rather as unhealthy accretions. At the same time, the author, following Gauss, has failed to recognise the extreme diffidence with which Laplace put forward his hypothesis. By many, the caution and reserve with which Laplace accompanied his suggestions will always be regarded as a model of good taste and evidence of a correct scientific attitude.

The New Hygiene. By Elie Metchnikoff. Pp. viii+104. (London: William Heinemann, 1906.) Price 2*s.* 6*d.*

THIS little book contains the three Harben lectures delivered by Dr. Metchnikoff at the Royal Institute of Public Health last year, an appreciative preface being contributed by Prof. Ray Lankester. The "Hygiene of the Tissues" is the title of the first lecture, and in it the phenomenon of phagocytosis is discussed at some length, and since this fact is considered to be the principal means of defence of the body against the invasion of microorganisms, and since such drugs as alcohol, opium, and many others impede phagocytosis, it is concluded that their use should be avoided or limited in the treatment of disease, and certain substances such as blood serum and salt solution, which stimulate phagocytosis, employed in certain circumstances. In the second lecture, on the hygiene of the alimentary canal, the evil effects of parasitic organisms are dealt with, and the use is advocated of sterile food so far as is possible. The third lecture deals with hygienic measures against syphilis, and the use of inunction of mercurial ointment as a prophylactic against infection detailed. The book is of extreme interest, and one that should be widely read by the educated public.

R. T. H.

Synopsis of Mineral Characters. Alphabetically arranged for Laboratory and Field Use. By Ralph W. Richards. Pp. v+97. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1907.) Price 5*s.* 6*d.* net.

THE title of this convenient pocket-book serves to define its scope. Emphasis is laid upon crystal form, habit, system, cleavage, hardness, fusion, and solubility in hydrochloric or other acid. Definitions of mineral terms and of rocks associated with the minerals included are also provided. The arrangement of the matter makes reference to the book easy.

LETTERS TO THE EDITOR.

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Anomalous Dispersion and Ionisation

MY criticism of Mr. Schott's interesting experiment (NATURE, March 14, p. 461) was due to my carelessness in reading his brief account. I failed to notice the words "and the tube" in his description of the battery connections, which fact, together with the low voltages which he used, gave me the impression that he employed the current to heat the wire, the ions being derived from the hot metal.

The experiment as actually performed is of considerable interest. Everything depends upon just what is meant by "the dispersion is completely annulled." I infer that the oppositely curved branches of the spectrum move back into the original straight line, but nothing is said as to whether the gap caused by absorption is filled in. The dispersing power of the sodium tube depends upon the density gradient of the sodium vapour, as we pass from the floor to the roof of the tube. Anything which interferes with this will alter the dispersion. If the discharge stirs up the vapour and renders it homogeneous over each cross-section of the tube, the dispersion will be annulled, while the absorption will remain. The nature of the action going on in the tube can probably be learned by looking through the tube at a bright sodium flame, or a gas flame provided with a blue screen which transmits only the region 4600–4900. It will be found that the upper portion of the tube is fairly transparent to the radiations, while the vapour along the floor is quite opaque to them. The effect of the current on the transparency at different levels should be noted.

There has always appeared to me to be some mystery about the behaviour of sodium vapour in highly exhausted tubes, for it is difficult to see how equilibrium can exist between the dense vapour along the floor and the nearly perfect vacuum along the roof. In the light of recent experiments which I have been making, I now believe that I have found the solution of the apparent difficulty. The actual density of the vapour along the floor has in all probability been over-estimated. It is usual to exhaust the tubes to a pressure of a millimetre or two. In all probability, pure sodium vapour at two millimetres pressure is what we should call a very dense vapour (considered optically). Suppose, now, we heat the floor of the tube to the temperature at which the vapour pressure of sodium is equal to the pressure of the residual gas in the tube. The density of the sodium vapour considered alone (partial pressure) will depend upon the rate at which it can diffuse through the residual gas to the cooler roof of the tube. If the sodium vapour is given off from the molten metal more rapidly than it can diffuse away, we may have pure sodium vapour at the surface of the metal, and mixtures of sodium and hydrogen in decreasing proportion as we pass upwards towards the roof, the total pressure being the same at every point, however. If this is the true state of things, the dispersing power of the tube would disappear if every trace of the residual gas was removed. I intend shortly to test this point. I have already found that in the long steel tubes such as are used in observing the magnetic rotation of the vapour, the density of the sodium vapour is greatly increased by the admission of hydrogen or air. In this case the central portion of the tube is uniformly heated with an electric oven, and the sodium distils away to the cooler portions. The presence of hydrogen or nitrogen hinders this process, the gas holding back the sodium vapour, so to speak, and allowing it to acquire a density, or rather pressure, equal to its own.

This way of looking at the state of affairs in the tube may prove helpful in explaining the interesting effects observed by Mr. Schott, whose further experiments I shall follow with interest.

R. W. WOOD.

Baltimore, April 2.

Positive Streams in "Crookes" Tubes.

REFERRING to the abstract of Mr. F. W. Aston's very interesting paper read before the Royal Society on December 13, 1906, "On Experiments on the Length of the Kathode Dark Space with Varying Current Densities and Pressure in different Gases," published in your issue for April 11 (p. 574), may I point out in reference to the therein contained statement that "the stream of positive ions may be strikingly shown by a rotatory mica mill mounted inside the dark space which rotates violently in the opposite direction to the familiar ones designed to show the motion of kathode rays away from the electrode," that in my two papers "On the Circulation of the Residual Gaseous Matter in a Crookes' Tube," read before the Physical Society, and published in the *Philosophical Magazine* for October, 1898, I showed similar results, *i.e.* that mica mill wheels which turned in one direction under kathode-ray bombardment, turned in the opposite direction when so placed as to be just outside of the stream of kathode rays, thus indicating a current of particles proceeding towards the kathode, which particles I found to be charged positively?

These results, as stated in my first paper, could only be obtained with extremely high vacua, when no doubt the mica mill wheels were inside the dark space, as is found necessary by Mr. Aston.

A. A. CAMPBELL SWINTON.

66 Victoria Street, Westminster, S.W., April 13.