

specimens illustrating the subject of evolution, of adaptation to environment, protective coloration, natural variation and variation produced by man—as in domesticated animals—as well as series showing the characters and affinities of various groups of animals. In short, these collections form a museum in themselves, and it is along the educational lines laid down by Flower that modern museums are bound to progress. The old type of museum with its interminable and monotonous rows of scantily labeled specimens is, if not a thing of the past, a thing that is passing and the success or failure of the 'museum man' will be judged by the standard set by Flower.

Although devoting his energies mainly to museum work, he yet found time for original research and for a very considerable amount of literary labor, how much may best be gathered from the bibliography at the end of the volume. The 'Osteology of the Mammalia,' and 'Mammals, Living and Extinct,' the latter prepared with the collaboration of R. Lydekker and the outgrowth of articles in the 'Encyclopædia Britannica,' are his most comprehensive works and will always remain standard books of reference.

A man of high scientific attainments, the friend of Huxley, Darwin and Hooker, his greatest work was undoubtedly the impetus he gave the progress of science by making it not merely intelligible, but deeply interesting to the average observer from whom must ultimately come the support of scientific research.

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DISCUSSION AND CORRESPONDENCE.

ANIMAL HEAT AND FEVER.

TO THE EDITOR OF SCIENCE: I have recently been engaged in a clinical study of fever, and as I am out of reach of any adequate reference library, I thought you would kindly permit me the use of your columns for a request for information as to the latest work which has been done on the problems of animal heat and fever.

The data which I have been able to collect appear to have established fairly clearly that

fever is accompanied, not merely by diminished loss of heat (thermolysis), but also by increased production of heat (thermogenesis), *without increase of oxidation*.

The points upon which I should like information are:

1. Is animal heat, or body-temperature, to be regarded as a vital necessity, or merely an accompaniment of the really vital, metabolic changes? The perfection of constructive and growth processes not merely in cold-blooded animals, but particularly in plants, would appear to afford ground for this belief.

2. Have we any grounds for regarding the particular body-temperature of a given species of animal as roughly an index of the friction of the body-engine, and body heat as energy wasted?

3. Are the processes which control the temperature chiefly concerned with the dissipation of heat before it can have accumulated sufficiently to become injurious to the organism?

4. Are we justified in believing that the energy which enters into the normal activities of the body, secretion, motion, growth, is more nearly electrical than thermic in character?

5. Has the work done three or four years ago by Robin and Henrijean, showing that oxidation is not increased in fever (as measured by the oxygen intake and the carbon dioxid output), but on the contrary diminished, been supported by later research?

6. If this be true, are we justified in regarding fever as, to put it very crudely, an increase of friction in the vital machine, with consequent dissipation of heat, due to the disturbing influence of toxins, whether introduced from without or formed within the body?

The recent researches of Roger, Sanarelli and Metchnikoff show clearly that the natural effect of the toxin is to depress the temperature, and if the dose be large enough, or the resisting power of the animal sufficiently lowered, that depression will continue until death results in chill (hypothermia), without the occurrence of any reaction, or rise of temperature at all.

7. Would it not appear as if the increased temperature of fever was due to the sudden diversion by the toxin of all the energy which

normally goes into secretion, motion and growth, into the disproportionate production and waste of heat. The fact that while oxidation is not increased in fever, urea, uric acid and urinary nitrogen generally are markedly increased would certainly appear to point in this direction.

I should be greatly obliged for any references to recent work done upon any of these problems, or for any criticisms of the possible theory of fever or body heat here suggested.

WOODS HUTCHINSON.

SPECIAL ARTICLES.

RECENT OBSERVATIONS UPON DÆMONELIX.

WHILE in charge of a field party sent by the Carnegie Museum to northwestern Nebraska and Wyoming this season, the writer left camp early on the morning of July 4 to study and ascertain the contact between two geological horizons in the Loup Fork Miocene. On the way a locality showing an extensive development of *Dæmonelix* was found. These curious fossils were in great abundance in this place and presented a most imposing appearance. The first impression received was that of a petrified forest emerging from the soft sandstone and gradually disintegrating. For the purpose, if possible, of gaining some additional knowledge with reference to the remains of *Dæmonelix*, the origin and nature of which have led to considerable discussion, the writer stopped and began a systematic examination of the locality. After considerable time had been spent in searching among the broken specimens of *Dæmonelix*, some fragments of the skeleton of a rodent were found below a shelf of sandstone where a *Dæmonelix* partially disintegrated was lying. Carefully picking up the fragments and preserving them, the writer recalled the statement of Professor Barbour that he had found a skeleton of a rodent on the inside of one of these 'twisters' in 1891, and the search was continued with vigor.

It was not long until a nearly complete skeleton was found in the interior of a partially weathered 'rhizome,' which had the base of the upright spiral still in position. Apparently the animal had been in the act of

going out—at all events the skeleton was lying with the head toward the exit, or the spiral portion of the *Dæmonelix*—when it was overtaken by some accident and died.

The work was now becoming interesting and everything else was forgotten in the quest for still further data to support what was rapidly growing to be a settled conviction in the mind of the writer as to the origin of these 'Devil's Corkscrews.' The work was carried on during the entire day in this locality and no less than six specimens of the remains of rodents were found, all of them on the inside of *Dæmonelix*.

The work was not restricted to this locality, but other localities were subsequently systematically worked. Bones were not only found in the transverse pieces or 'rhizomes' of the *Dæmonelix*, but they were also found in the vertical spirals. There were found skulls, jaws and portions of skeletons of what appear to be one and the same animal (*Stenofiber*?). In all there are in the collection made for the Carnegie Museum from twelve to fourteen specimens of the remains of rodents, which were found in as many *Dæmonelices*. A portion of the material was gathered from the typical Nebraskan localities, where Professor Barbour secured the material of *Dæmonelix*, which he has so ably and exhaustively discussed in his papers, which have from time to time appeared in various publications.

It was a pleasure to meet Professor Barbour at his home in Lincoln, Nebr., and to have a discussion with him in regard to this question. Free access was accorded to all of the type specimens. That there are plant remains in the *Dæmonelices* has been thoroughly established. The relation of these rodents to *Dæmonelix* and the probable habits of the animals, and other questions which arise in this connection, may better be determined when the material has been cleaned up and prepared for thorough study. In the meanwhile the writer is led to believe from the facts above recited, that there is but little room to doubt that *Dæmonelix* is the cast of a burrow of a rodent.

When the material has been prepared for