

within any one of a number of ranges lying in the vicinity of  $2\mu$ ,  $2\mu/2$ ,  $2\mu/3$  . . . , where  $\mu$  is the natural frequency of the system.

Further investigations upon this and other allied subjects appear in seven subsequent issues of the *Philosophical Magazine*. As regards the forced oscillations discussed in the *Quarterly*, the author gives, in the way of experimental verification of his mathematics, the following:—the influence of the disturbing motion becomes feebler as  $r$  increases, but it may easily be observed experimentally in a number of cases. For this purpose suspend a load by means of a spiral spring, and attach to it a pendulum light compared with the load, but of such density that the air resistance is negligible; the pendulum being of suitably chosen period, it will be found that when the load is carefully adjusted the relative equilibrium of the pendulum in the vertical motion is unstable.

I believe the beauty and interest of the results obtained by Mr. Andrew Stephenson have not been generally realised, otherwise it is nearly certain that something more satisfying in the way of experimental demonstration of these oscillations than mere observation of "instability of equilibrium" in certain cases would have been put in the field. I think an experimentalist would hardly be pleased with anything less than the actual permanent maintenance of oscillations of the type mentioned, *i.e.* something similar to the experiments of Faraday, Melde, and Lord Rayleigh for the case of double frequency, which, as Mr. Stephenson points out, is only one particular case of his general theorem.

During the course of certain acoustical work which I have been engaged in during the last two years, I observed certain types of stationary vibration which I find are undoubtedly of the kind contemplated in Mr. Stephenson's paper. These observations were made with an apparatus from which any new effects were apparently hardly to be expected. The arrangement was the well-known one of a string maintained in vibration by a tuning-fork oscillating in a direction parallel to the string. It is generally supposed that the oscillations permanently maintained have a frequency which is half that of the tuning-fork. I found this was *not* always the case. With an electrically maintained tuning-fork the amplitude of oscillation of which could be readily adjusted, the stationary oscillation of the string had a frequency of  $\frac{1}{2}$  of, equal to,  $3/2$  times, twice, &c., that of the tuning-fork, each term in the harmonic series appearing separately by itself with a fairly large amplitude, or with one or more of the others conjointly, according to circumstances. The frequency- and phase-relations could be studied by several methods, most of which were very simple applications of the principle of Lissajous's figures.

The possibility of isolating the harmonics, and also certain serious discrepancies between theory and experiment as regards the phase of the oscillations in the case of double frequency, were traced to the existence of variations of tension in free oscillations of sensible amplitude. These variations of tension were experimentally demonstrated by a special form of monochord denominated the "Ectara" (*vide* the Journal of the Indian Mathematical Club for October, pp. 170-5), in which the sounding surface is a membrane perpendicular to the vibrating string, and emits a tone having *twice* its frequency.

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C. V. RAMAN.

#### Absorption-bands in Colourless Liquids.

IN the obituary notice of the late Dr. W. J. Russell, F.R.S. (*NATURE*, November 25, p. 101), whose genial friendship I enjoyed and with whom, when occasionally in London, I had friendly intercourse, it is stated that he had published "papers conjointly with Mr. Lapraik on absorption spectra, and notably one on the absorption bands in the visible spectra of colourless liquids, which was the pioneer paper in a branch of inquiry that has been ably followed up by Prof. Noel Hartley, F.R.S., Mr. E. C. C. Baly, F.R.S., and others." It seems ungracious to call in question the accuracy of this reference, and I feel, indeed, a great inclination to let it pass without comment, although it is incompatible with authoritative statements made elsewhere; but, inasmuch as the passage is liable

to be reprinted without question and repeated in other publications, I consider it would be better to invite the writer's attention to the Chemical Society's Transactions, xxxix., 153-68, 1881, "Researches on the Relation between the Molecular Structure of Carbon Compounds and their Absorption Spectra," and suggest that he should compare it with the paper which follows in the same volume, pp. 168-73, "On the Absorption-bands in the Visible Spectrum produced by Certain Colourless Liquids." Having done so, I think he will agree that not only is the latter not the pioneer paper, but also that there is very little in common between the two. In fact, the latter communication is more closely allied to the work of Abney and Festing in the infra-red region, a work to which the authors themselves make a special reference.

W. N. HARTLEY.

Royal College of Science, Dublin, November 30.

#### The Inheritance of Acquired Characters.

IN his review of Prof. Poulton's work, "Charles Darwin and the Origin of Species," Prof. Meldola says (*NATURE*, November 25, p. 92) that the Darwinian theory is absolutely dependent upon the truth of the belief "in the transmissibility by inheritance of individual differences or 'fluctuations.'" This is undoubtedly true. There is now available a vast amount of evidence tending to show that "fluctuations" seemingly the direct results of changes in the environment are inherited; but how is it possible to convince Weismann and his followers that such "fluctuations" have not been due, as they will say, to "spontaneous germinal variations"? Surely the *onus probandi* really rests with them!

We have here the question of the inheritance or not of acquired characters reduced to its simplest terms. There is much and very varied evidence to show the influence of changes in the environment in producing "fluctuations" which are heritable, but what evidence can those who disbelieve in the inheritance of acquired characters present to show that in all such cases there *must* be a primary germinal change?

H. CHARLTON BASTIAN.

The Athenæum, November 26.

#### Luminous Night Clouds and Aurora Spectrum.

ON the evening of Friday, December 3, there occurred a very brilliant display of luminous night clouds in rather peculiar circumstances. During the earlier part of the evening the sky had been clear, and no indications of an aurora were observed. About 10.15 p.m. the sky became completely overcast quite suddenly, and it was noticed that this appeared to be by general formation of haze *in situ*, and not by the drifting of clouds. Almost immediately after this numerous patches of light cloud appeared, travelling with considerable velocity eastward. From numerous previous experiences it was at once apparent that these were not ordinary cloud forms, and the moon was not high enough to account for their extreme brilliancy. Careful examination with a hand spectroscope confirmed the surmise that they were luminous clouds, the green auroral line being very bright and sharply defined; on several of the brighter masses other lines were suspected, but not sufficiently well to assign any position. These observations were confirmed by Mr. W. Moss. At about 10.45 p.m. the clouds gradually became less frequent, and the sky became clear again almost as suddenly as it had been overcast.

It will be of interest to hear if any magnetic storm has been recorded for this epoch. The surface of the sun has been in continued disturbance during the past week, as evidenced by the rapidly changing forms of numerous spots. One of the largest groups would be passing round the north-west limb.

CHARLES P. BUTLER.

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#### Coloration of Birds' Eggs.

SOME time ago I wrote a short letter asking for information about the colours of birds' eggs, which appeared in *NATURE* of May 14, 1908. I read the answer to my letter in a subsequent number of *NATURE*, which, unfortunately, did not appear to me to throw much light on the subject.

I would like to suggest that this colouring of eggs was in some way originally analogous to the change of colour observable in the chameleon and certain lizards, though by no means, at the same level of development. Although it is quite possible that the colouring in some cases is protective, or has become so, it does not seem that this is a fixed rule. Why should the egg of a starling, which generally builds on house-tops, be blue? The hedge-sparrow's, again, is blue, while the thrush's is blue spotted with black, and the blackbird's is green, though the position of their nests is vastly similar. Again, on examining the excellent "clutches" at the Natural History Museum which exhibit the additional cuckoo's egg, one is struck by the variation in shade, which, according to observers, is matched by the bird itself.

It seems to me that the elucidation of this problem would be of great value in such vexed questions as the inheritance

#### THE PROPHYLAXIS OF TROPICAL DISEASES.

THE history of tropical medicine, or what might be called its recent twentieth century renaissance, will go down to posterity as one of the most remarkable chapters in medicine. In a book entitled "Mosquito or Man? The Conquest of the Tropical World,"<sup>1</sup> Sir Rubert Boyce endeavours, in his own words, to epitomise this wonderful movement, a movement initiated in England by the then Secretary of State for the Colonies, Mr. Joseph Chamberlain, and by Sir Patrick Manson, a physician who had practised in the East, and had returned home imbued with the idea that the diseases of the tropics stood, so to speak, by themselves, and thus required special teaching in the medical schools of this country. The idea



FIG. 1.—Water-logged Anopheline Breeding Land, Belize. From "Mosquito or Man?"

of acquired characteristics, and might be really illustrative of the exact processes of evolution. R. L. LESLIE.

13 Electric Mansions, Brixton, S.W., December 1.

#### The Terminal Velocity of Fall of Small Spheres in Air.

At the recent Winnipeg meeting of the British Association we presented some results on the terminal velocity of fall of approximately spherical spores, which were not in agreement with Stokes's formula (see NATURE, October 14, p. 472). We have succeeded since in making minute spheres of paraffin wax, a certain black wax, and mercury, and have determined their terminal velocities over a wide range of sizes by the same method as in the preceding investigation. The velocities obtained for these spheres are in close agreement with Stokes's formula. The reason for the deviations in the former cases is not clear.

JOHN ZELENY.

L. W. MCKEEHAN.

University of Minnesota, November 23.

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gained ground; two tropical schools, one in London, one in Liverpool, were founded, as Sir Rubert describes in his first chapter, and from that day onwards things have never looked back. Discovery after discovery have poured from these schools until now we stand on the threshold of a new world, a tropics as healthy as a temperate clime.

There apparently is nothing new under the sun, not even in medicine; the author describes in his fourth chapter how Sir Henry Blake, when Governor of Ceylon, had been shown a medical work written fourteen hundred years ago, in which the mosquito was stated to be a carrier of disease, and in which malaria was described as being transmitted by flies or mosquitoes—a truly prophetic utterance. More recently than this certainly, but yet, as things go now, of older

<sup>1</sup> "Mosquito or Man? The Conquest of the Tropical World. By Sir Rubert Boyce, F.R.S." Pp. xvi+267. (London: John Murray, 1909.) Price 10s. 6d. net.