence of tracings in the paper; Reid was the last pre-graphic physiologist in Scotland. Amongst other things long since fully corroborated, Reid showed that the heart had the double innervation through the vagi and the sympathetic. He came within a very little of discovering the cardio-inhibitory functions of the vagus. The memoir was published in full in the *Edinburgh Medical and Surgical Journal* (No. 139), but an *épitomé* of it had been read at the Liverpool meeting of the B.A. in 1837.

One or two paragraphs from this admirable paper are worth quoting in the light of to-day:—"It may appear to some that I have repeated many of these experiments with unnecessary frequency and a wanton sacrifice of animals, but I naturally felt diffidence and distrust in the accuracy of the results I obtained when opposed to those of more experienced observers, and it was only after repeated and careful examination of the phenomena that I could feel myself justified in calling these in question. It is also sufficiently obvious that nothing is more injurious to the progress of science than hasty and partial observations, and I was anxious to avoid . . . adding to that mass of conflicting evidence which there is already so much reason to deplore."

"It is obvious that, without the aid of active and intelligent assistants, it would have been perfectly impossible to have proceeded with such an investigation."

It is interesting to us to be told that one of these assistants was Sharpey.

Had Reid lived only a little longer, so as to have used the DuBois' Inductorium, he would unquestionably have discovered much more; the pity was, he had to cease working "in the rich dawn," physiologically speaking, "of an ampler day."

In 1838 he was appointed pathologist to the Edinburgh Royal Infirmary, and a year later superintendent of the Pathological Department. As the result of his observations at this time, he compiled "Tables of the Weights of some of the most important Organs of the Body at different Periods of Life" (published 1843). In 1839 he brought out a paper, "On the Effect of Lesion of the Trunk of the Ganglionic System of Nerves in the Neck on the Eyeball."

Dr. Reid had unsuccessfully contested first the chair of medicine, and later the chair of anatomy in the

University of Aberdeen, but in 1841 he was unanimously elected to the Chandos chair in St. Andrew's. In the same year he published his important paper, "On the Relation between Muscular Contraction and the Nervous System," whereby he made a contribution to a controversy then already quite a century old—as to whether the irritability of muscle was or was not "inherent." The great Haller had taught it *was* inherent (the "vis insita"). Robert Whytt, professor of medicine at Edinburgh just a hundred years before Reid's time, had been a strenuous opponent of the doctrine of inherent irritability. Follow-Boerhaave, the leader of the Batavian school, who had trained so many of the professors of Edinburgh, Whytt considered that his experiments confuted the opinions of Haller. When Reid took up the subject in 1834, it was still a controversy.

Reid, using frogs, demonstrated:—

(1) That the muscle of a nerve-muscle preparation, fatigued by stimulation through its nerve, could still contract when it was stimulated directly.

(2) That a muscle, the nerve of which had been cut, would not waste away, provided it was "daily exercised by galvanism."

He even then pointed out the now obvious therapeutic application of this latter fact. His position was: irritability is indeed inherent, but the muscle must be constantly in use in order not to suffer from "dis-use atrophy."

Amongst his collected papers we find one "On Sensational and Emotional Reflex Actions," from which we may conclude that Reid had grasped the essence of the conception of reflex action in such a way as to see that the presence of consciousness need not make the action any the less truly "reflex."

After going to St. Andrews, Prof. Reid published two long papers on the epidemic of fever in Edinburgh in 1836. He began to study the marine biology of the bay, and papers on polyps, molluscs, and medusæ were, between 1844 and 1847, communicated to the "Philosophical Society of St. Andrews," a society still existing.

In 1844 John Reid was married to Miss Ann Blyth, of Edinburgh. Their two sons died in infancy; their two daughters died before their twenty-fifth year; his widow, who was married to a Mr. Foster, survived him more than forty years.

Prof. Wilson, his biographer, describes Reid's appearance in these words:—"Tall, with a strong figure, diminished in height by a stoop acquired by so much bending over books, dissections, and microscopes, his complexion fresh and even ruddy, his forehead expansive, his eyes small, but of a bright black; his hair, which matched his eyes, was worn long."

By August, 1848, it had become evident that Reid was suffering from cancer of the tongue and throat. On August 31, at Prof. Simpson's, 52 Queen Street, Edinburgh, John Reid underwent an operation at the hands of his friend, Mr. (later Sir) William Ferguson; Goodsir, James Duncan, and Hughes Bennett (his old pupil) assisting. On November 29 a second operation was considered necessary; this was carried out at Prof. Goodsir's, 55 George Square, by Duncan, Spence, and Goodsir. For a third time (January 1, 1849) did poor Reid submit to the knife; he warned them about admitting air into the veins of the neck; they could not have forgotten that he had written on "Death by Admission of Air into the Venous System." Doomed at forty, Prof. Reid, after visiting Keswick and Innerleithen, returned for the last time to his house in North Bell Street, St. Andrews (now re-named Greyfriars Garden). On his death-bed he collected all his published papers in a large octavo of 659 pages. He had the courage to

review a work by Hughes Bennett on "Cancer." His sufferings were extreme: morphia and the newly-discovered chloroform alone could assuage them. The end came none too soon on July 30, 1849.

In the "Life of John Reid" (Edinburgh, 1857) Prof. Wilson tells us that he attended the funeral on a "singularly bright and beautiful day."

We who know the old city have seen such days, rare indeed, but memorable in their rare beauty when they come. We can so well picture the sad, slow procession from the Town Kirk to its goal within the ruins of the noblest of Scottish cathedrals; there, amongst green graves, they laid John Reid to rest where the murmur of the everlasting sea makes moaning music through the roofless fanes.

Scotland has produced greater anatomists, pathologists, zoologists, and physicians than was John Reid, but I question whether, having regard to the limitations of his scientific environment and to the imperfections of the methods and of the technique with which he worked, anyone would undertake to deny his right to be considered one of the most original and prescient physiologists of purely Scottish birth and training.

I venture to believe that in this year of centenary commemorations no man of science will grudge John Reid his own.

D. FRASER HARRIS.

NOTES.

THE collection of fossil Brachiopoda formed by the late Mr. J. F. Walker, of York, has been presented to the British Museum (Natural History) by his executors, Mrs. Walker and Mr. Gelson Walker. It consists of several thousand specimens arranged in groups to illustrate the variations of species and the gradation of several so-called species into each other. It therefore supplements the Davidson collection, which was bequeathed to the museum in 1885. It is especially rich in material from the English Jurassic and Cretaceous formations, to which Mr. Walker devoted much attention; but it also contains important series of specimens from other English strata, besides several small collections for comparison from the European continent. The greater part of the collection will be kept for reference in the original cabinets, but more than a hundred important specimens, described and figured in Davidson's "Monograph of the British Fossil Brachiopoda," will be placed in the exhibition cases of the public gallery.

MR. W. R. BOELTER writes to urge the institution of a people's "Arbour Day" in October for the purpose of planting fruit trees along roadsides as they are in some parts of Germany. From a report issued by the Minister of Agriculture of Saxony it appears that the department in charge of these trees made a profit of 12,000l. during 1908 from a countryside corresponding to our Black Country. As, however, the system of road maintenance in Germany differs completely from that followed in England, similar success can scarcely be anticipated here, where the roads are controlled by numerous district and county authorities. Farmers object to trees on the roadside near arable land, and road surveyors in general dislike trees, because the highway does not dry up well under them after rain. Even when permission has been obtained to plant fruit trees along roadside waste in some districts, it will be necessary to appoint officers whose duty it is to protect the trees and promote their satisfactory growth. We are afraid that few local authorities are likely to add to their responsibilities by undertaking the care of young trees along the roadside, much as we are in sympathy with Mr. Boelter's suggestion.