Letters to the Editor.

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Biographical Byways: Dr. S. P. Langley.

I REGRETTED to see Sir Arthur Schuster's article in NATURE of February 7 presented so unpleasing a picture of my old chief, Dr. S. P. Langley. Like some other great men I have met, his character had blemishes, and, as one of Sir Arthur's anecdotes indicates, it was surprising to see in so great a man such care to preserve the appearance of dignity which he thought properly attached to his office and his attainments. If he had been as careless of it as Lord Kelvin, dignity would have wrapped itself about him like a cloak, crowned with the mantle of lovableness, which, to his intimates, Langley surely possessed. One is reminded of the Scripture saying: "He that loveth his life shall lose it."

In regard to the eclipse of July 29, 1878, Sir Arthur Schuster's recollection is contradicted by Langley's own account. Prof. Cleveland Abbe, indeed, was carried down on account of sickness, but Langley, though at first ill, remained at the summit of Pike's Peak, observed the eclipse, sketched the corona to 12 diameters, and his report and sketch is to be found in the publications of the U.S. Naval Observatory (Washington Observations, 1876, Pt. 2, vol. 23, pp. 203-10).

As a pioneer, Langley has to his credit the great forward step that he took in the spectral study of the energy of radiation of the sun, the moon, and terrestrially heated bodies. He was the founder of modern methods in this branch of science. Also, he lent his prestige to rescue from the domain of ridicule the subject of mechanical flight, and investigated at great length, with novel devices, the reactions of moving surfaces in the air. On the basis of these experiments he accomplished prolonged steady flight of quarter-sized engine-driven mechanical models, about eight years before the first human flying with power-driven aeroplanes took place. Except for bad judgment in shooting his larger machine from a house-boat, instead of allowing it to take off gradually as was proposed, engine-propelled human flight would have been made several years before it actually occurred. The blemishes of such a man ought not to blind us to his greatness.

I am happy, however, to be able to soften the implication of the final anecdote of Sir Arthur Schuster. He got the quotation, I suppose, through several mouths, and it is not accurate. When I was about to start on my first expedition to Mount Wilson, in the year 1905, Dr. Langley came to my office to talk over the plans. Months earlier we had discussed his value of 3 calories for the solar constant, and he was nearly convinced, I believe, that it had been based on an error of logic in the reduction of the Mount Whitney observations. Yet he did not desire to publish a retraction, for, as he said, "Mr. Abbot, I did that work when I was at the height of my powers. Now that I have been long out of the field, I am not more competent than I was then to reason upon it." He paused a moment, and added with a twinkle in his eye: "As the witty Frenchman has said, 'What has posterity done for us that we should care so much for the opinion of posterity?'"

So, when we finished our interview in April 1905, it was rather in the nature of good-natured chaffing than in the nature of an order when Langley said to me: "You will, of course, bear in mind that it is rather the *variation* of the sun that you are going to measure than the absolute value of the solar constant." The twinkle came again into his eye, as he continued: "In fact, Mr. Abbot, I might add that for me the best value of the solar constant is that which nearest approaches 3 calories!" and, as he always did when he had said a good thing, he turned quickly and almost ran away. It was the last time that I saw Dr. Langley alive.

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Passivity of Iron and other Metals.

IT is well known that the principal metals which show the phenomena of passivity are chromium, manganese, iron, cobalt and nickel. These elements have this in common that they form divalent ions, and that while possessing electrons, on Bohr's theory, in the 4th-quantum orbit, their 3rd-quantum orbits are incomplete. My view is that these elements when in the active state have each two electrons in the 4th-quantum orbit, and that they become passive when one of these electrons is removed to a 3rd-quantum orbit. This implies that the usual chemical and physical agencies which make an active metal passive or a passive one active, merely, in some way, induce these electronic changes. It is for the physicists to say if this be possible. There is, however, no *a priori* objection to this view since transitions between 3rd- and 4th-quantum orbits of these elements are known to occur readily. I do not suppose a suggestion of this kind will explain the whole of the phenomena of passivity, which is admittedly complex, but I offer it as a contribution towards the explanation of the more obvious phenomena.

Very few determinations of the electrode potentials of metals in the passive state have been published, and some workers have doubted if such determinations have any significance. I have found a simple way of preparing and keeping metals permanently in the passive state, and of comparing their electrode potentials with those of metals which do not show passivity. This consists in obtaining metals two at a time in mercury and comparing their powers of reducing solutions in sulphuric acid of uranyl sulphate, ferric sulphate, potassium permanganate and other oxidising agents. I find the order of the potentials of the metals in mercury is (proceeding from electro-positive to noble metals and including only those relevant to this discussion): zinc, cadmium, thallium, tin, lead, copper, manganese and iron, bismuth, cobalt, mercury, nickel and platinum. The order of these metals seems quite definite. It is the same whatever oxidising agent be reduced, whether the solutions be hot or cold, whether sulphuric or hydrochloric acid be employed, and whatever other metals are present in the amalgam. The order of potentials of metals in the free state is known to be: manganese, zinc, iron, cadmium, thallium, cobalt, nickel, tin, lead, copper, bismuth, mercury and platinum. A comparison of these two lists shows that only the metals known to show passivity fall out of order. The simplest inference is that the passive state is a quite definite condition, and that it is produced and maintained when the metal is amalgamated. This is consistent with Lambert's discovery that pure iron is a noble metal when its surface is electrically neutral.

The ions of these passive metals, however, do not behave as if they were the ions of noble metals. For example, ions of tin, lead and copper, but not of