school. For example, one teacher of girls proposes to show by furnace and acid that chalk gives off a definite quantity of gas. This seems to me appropriate for an advanced university student, but is not the thing for schools at all.

Experiments to show the indestructibility of matter have this advantage, that you must begin with some matter, and that you must have some appliances on both of which the inquiring mind may feed. But as to where the matter goes to is another matter, and as to what the measurements are all for, you might as well be noting them during the progress of a pantomime.

The same criticisms apply to physiology and botany. It is said we cannot properly study the stomach without a preliminary of histology. If so, they cannot be approached in schools, for histology is a late science and is vain and empty to pupils. The microbes of false ideas are thick in it. But Harvey knew no microscopical histology, and yet he was not altogether a fool. I find boys and girls of fifteen and sixteen studying the alternation of generations in a phanerogam, and not only the nutrition but the respiration of plants. Surely this is pushing on to modern methods with a vengeance. But is there anything gained in development of faculty? Can they *observe* these things, or do they trace a dim something which they are told are there, and recognise them with the wild delight of an irresponsible original researcher? It is the delight of a child who has jumped six feet high with just a little assistance. An independent mind rejects all this and begs for a little exercise in kinds of knowledge which you will find well represented in Pliny.

When we turn back to the books of study which we read as boys of fifteen and sixteen in the times when the ambition to kick a goal or vault ten feet was so strong and so easily ousted other ideas, how many very important laws we find which we then read and now for the first time *know*. I can remember the time when I tried to wake a class to the importance of Boyle and Charles's laws, and I can also remember the time when I remembered that my own old master vainly tried to wake us to it. The result in neither case was thanks, and it was the teachers who were wrong, not the pupils. We do our best, but we are vastly wrong, and we inflict many injustices by force of punishment just as in the old *régime* they broke the rulers over our fathers' shoulders in teaching them practical prosody. A little study of history will lessen this injustice.

At the same time we must distinguish essential historic progress from mere accidents of time. I should be sorry to exclude hydrogen explosions absolutely. JAMES SUTHERLAND.

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Abbe's Optical Theorems.

IN the article, "Optical Science" (NATURE, p. 203), as well as in the preface to Prof. S. P. Thompson's translation of Lummer there mentioned, regret is expressed at the neglect in English text-books of Abbe's contributions to optical theory.

Will you allow me to remark that statements and proofs of Abbe's theorems will be found in §§ 205*b*-205*f* of the 1899 edition of my "Deschanel, Part iv." They occur in the chapter on "Systems of Lenses," and are based on careful study of the writings of Abbe and Czapski.

Ealing, January 9. J. D. EVERETT.

Fireball in Sunshine.

ON Sunday, January 6 last, at 0h. 52m. p.m., a brilliant fireball was seen by many observers in Scotland. The sky was clear and the sun shone brightly at the time. The meteor was observed from Whiteinch Park and Great Western Road, Glasgow, flashing across the north-western sky, and resembling a rocket with a long streaming tail. One correspondent at Glasgow says it travelled from the north-east to west, and that in colour it was like reflected sunlight. Another writer describes it as being of considerable size, "the fiery mass being as large as a bowling ball with a glowing red tail attached." At Killearn, N.B., the object passed from N.W. to W.N.W., and was about 12 degrees above the horizon at the time of its disappearance. It traversed a path of about 20 or 25 degrees, during which it fell about 5 degrees. The radiant of the meteor was probably in Auriga, Perseus, or Aries, so that it belonged to a different system from that which furnished the brilliant daylight fireball of January 9, 1900 (NATURE, January 25, 1900). W. F. DENNING.

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Air and Disease.

IN these days of fresh-air treatment, some of your readers may be interested in a quotation from Palladius "On Husbondrie," an early fifteenth century MS. originally in Colchester Castle.

"The longe-woo," says that writer, "cometh ofte of yvel eire," *i.e.* lung-woe or consumption comes often of bad air. The whole verse describes the effects by which you may know bad air or water, and is, perhaps, worth quoting in its entirety.

> "The longe-woo cometh ofte of yvel eire,
> The stomake eke of eire is overtake,
> Take heede eke yf the dwellers in that leire
> Her wombes, sydes, reynes swell or ake,
> If langoure in thaire bledders ough' awake.
> And if thoue see the people sounde and faire,
> No doubt is in thy water nor thin aire."

Thus we are told that both lungs and stomach are affected by bad air and that, to detect bad air or water we are to see whether the inhabitants have aches in stomachs, &c.

The importance attached so early to air and water may, I think, prove worth mentioning, as it is not what most of us would expect. I came across the passage in turning over the leaves of Lodge's edition of Palladius, published by the Early English Text Society. HAROLD PICTON.

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RECENT ADVANCES IN THE GEOLOGY OF IGNEOUS ROCKS.

THE closing years of the nineteenth century witnessed a revival of interest in the petrology of igneous rocks, which must be regarded as marking an important stage in the development of that subject. Much detailed work, especially in the laboratories of German universities, during the three or four decades preceding had already accumulated a large body of information; but that work had been confined in great measure to the strictly descriptive side of the science—in short, to what is properly described as petrography—and some of it fell rather into the domain of mineralogy and physical optics than of geology. The value of such a store of material cannot be overestimated; but any tendency which promises to shape it into a connected system must be welcomed by geologists as the breath of life animating the valley of dry bones. Such a movement is undoubtedly felt at the present time, and may perhaps be held to mark the transition in petrology from the stage of observation to that of generalisation. An igneous rock has come to be regarded, more constantly than before, not merely as a mineral-aggregate, but as the product of consolidation of a molten rock-magma; and consideration has been directed to the constitution of such magmas and the conditions governing their consolidation. Recognition of the importance of studying the mode of occurrence of igneous rocks and their relations to one another has led to a closer union of observation in the field with research in the laboratory. Much is being learnt concerning the geographical distribution of the rocks, their connection with crust-movements, and the sequence of eruption of different types at a given centre. The facts thus acquired, and especially the fertile conception of "petrographical provinces," each with its suite of igneous rocks having a community of characters which bespeaks a common origin, have confirmed the conviction that widely diverse rock-types may be evolved from a common parent-magma. Hence arises the problem, to which Brögger and others have boldly addressed themselves, of the processes by which such "differentiation" is effected and the conditions which control them. Hence, too, another problem, a corollary to the former, to frame a natural classification of igneous rocks, based on genetic principles, to supersede the provisional classifications on various artificial or Linnæan schemes which are at present current. The questions involved obviously present great difficulties, and petrologists would be the first to admit that some of