cause, Professor Gray remarked that the question was mainly as to the way in which we may suppose creative power to be exerted, and upon what exerted, — whether always upon nothing to evoke something into existence, and this repeatedly, when small alterations would make all the difference between successive species. And enumerating the three, and only three, general views of efficient causation which may claim to be both theistic and philosophical; — viz.: 1. that of its exertion at the beginning of time, endowing created things with blind forces which produce the phenomena; 2. the same view, with that of insulated interpositions, or occasional direct Divine action, engrafted upon it; and 3. that of the constant and orderly immediate action of an intelligent creative Cause; — Professor Gray insisted that Professor Bowen, in adopting the latter view, was precluded from bringing the objections he did against the new theory; that the difference between Professor Bowen's and Mr. Darwin's view was thereby reduced to this: the one asserts that the origination of an individual, no less than that of a species, requires and presupposes Divine power as its efficient cause; the other, that the origination of a species is natural, no less than the origination of an individual; — propositions which do not appear to contradict each other.

Professor Gray then entered upon various questions of fact and of detail, and also insisted that, if psychologists would scrutinize facts of observation as they had those of consciousness, they would not confound together all the psychical manifestations of the brute animals as one faculty, but would discriminate (as they largely might) between their instinct, which prevails in the lower, and their intelligence, which is manifest in the higher animals. In respect to the proper intelligence of the latter, he adduced the very explicit and unqualified published testimony of Agassiz; and the fact of the heritability both of acquired habits and aptitudes, and of certain modified structures, was supported by additional examples.

Professor Bowen replied at length, but furnishes no abstract, and the discussion was continued by Professor Agassiz, and others, in incidental remarks. Also in a written note, contributed by Dr. Kneeland, as follows: —

At the last meeting of the Academy I stated my impression that Mr. Gordon Cumming, in the chapter referred to by Professor Bowen,

as to the barking of the wild dogs in Southern Africa, had intimated that they might be feral dogs, or dogs once domesticated and afterward becoming wild. That I find is not the case; as in Vol. I. p. 152 (note), he makes no allusion to a feral condition, distinctly calling them "wild dogs." But what is the extent of the argument that can be drawn from his authority as to the fact of wild dogs barking? In the first place, if it be argued from this that wild dogs bark, the argument would seem to go too far; for the reason that the wild dogs seen by Cumming and other travellers are not what we should call *dogs;* in fact, Cumming says (p. 152) that these animals seem "to form the connecting link between the wolf and the hyena;" this quotation indicates the so-called dogs to belong to the genus *Lycaon*, like *L. venaticus*, the hunting hyena, a canine animal, but hardly more a dog than a hyena.

He says that these dogs kept up a "chattering and growling," making most unearthly sounds, and barking "something like collies;" but he does not tell us how nearly this resembled the barking of collies, nor what is the bark of collies. Such indefiniteness of language is very poor proof that his wild dogs *barked*, in the common acceptation of the term. On another page of the book he is more definite, and says that the voice of these wild dogs consists of three different kinds of cry, each of which is used on special occasions: — first, a sharp, angry *bark*, uttered when they suddenly behold a strange object; — second, a kind of chattering, like a number of monkeys, or men conversing when their teeth are chattering violently with cold, emitted at night when excited by any particular occurrence, "such as being barked at by domestic dogs;" (in regard to this the question arises, if the bark be natural to them, why do they not return the compliment of domestic dogs by *barking* instead of chattering?) — and third, the most common, a rallying note to bring the members of the pack together, — soft, melodious, and distinguishable at a great distance, like the second note of the cuckoo. Still, no great proof that these dogs barked, as the term is generally understood.

All canines have a natural voice, which may in certain cases resemble a short, snapping bark, as in the prairie-wolf, the fox, &c.; but no one would be likely to confound this with the monotonous, oft-repeated note of the domesticated dog. Though domesticated dogs would be expected to howl like a wolf, or snap like a fox, or utter other natural canine noises, according to their derivation, when terrified or in pain; we

have no right, on the contrary, to expect, and there is no decided proof that we do find, in wild canines, other than feral dogs, a true bark.

The bark is the language of the domesticated dog, and by it he expresses the various emotions of joy, anger, fear, or suffering; and, as in human language, it must have been the work of ages to develop canine education to the point of a domesticated bark.

As far as Cumming goes, then, there are no proper wild dogs in Africa, but only jackals, hyenas, and lycaons, which may on rare occasions make noises which the vivid imagination of a Cumming might magnify into the bark of a collie.

Taking the word *bark* as we generally understand it, there seems no reason to affirm that wild dogs bark, any more than that wild felines mew; and it must be a very acute sense of hearing that would detect the bark of the dog in the voices of the wolf, fox, and jackal, or the mew of the cat in the growls of the lion and tiger. Though it be a difference of degree and not of kind, it is precisely the degree brought about by domestication alone. Even the half-civilized Esquimaux dog does not bark, his education not having reached that degree of refinement.

Comments were offered by Professors Bowen, Agassiz, Gray, and others.

The subjoined abstract of Mr. J. A. Lowell's remarks belong to a preceding meeting, and should have been introduced on page 410.

Mr. Lowell said that the book recently published by Mr. Darwin on the origin of species had deservedly attracted great attention, both in this country and in Europe. It is written with admirable candor, and rests on an ample and patiently accumulated collection of facts. Had the author, however, confined himself to the subject indicated in his title-page, his work would scarcely have inspired such universal interest. It is because he has unfolded a new theory of creation, that his views are espoused or combated with so much zeal. His facts are apparently, for the most part, uncontroverted; and it is precisely this admission of the facts that takes the inquiry from the exclusive domain of science, and opens it to all who are qualified to examine it merely as a deduction from acknowledged premises. The argument may be summed up in this: —

the tree, that the young larvæ may avoid destruction, — the bird, meanwhile, is by a like careful selection, acquiring claws fitted to climb, and a beak fitted to pierce the bark, and so has become a woodpecker. After all the prolonged and patient efforts of Nature, through countless ages, the relative numbers remain precisely at the point from which they started.

Finally, if this theory is true, it should be carried much farther. For why stop at the limits of human vision? Why at those of the best microscopes? Why even at those which we may expect the microscope ultimately to attain? Beyond and below these, there may exist myriads of forms, myriads of created organisms, equally entitled, on all principles of reasoning, to claim that they have been formed in the image of that original pair.

Four hundred and eighty-third meeting.

May 8, 1860. — Monthly Meeting.

The President in the chair.

Dr. Kneeland, in reference to some criticisms which his communication at the last meeting, upon the barking of dogs, had called forth, remarked, —

That, as regards the testimony adduced, which he said was the same as had been extolled on the other side of the question, he had introduced the testimony of the same hunter-naturalist, and his only, to show that the wild dogs in question were widely different from the common type of dogs, and that their voice could not be fairly compared to the educated bark of domesticated dogs.

As to the occurrence of indigenous wild dogs south of the Equator, he maintained, on the authority of Hamilton Smith and others, that the South American wild dogs are aguara or fox-dogs, and not true dogs; and also, on the authority of many naturalists, that the South Pacific dogs have been introduced from the Asiatic continent by their Polynesian masters; that, according to Dr. Pickering, there is probably no aboriginal dog in New Zealand; that the dogs of the Namaqua region in Southern Africa, on the authority of Anderssen, are half-reclaimed jackals; and that the Australian dingo, an exception to the zoölogical character of that region, on the authority of Dr. Carpenter

and others, is more likely to have been introduced from Asia, and to be the progeny of the Indian dhole, (rendered the more probable by the wolf-like characters of the dingo,) than to be the sole indigenous, carnivorous, placental mammal on that continental island. Seeing that it must be a mere matter of opinion, he considered the question of the occurrence of indigenous wild dogs south of the Equator as at best still *sub judice*.

Mr. C. Wright made some remarks on the architecture of bees, in reference to previous discussions upon the instinct of the honey-bee.

Mathematicians have regarded the economical characteristics of the honey-cell too exclusively, to the neglect of those symmetries which Maraldi pointed out.

The more prominent of these symmetries are the regularity of all the solid angles of the cell, and the consequent equality of all the angles made by the sides and rhombs with each other to 120°, or to $\frac{4}{3}$ of a right angle. Another important symmetry which follows from these is seen in the position of that point in the axis of the cell which is directly over the middle points of the rhombs; for this point is at the same distance from all the nine planes of the cell, and just opposite similar points in the nine contiguous cells; so that little spheres which would just fit the honey-cells would, if pressed to the bases of the cells on both sides of the comb, touch the rhombs in their middle points, and the sides in their middle lines, by points in the spheres themselves, at which they would touch each other but for the thickness of the intervening walls.

While the common mode of considering the form of the honey-cell regards it as the effect of rational economy, these symmetries show how the cell might be the natural result of simple or sensible economy, as applied to the building of simple nests, the common type of which is a cylindrical cavity with a hemispherical base. The construction of a series of such nests side by side, and with the bases of two opposite series in closest contact, would, by the simple removal of the interstitial material, result in two series of cells like the normal ones of the honey-comb, both in the forms and the arrangement of the sides and bases. Hence, as the bee builds the two series of cells from their common bases, making the incipient depressions on one side form the interstitial eleva-