heredity. The facts regarding the inheritance of color are better known than is the case with other groups of characters. The suggestion that the "factors" above mentioned are merely the power of producing certain chemical substances seems to me to be worthy of consideration. I believe that on this suggestion a new working theory of inheritance can be constructed that will explain the facts without recourse to the idea of "unit-characters," "pangenes," or any kind of character "bearers," in the sense of bodies or substances which are alone responsible for the development of a given character. It would be out of place here to attempt to present such a theory. I think, however, that an illustration of what I mean may be permissible. Let us suppose that a series of wireless stations, say in San Francisco, Denver, St. Louis and Washington, attempt to relay a message from the Pacific to the Atlantic. Now, if the St. Louis station should fail to do its part, the message would not arrive. In this case, we may not say that, if this station had done its part, it would have been *the* sender of the message. The relaying at that station is merely one of a chain of events that are necessary to the success of the experiment. But if St. Louis fails, then that station *is* responsible for the *failure* of the message to arrive at Washington.

The production of red pigment in the seed coat of the cowpea may possibly be a complex process in which every part of the living substance of the cell is concerned; but if a single cell organ which performs a necessary part of this process fails to play its part, then red pigment fails to develop. The cell organ whose failure to perform a usual function may thus be accountable for the lack of pigment formation might then be considered the "gene," as Johannsen calls it, for the *absence* of red pigment; while the whole organism might be the gene for the presence of this pigment.

In order that the study of the physiological chemistry of pigment formation shall give results of the greatest importance to the theory of heredity, it would be an ideal condition if such work could be carried out by one who possesses a wide acquaintance with the facts and theories in both these sciences. But such men are not plentiful. The next best scheme would be a cooperative study of the subject by two men, one in each field. I am happy to be able to say that Dr. Bartlett has consented to take up the chemical end of this work in connection with my investigations of the genetic phases of the problem, and Professor Piper has promised to grow the material for such study. Gortner's important work in this field, in connection with Dr. C. B. Davenport's work on genetics, has already been mentioned. With all these investigations, and those of Miss Wheldale and Professor Bateson at Cambridge, it is to be hoped that we shall gain a somewhat more definite view of the nature of Mendelian factors.

W. J. SPILLMAN

THE PERUVIAN EXPEDITION OF 1912

THE Peruvian Expedition of 1912, organized under the auspices of Yale University and the National Geographic Society for the purpose of carrying on geographic and anthropologic exploration in Peru, will endeavor to continue and extend the work of the Yale Peruvian Expedition of 1911, utilizing the discoveries made then and continuing further along the same lines.

It is our purpose to pursue intensive studies in the region where reconnaissance work was done on the last expedition, taking advantage of the discoveries then made to guide the plans for this year.

The work planned for the expedition is as follows:

I. In topography:
1. To make a topographical map on a scale of 2 miles to the inch, with a contour interval of 100 feet, of the Cuzco basin.
2. To connect that part of the Vilcabamba survey made by the topographer of the 1911 expedition with his trans-Andean cross section from Abancay to Camaná.
3. To make a map of the so-called Vilcabamba country which lies north of Cuzco between and including the valleys of the Apurimac and Urubamba rivers. Some portions of this were finished by Mr. Kai Hendriksen, topographer of the 1911 expedition, but owing to the difficulties of the route he was only able to make a beginning.

Every effort will be made to complete the map of Vilcabamba, placing on it not only the ancient and modern sites, but also the data for further physiographical and geological study.
4. To map the routes connecting the later Inca capital of Vitcos with the rest of Peru.
5. To discover and identify the places mentioned in the Spanish chronicles and in the early accounts of Peru, particularly the places connected with the 35 years of Inca rule after the advent of Pizarro. As many of these place names have changed, it will be necessary to identify the places by a careful comparison of their situation and surroundings with the itineraries and descriptions given in the chronicles.

II. In geology:
1. To make a careful survey of the Cuzco basin and its vicinity, with special reference to the age of gravel deposits where human and other remains were found on the expedition of 1911.
2. To make a geological reconnaissance of the Vilcabamba country, continuing the work already begun.

III. In meteorology:
1. To establish and equip meteorological stations at Cuzco and at Santa Ana, stations at which continuous observations may be made for several years, these observations to be supplemented by field observations taken by various members of the expedition wherever practicable.

IV. In pathology:
1. To study the various diseases throughout the region visited, and their geographical extent.
2. To study the effect of coca chewing.

V. In osteology:
1. To study the bone deposits in the Ayahuaycco quebrada where human and other bones were found on the 1911 expedition.
2. To collect osteological material not only in the Cuzco gravels, but also in the mountains of Vilcabamba.

VI. In forestry:

To make a reconnaissance survey of the Vilcabamba region between the Apurimac and the Urubamba valleys.

VII. In anthropology:
1. To take photographs and physical measurements of native types throughout the region visited, with particular reference to a study of the distribution of the more important groups.
2. To collect material for a study of the distribution of types of cranial deformation.

VIII. In archeology:
1. To make a thorough investigation of the region round about and north from Cuzco and Pisac, photographing, measuring and describing whatever architectural material presents itself.
2. To continue the investigation of the ruins discovered on the expedition of 1911.
3. To penetrate still further into the jungles of the Pampaconas Valley and beyond, to see whether any more remains of Inca occupation can be found.

The expedition will include a geologist, an osteologist, a surgeon, three topographers and three assistants, besides the director. The geologist will be Professor Herbert Gregory, Silliman professor of geology in Yale University, and the osteologist, Dr. George F. Eaton,

curator of osteology in the Peabody Museum of Yale University.

HIRAM BINGHAM,
Director of the Expedition

SAMUEL BUTLER AND BIOLOGICAL MEMORY

THE present vogue of the books of Samuel Butler—not a great vogue but one fairly commensurate, perhaps, with the scientific worth and general interest of his writings—has led me to a rather critical reading of the four books and several scattered essays of this partly scientific, partly artistic, mostly iconoclastic, and wholly clever and epigrammatic modern namesake of the greater Samuel Butler of two centuries gone.

He finds himself dubbed in the British Museum Library catalogue as "philosophical writer," being alphabetically bestowed between "Samuel Butler, bishop" and "Samuel Butler, poet"; and in one of his essays tells a pretty story to account for his title.

The library catalogue is, as many will recall, printed and pasted in huge tomes, hundreds of them, and changes in its arrangement are not easily made. When our Butler found himself beginning to get into the catalogue he found also that he was getting mixed up with his namesake bishop and his namesake poet, and as yet he had no distinguishing title of his own. When he complained to the Library directors of his trouble it was pointed out to him that it was largely his own fault in not having sufficient distinction or distinctiveness to be classified properly. He must have a title. What was he, really? His writings were partly about Italian art, partly about the authorship of the Odyssey, partly about evolution and partly of the nature of stories. How was he to be distinguished? Had he any title? He replied, after meditation, that he was a Bachelor of Arts. The director pointed out that as far as his book titles were not actually confused with those of the bishop and poet, they were pasted in between theirs, and that if he were catalogued as "Samuel Butler, B.A.," the strictly alphabetical sequence of the catalogue would be wronged. Could he not, perhaps, arrange to be a Master of Arts? Butler replied that he understood that Cambridge stood one a Master for five guineas, but he was not willing to go above three guineas ten! Well, anyway, was the answer, he must be "Samuel Butler, something, between *bi* and *po!*" So it was finally agreed that he should be "Samuel Butler, philosophical writer"—*phi* agreeing properly with the order in which he had already been irrevocably pasted!

Now this long digression, by way of introduction, from the subject of my letter, has after all a definite significance in relation to it. It has indeed, for me, at least, a double significance. It suggests something about British ways and something about the doubt as to how Samuel Butler's writings, even the four books about Darwinism, Lamarckism and biological memory, should be classified. Are they contributions to science, or to pure literature? Certainly, they are contributions to the gaiety of nations when they are not, as occasionally they as certainly are, contributions to that which makes the judicious to grieve. Whatever of sharpness in polemic one may tolerate in a critic of Darwinism, innuendo and really almost scurrilous personal attack on Charles Darwin one will not tolerate. And Butler comes to no less than this in his attempt to show Darwin's bad faith in a matter of the use of a certain freely modified translation of an account of Erasmus Darwin by Krause, in *Kosmos*.

Butler, though strongly anti-Darwinian (that is, anti-natural selection and anti-Charles Darwin) is not anti-evolutionist. He professes, indeed, to be very much of an evolutionist, and in particular one who has taken it upon his shoulders to reinstate Buffon and Erasmus Darwin, and, as a follower of these two, Lamarck, in their rightful place as the most believable explainers of the factors and method of evolution. His evolution belief is a sort of Butlerized Lamarckism, tracing back originally to Buffon and Erasmus Darwin. He is equally insistent on degrading the explanations of Charles Darwin, Wallace and Weismann, viz., the selection