

*January, February, and March* are bright yellow; upon a second question, 'shining white yellow.'

*April* is blue, 'the shade ladies call French blue.'

*May*, light yellow, 'not at all like January.'

*June*, light green.

*July* is glaring yellow; and *August*, orange.

*September* is golden brown; *October*, dark brown.

*November* is 'indiscriminate gray.' I cannot exactly describe it: it is like lead color.'

*December* is gray.

This case appears to me sufficiently different from any of those mentioned by Galton to deserve special notice.

It would be very desirable, I think, to make a systematic investigation of the influence of heredity on such associations of color and form. Could not the Psychical society undertake such work?

CHARLES S. MINOT.

Boston, July 22.

### Maxwell's demons.

Sir William Thomson has shown that since work is readily converted into heat, while heat is never wholly transformed into work, or in fact into any other form of energy, there must continually take place what Tait calls a *degradation* of energy; while its *dissipation* is pronounced to be the inevitable consequence of certain laws, connecting heat and work, established by thermodynamics.

Maxwell has pointed out that one of these laws is by no means a necessary truth ['Theory of heat,' chapter xxii., Limitation of the second law of thermodynamics]. Theory shows, that, in what is called a state of uniform temperature, some of the molecules of a body have by chance much greater velocities than others. If, therefore, as Maxwell says, we could suppose the existence of small beings, capable of following the motion of each molecule, and opening or shutting holes in a partition so as to allow the fastest molecules to pass through one way and the slowest the other, it might be possible theoretically, without expending any work, to separate a gas into two portions, — one hot and the other cold, — in contradiction to the second law of thermodynamics.

It seemed to me of interest to point out that what, as Maxwell has shown, could be done by the agency of these imaginary beings, can be and often is actually accomplished by the aid of a sort of natural selection.

When the motion of a molecule in the surface of a body happens to exceed a certain limit, it may be thrown off completely from that surface, as in ordinary evaporation. Hence in the case of astronomical bodies, particularly masses of gas, the molecules of greatest velocity may gradually be separated from the remainder as effectually as by the operation of Maxwell's small beings.

It is true, that, in overcoming the attraction of the central mass, the escaping molecules may be deprived of the whole or a portion of their velocity; but the transformation of heat into work marks the process still more distinctly as an exception to the second law of thermodynamics, which "asserts," according to Maxwell, "that it is impossible to transform any part of the heat of a body into mechanical work, except by allowing heat to pass from that body into another at a lower temperature" ['Theory of heat,' chapter viii.].

One might now dismiss the subject as a mere curiosity; but is it not possible that what may be called the *renovation* of energy plays an important part in the history of the universe? While philosophers, anxious to preserve their store of available energy,

may speculate on the possible equivalence of renovation and dissipation, will not the scientist hesitate, without further examination, to extend the principle of universal dissipation from physical to astronomical phenomena?

HAROLD WHITING.

### The classification and paleontology of the U. S. tertiary deposits.

In penning my protest (*Science*, June 12) against some recent geological and paleontological speculations of Dr. Otto Meyer, I had intended that it should represent my final words in the matter, inasmuch as the article under discussion appeared to me unworthy of exhaustive criticism. The appearance of instalment No. 2 of the same series (which, if any thing, is only more remarkable than No. 1), and a rejoinder to the first from Prof. E. W. Hilgard, constrain me to add a few additional paragraphs, more, perhaps, of a general than of a special character.

Professor Hilgard says, "I emphatically agree with Hellprin as to the impossibility of subverting the cumulative stratigraphical evidence to the effect that the relative superposition of the several principal stages — the Burstone, Claiborne, Jackson, and Vicksburg groups — cannot be otherwise than as heretofore ascertained;" and, further, "I recall to my mind that years ago I had occasion to repel a similar attempt, on the part of Mr. Conrad, to subvert the relative position of the Jackson and Vicksburg groups upon supposed paleontological evidence." It might appear, from the conjunction of these expressions, that the only evidence supporting the accepted superposition of the different members of the southern old tertiaries was of a stratigraphical character, and that the paleontological evidence was in conflict with that derived from stratigraphy. As a matter of fact, however, the paleontological evidence, whatever it may have been when Conrad first devised his scheme of classification, is, as we now know it, absolutely confirmatory of the pregnant facts which the stratigraphy of the region presents; and, indeed, it would be difficult to find a region of similar deposits where it is more so. The absence or scarcity of forms of a distinctively old-type facies in the Vicksburg beds, and the introduction there of new forms whose equivalents or immediate representatives are known only from the newer horizon, are sufficient in themselves to establish the position. While it may be true, although this is far from being proven, that not a single one of the Vicksburg fossils is identical with species belonging to the typical oligocene basin of Germany, it is equally true that several of the species find their analogues or equivalents in the deposits of San Domingo, which are indisputably of post-eocene age; and whatever Dr. Meyer's own individual opinion may be as to the bugbear Orbitoides, and to its value as a 'leitfossil,' the keen appreciation of Hautken, Rupert Jones, Karrer, Fuchs, Suess, and Duncan has long since settled the question. It is amusing to have the forty-year old opinions of D'Orbigny and Edward Forbes referred to as authority on the value or no-value of certain fossil forms whose organization was barely known at the time that the opinions were rendered, and whose differences from other (distantly) allied forms were not even dreamed of. With singular perversity of purpose, Dr. Meyer fails to inform his readers that the American foraminifer whose merits are discussed by Professor Forbes, is confounded by that naturalist with a form which belongs not only to a distinct genus and family from Orbitoides, but to a distinct sub-order.

Aside from the testimony of the Vicksburg fossils