AN investigating committee of five members has been appointed by the U. S. Department of Agriculture to formulate plans and recommendations upon which the U. S. Department of Agriculture and cooperating agencies will base a program of soil-erosion investigations of nation-wide scope, according to an announcement made by Dr. A. F. Woods, director of the scientific work of the department. The investigations have been made possible by an item of $160,000 in the agricultural appropriation act of 1930, of which $40,000 is now available. The committee consists of A. G. McCall, chief of the division of soil investigation, Bureau of Chemistry and Soils (chairman); S. H. McCrory, chief of the division of agricultural engineering, Bureau of Public Roads; A. H. Clapp, in charge of the branch of research, Forest Service; J. G. Lipman, director of the New Jersey Experiment Station, and A. B. Conner, director of the Texas Agricultural Experiment Station.

THE Department of State has completed the arrangements for the participation of this government in an international conference to consider the revision of international classifications of the causes of death. This conference is to be held in Paris during October of this year and the invitation was extended through the French Ambassador. The following list of American delegates has been approved by the President: Dr. Timothy F. Murphy, chief statistician for vital statistics, Bureau of the Census, Washington; Dr. Haven Emerson, chairman, Committee on Reliability of Statements of Causes of Death, vital statistics section, American Public Health Association, New York City; George H. Van Buren, Metropolitan Life Insurance Company, New York City; Dr. William H. Guilfoy, director of records, City Department of Health, New York City; Dr. W. J. V. Deacon, director of statistics, State Department of Health, Harrisburg, Pennsylvania; Dr. Jessamine S. Whitney, Statistician, National Tuberculosis Association, New York City; Assistant Surgeon-General Rupert Blue, U. S. Public Health Service, Washington; Dr. Emlyn Jones, chief of the bureau of vital statistics, State Department of Health, Harrisburg, Pennsylvania; Edgar Sydenstricker, U. S. Public Health Service, Washington.

## UNIVERSITY AND EDUCATIONAL NOTES

LOUISE ALLEN PRYOR has left her residuary estate of about $40,000 in trust to the New York Polyclinic Medical School and Hospital as a scholarship fund in memory of her father, who for many years was a professor at the institution.

THE Collège de France, founded by François the first in 1530, will celebrate its four-hundredth anniversary next year. A large attendance of delegates from French and foreign universities is expected.

IN the issue of SCIENCE for April 25 there was an error in regard to the Henry Barnard Davis professorship in geology at Yale University. Professor Chester R. Longwell has been appointed to this new chair, established by the mother and the aunt of Mr. Davis, who graduated from Yale College in 1911 and died recently.

PROFESSOR JOSEPH W. BARKER, of the Massachusetts Institute of Technology, has been appointed head of the department of electrical engineering at Lehigh University. He will succeed the late Professor William Esty.

HARRY M. GEHMAN, assistant professor of mathematics at Yale University, has been elected professor of mathematics and head of the department in the University of Buffalo to succeed the late Professor W. H. Sherk.

DR. JOSEPH MARCHAND HAYMAN, associate in medicine in the University of Pennsylvania, has been appointed associate professor of medicine in the school of medicine of Western Reserve University, Cleveland.

DR. C. H. GORDON has resigned as head of the department of geology at the University of Tennessee, but retains the professorship of geology, which he has held since 1907. Dr. G. M. Hall, associate professor, has become acting head of the department.

DR. CHARLES H. BEST, who was associated with Dr. Banting in the discovery of insulin, has been appointed professor of physiology at the University of Toronto to succeed Professor J. J. R. Macleod, who has accepted a chair at the University of Aberdeen, Scotland.

## DISCUSSION

### ON THE PHYLOGENY OF HORSES, DOGS AND CATS

DR. AUSTIN CLARK in the current (March 8) number of SCIENCE makes certain remarks about horses, cats and dogs to which I find it necessary to take exception. He cites the horse as an example of "linear evolution involving a time element," but states, correctly enough, that gaps are found in all these evolutionary lines, and that "many of these gaps appear to be real—that is, they were never, as far as we have been able to learn, bridged by so-called missing links." As a matter of fact, the fossil record

of the horse is not at all an example of linear evolution. It exhibits at every stage of its progress the tendency, normal to all evolutionary phyla, to branch out into progressively divergent races. The more material we have to study, the more clearly and precisely does this appear. *E.g.,* the genus *Merychippus* first appears in our record with one very primitive but very variable species. In the next stage we find several subspecies, groups showing an exaggeration of the characters of certain individuals of the preceding stage. In the next stage these subspecific groups have become more distinct and are ranked as species. In the next stage we find some among them surviving as closely related genera, and in succeeding stages these genera become more distinct, more specialized in diverging lines of adaptation; all finally die out except *Equus,* which has in turn branched out into a number of distinct groups, with minor subspecies divergence appearing in each group. At the same time as this branching is going on there are many features of parallel progressive evolution. The analogy to the growth of a tree is a sound and a real one.

That there are gaps even in so well-documented a record as the evolution of the horse is of course nothing new. Aside from criticisms made by those who have no adequate first-hand knowledge of the facts, it was emphasized by Gidley thirty years ago. One of the two most serious gaps to which Gidley called attention has been pretty well filled by subsequent discoveries. The other, between Eocene and Oligocene Equidae, still remains. Perhaps it will be filled during the next thirty years, perhaps not. A consideration of the true nature of the fossil record should make it clear that such "gaps" are to be expected. It is a continual branching out. At each geologic stage a race is represented by numerous species and subspecies scattered over a wide region. Some of the species inhabited the particular areas from which our fossils are obtained, and some of these may be known to us, rarely if ever all of them. Other species, inhabiting other areas, are necessarily unknown to us. Among these many species, one is the direct ancestor of the particular line whose evolution we are tracing, and we are fortunate if it is known to us. The others are collateral ancestors in various degrees of removal from the direct line. Unless we happen to have a succession of richly fossiliferous formations in the center of evolution and dispersal of the race, we can not expect to have a line of direct ancestry. But we can and do have in many cases a succession of collateral ancestors so nearly related to the direct genetic line as to afford, when critically studied with due recognition of their status, a clear record of the physical evolution of the race, sometimes in more general, sometimes in more detailed terms, according to the nearness of their approximation to the direct ancestral line. The "gap" between *Epihippus* and *Mesohippus* is probably a real one in the sense that *Epihippus* is not the direct ancestor of *Mesohippus.* But it is a fairly near relative, represents nearly the stage of evolution of the as yet unknown direct ancestor, and through evidence of various other members of the race living at the same time in other regions we may infer within close limits what the direct ancestor was like and where he lived.

Dr. Clark's misleading remarks about cats and dogs are more excusable in that the evidential facts as to their evolution have never been adequately brought together and presented as a whole. He tells us that "the gap between cats and dogs is broad, and it remains broad throughout the fossil record. Cats never become dogs nor dogs cats; but both are carnivorous mammals."

No one so far as I know ever suggested that cats became dogs or dogs cats, however it may be with monkeys and men; but it *has* been believed that these two diverse families of Carnivora are descended from the primitive Carnivora (Miacidae) of the Eocene epoch. In support of this conclusion there is a fairly close sequence of intermediate stages leading back from the specialized modern dogs to the generalized *Miacis;* and a similar series, less exact in its earlier stages, through which the cats are traced back to the same common ancestor. There is no serious "gap" in the line through which the dogs are traced back to the Lower Eocene *Miacis,* but the Eocene ancestors of the Felidae are represented only by a number of European genera imperfectly known and apparently not very close to the direct line of descent. The "gap" between cats and dogs is very much reduced in the Oligocene as compared with the present day; Oligocene dogs have many of the primitive characters of cats; Oligocene cats have many of the primitive characters of dogs; and both are much nearer in every way to *Miacis.* Dr. Clark's statement is evidently intended to give the impression that the "gap" between them is not reduced as we trace them backward. That is very far from being correct.

Thirty years of research and field collecting for the American Museum, studying especially fossil Carnivora and horses, are the basis of the above conclusions. The original literature on the Equidae is summarized in an article on the "Evolution of the Horse" in the *Quarterly Review of Biology,* April, 1926. The original literature on fossil cats and dogs

is scattered through many publications; my own contributions chiefly in the American Museum Bulletin. But in both groups, and especially in the Carnivora, a great part of the evidence has not yet got into print. I suggest that any one indisposed to accept these conclusions should examine the evidence, published and unpublished, on which they are based, with the object not of proving a theory but of discovering the truth. Some authors seem to believe that unpublished evidence has no right to be considered in a scientific discussion. This may be one of the rules of the game, if science is merely an academic exercise. But if our object is not to play a game but to get at the real truth as to the history of life, it is surely most foolish to disregard any evidence that may help us to a conclusion.

I leave to others the general criticism of Dr. Clark's "new" theory of evolution—merely remarking that the idea of separate origin of the major phyla of animal life was a commonplace of discussion when I went to college in the late eighties, and still remains an open question so far as I know. For the rest, his statements seem to me gravely misleading as to the actual facts of phyletic evolution, although worded in so vague a way as usually to escape being absolute misstatements.

W. D. MATTHEW

UNIVERSITY OF CALIFORNIA

## THE PRACTICAL SIGNIFICANCE OF INCREASING THE DAILY LIGHT PERIOD OF WINTER FOR STRAWBERRY BREEDING

A STUDY of the time of ripening of some of the standard strawberry varieties grown in the southeastern states from Maryland to Florida indicates that their relative earliness or lateness varies with the locality. In central Florida, fruit of the Missionary, the leading variety, begins to ripen in early winter and considerably earlier than Klondike. Farther north at Willard, N. C., the Missionary is no earlier than Klondike but nearly three weeks earlier than Howard 17. Still farther north at Glenn Dale, Md., the Missionary, Klondike and Howard 17 ripen at approximately the same time.

These results correspond to those reported by Bradford[1] for the peach and apple. He noted that differences in the flowering period in peach varieties might be masked at Columbia, Mo., while farther south the same varieties showed striking differences. He correlated this behavior with a rest period. The Missionary and Klondike strawberries, however, have no definite rest period and plants of these sorts set in the fall in Florida grow vigorously throughout the winter. Moreover, when taken into the greenhouse at Washington in the fall they continue growth throughout the winter. Other differences also showed up in the warm greenhouse. Both varieties blossomed but the Klondike made the stronger leaf growth. From this it would appear that Klondike is better adapted to the very short days of midwinter in the reduced light intensities of the greenhouse. Both sorts responded far more to the increase in temperature than did most northern sorts. In fact, when taken into the greenhouse in October the Howard 17 made practically no growth whatsoever.

A study of the behavior of these varieties in the greenhouse during the short days of the winter in response to increased daily light exposures obtained by supplementing the normal illumination period from sunset to 10 P. M. has shown still other differences. Two-hundred and one-hundred-watt lights with reflector shades were placed approximately sixteen inches above the ground surface so that the area lighted by each was seven square feet. The plants were given the supplemental light from October 20 to January 19. Growth was not as vigorous under the 100-watt lights as under the 200-watt lights, but the different varieties responded for this three-month period in the same way under the 100 as under the 200-watt lights.

When the daily light period in the greenhouse was increased by the use of the electric lights the Missionary variety responded more quickly than the Klondike, while the Howard 17 still made almost no response. Other northern sorts made varying responses to this increased daily illumination, some making almost no growth, others a growth almost as vigorous as the Missionary even though making almost no growth under the normal winter day. The tests, so far, indicate that in contrast to peaches and apples, some varieties represented by the Missionary and Klondike seem to have no rest period; other varieties apparently "rest" in the greenhouse under the normal short days of low light intensity but grow vigorously when given an increased daily light period; while still others which made very little growth when brought into the greenhouse on October 20 or December 10, started to grow vigorously when brought in February 1, and may, perhaps, have a rest period of the type of the peach and apple. Greater intensity, different quality or longer duration of artificial light than were used might, of course, have broken the rest period of this last group. English varieties, represented by the John Ruskin and Jucunda, and an Alaskan variety were among the least responsive to increased daily light periods even when brought into the greenhouse as late as February 1. This behavior

[1] F. C. Bradford, "The Relation of Temperature to Blossoming in the Apple and the Peach." Mo. Agr. Exp. Sta. Research Bul. 53: 1–51. 1922.