roborate the conclusion reached by the method of basket cultures.

To test this proposition still further, the baskets of untreated soil used in the first fertilizer test were replanted and the plants allowed to grow three weeks. The result showed the soil to have improved to the extent of about 183 per cent. by transpiration and 86 per cent. by green weight. This observation suggested that possibly the plants of the first planting had absorbed from the soil sufficient salts to reduce the concentration of the soil solution to a considerable degree, although the plants had made but a poor growth, and that in this way the injurious property of the original sample had been largely corrected. At the end of this second culture the soil was again subjected to a chemical analysis of its water extract, with results which showed clearly that the above explanation is the correct one. The following amounts of dissolved materials, expressed as before in parts per million of air dry soil, were found: NO_3, 87; PO_4, trace; K, 29; Ca, 4; and Cl, 100. It is obvious that a marked decrease in dissolved salts has indeed taken place.

While the last test was in progress basket cultures were carried on with three new samples of this soil from other spots in the same field, these having been obtained in order to determine whether or not the first sample was typical of the whole field. The average growth in the three new samples was very much better than that in the first planting of the original samples, the difference amounting to 322 per cent. by transpiration and 110 per cent. by green weight. Thus it became apparent that the original soil sample was not typical of the field from which it was taken and that in general the field is not unproductive.

It appears then that the particular spot from which the original sample was taken has in some way, possibly by over-fertilization, too high a soluble salt content for good plant growth.

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OBSERVATIONS ON COLOR PERCEPTION AMONG THE VISAYANS OF LEYTE ISLAND, P. I.

As a United States government teacher in the public schools of Leyte Island, I became interested in the dialect of the Visayans. In this study I found frequently suggested what sort of men the Visayans were when the Spaniards came to their islands. The modified Spanish words in the vocabulary of the present native designate ideas given to the Visayans by the Spaniards. It was not long before I was confronted with the same question that Gladstone encountered in his study of Greek. Gladstone by pointing out that in the Homeric vocabulary there were no words for blue, and by concluding that in the time of Homer the Greeks did not see blue, opened quite a controversy over the evolution of color perception as based upon the nomenclatures of ancient people and savages of the present. Geiger advanced the theory that red was the first color seen by man and after that the other colors in their order as formed by the spectrum. Geiger was supported by Magnus with further philological evidence. This discussion until recently had been considered closed. Havelock Ellis in Vol. 69 of *The Contemporary Review* at page 715 says: "There is no doubt whatever that all races of men, concerning whom any evidence can be obtained, have been acquainted with the same regions of the spectrum we have known." After so strong a statement I was surprised to find Rivers, who had made extensive experiments upon the Papuans of Torres Straits, saying of his work that one of its chief interests 'is that it shows a defect in nomenclature for a color may be associated with defective sensibility for that color and so far lends support to the views of Gladstone and Geiger.'[1] The evidence that I have obtained among the Visayans also supports the views of Gladstone and Geiger. My discovery that the people had no words for the colors higher than yellow was new to me, but I later learned that this fact was known as early as 1869. Words for the higher colors which are used to-day by the natives are bor-

[1] 'Reports of the Cambridge Anthropological Expedition,' Cambridge, 1901, Vol. II., Part I., p. 49.

rowed Spanish terms. I found *siga, meserum, mabosag, maitum, mapula* and *madarag* were fixed words for *light, darkness, white, black, red* and *yellow,* respectively. I tried all methods suggested to find pure Visayan words designating the colors of more rapid rates of oscillations. All classes of the people were consulted, but no such words were brought to light.

The most comprehensive dictionary of the Visayan as spoken by the people of Leyte is the large 'Diccionario Hispanio-Bisaya; Bisaya-Hispanio,' by R. P. Fr. Antonio Sanchez. From it the following was taken:

Spanish.	Visaya.	English.
Verde.	Lunhao, hilao, hayat, banua.	Green.
de Café.	de Café.	Brown.
Purpuro.	Purpuro.	Purple.

Here we see given four Visayan words for green. None of these, however, is actually used by the natives for designating green. So we turned to the Bisaya-Hispanio part of the dictionary and found the following:

Visaya.	Spanish.	English.
Lunhao.	Color verde.	Color green.
Hilao.	Cosa cruda; verde.	Thing crude; green.
Hayat.	Cosa verde; sin maduraion.	Thing green; without maturity.

It will be seen here that all the words used for the definition of the Spanish verde express rather the general condition common to things not dried, things unripe and the general appearance of the grass, fields and forests —*lunhao* excepted. For six months I carried *lunhao* about with me. I could find but one man to recognize this word. El Capitan Louis Cordero, an intelligent citizen of Burauen, explained to me that it did not express the idea of verde or green, but that it also had reference to an uncured state. He gave as an example the condition of nipa thatching before it was completely dried and ready for use. *Lunhao,* therefore, is an exceedingly doubtful word by which to express the idea of green. In fact my efforts led me to conclude that it does not have any such meaning. But be that as it may it is quite a suggestive fact that so much vagueness hangs about the idea of green as expressed in truly Visayan words.

And when we come to the color next higher in the scale of the spectrum we find no Visayan word whatever given for it. The dictionaries give the Spanish *azul* modified into *asul.* And this is the only word the natives use. For violet and other colors nothing but pure Spanish words are used. So far as the present dialect is concerned we are led to infer that until the Spaniards came the Visayans had no ideas of green, blue and violet, which demanded words for their expression.

But not satisfied with these observations, I turned to the children of the island. Children, of course, can not be expected to handle colors as well as adults. But with this caution in mind some results were obtained which, because of their lack of variation are of considerable interest.

In speaking with the American teachers I learned that they experienced difficulty in getting the children to recognize colors. Mr. B. M. Sullivan, an American teacher at Dagami, pointed out to me the fact that 'the ladies nearly always wear red and yellow. When they do wear dark blue they call it black. Their light blue skirts they call green.'

On February 15, 1902, a purple kite sailed by my window. This a boy servant, twelve years old, pronounced de café—brown. Later he called the same kite red. On March 27, 1902, another servant, seventeen years old, bought a pair of purple slippers, which he said were brown.

On March 14, 1902, while I was sitting with Mr. Sullivan, six little girls came into his room. They were about nine years old. These little girls had never seen the green hyloplate writing boards which the educational department had recently sent. The girls were soon before them eagerly disputing their color, for they had expected writing boards to be black. Were they green, blue or black was a difficult question for them. After much dis-

cussion and reading of our faces they finally decided that they were green.

Several days later we took the matter of color perception into the Dagami schools. Mr. Sullivan, their teacher, asked a nine-year-old girl the color of a handkerchief that she wore about her neck. She answered correctly that it was blue. But to his next question she replied that the grass was the same color. Another girl about ten years old pronounced a rather dark green leaf *maitum*—black. A class of thirteen girls in the same school, ranging in age from eight to twelve years, named properly and without any difficulty the colors of pencils painted red and yellow. But the green and blue pencils they could not at all name. They simply could not perceive the green and blue as such.

On September 9, 1902, in dealing with a class nine to ten years or older, who had had no chance either in Spanish or American times to improve themselves, I found them very ready to recognize red and yellow. All seven would respond with the proper Visayan words for these colors. One of the class wore dark blue trousers; they were decidedly blue, yet not as dark as navy blue. For the color of these trousers six of the boys gave the Visayan word *maitum*—black—and the seventh boy, to get ahead of his classmates, shouted out the Spanish word *negro*—black. The same class had no difficulty with the red and yellow as given in the color chart of E. G. Regal's 'Lessons for Little Readers,' Heath and Company. But I found they as readily called light blue green or brown as anything, and no better did they handle the green.

Mr. H. E. Guyer, one of the American teachers at Tacloban, gave me the following statement:

> The dullest boy in my school has never called a red ball anything but a red ball. Except for a thoughtless boy's answer they invariably call a yellow ball yellow. In other colors I can not rely upon them, except some few who have memorized them. And even they flounder if I mix the colors up.

It has been suggested that these observations may be worthless on the ground that any children might make similar mistakes in naming colors. I can not think that these observations can be explained away in this manner, because, in the first place, if this were the cause the colors mistaken would not have been so constantly green and blue. And, secondly, this differs radically from results of experiments made upon children of parents who have a well-defined perception of blue and green. Marx Lobsien in a series of experiments upon German school children observed that the three fundamental colors, *Rot, Gelb* und *Blau,* were almost accurately handled. Of these blue was more accurately handled than yellow. "Nach meinen Untersuchungen steht am höchsten in der Wertung da das Rot. Es wurde auf allen Alterstufen immer richtig aufgefasst und benannt; ihm fast gleich, nur auf der fünften Stufe findet sich eine kleine Unterschwankung, ist das Blau, dann folgen 3 Gelb, 4 Grün, während Orange, Violette, Indigo unverhältnissmässig ungünstig dastehen."[2]

It has also been explained that primitive men have no words for green and blue because they have no interest in these colors. Rivers found that the Paupan name for red was the modified term used to designate the female parrot *Eclectus polychlorus.* On the island of Leyte there is a dark blue snake with a yellow head which the natives fear greatly because of its poisonous fangs. If so inoffensive an animal as a parrot could have attracted the early Paupans and given them their name for red, one marvels that the early Visayans were not attracted by this snake to blue. I have no doubt that other instances could be found in which green and blue were strikingly presented, so that the pre-Spanish Visayans would have taken notice of them if they had seen these colors as such.

These observations, therefore, lend weight to the theory that the eye, in its evolution as a color-sensing organ, saw at first only the colors at the red end of the spectrum; and seem to show that the Visayans, at least at the time when they were discovered by the

[2] *Zeitsch. f. Psych. und Phys., etc.,* Bd. XXXIV., Heft I., January 19, 1904, p. 35.

Spanish, were still in the stage when red and yellow were the only colors clearly perceived.[3]

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THE NATIONAL ACADEMY OF SCIENCES.

THE academy held its autumn meeting at the Sheffield Scientific School of Yale University, on November 14 and 15. The scientific program was as follows:

JOHN TROWBRIDGE: 'Slow movements of electrical discharges.'

E. B. WILSON: 'Sex-determination and the chromosomes.'

L. B. MENDEL: 'Studies on the chemical physiology of development and growth.' (Introduced by R. H. Chittenden.)

W. M. DAVIS: 'The Dwyka glacial conglomerate of South Africa.' (Illustrated by lantern slides.)

B. B. BOLTWOOD: 'The disintegration products of thorium as indicated by the proportions of lead and helium in minerals.' (Introduced by H. L. Wells.)

A. HALL: 'Relation of the true anomalies in a parabola and a very eccentric ellipse having the same perihelion distance.'

S. L. PENFIELD: 'On a new mineral from Borax Lake, California.'

F. E. BEACH: 'On errors of excentricity and collimation in the human eye.' (Introduced by C. S. Hastings.)

C. S. PEIRCE: 'The relation of betweenness and Royce's O-collections.'

L. P. WHEELER: 'Some problems in metallic reflection.' (Introduced by C. S. Hastings.)

FRANZ BOAS: 'On Pearson's formulas of skew distribution of variates.'

A. AGASSIZ: 'On the variation in the spines of sea urchins.'

W. H. BREWER: 'Further observations on sedimentation.'

H. A. BUMSTEAD: 'The effect of Röntgen rays on certain metals.' (Introduced by C. S. Hastings.)

THE GEOLOGICAL SOCIETY OF AMERICA.

THE eighteenth annual meeting of the Geological Society of America will be held on December 27, 28 and 29, in Ottawa City, the Canadian capital. The circular of information issued by Secretary Fairchild gives the details of arrangements for the meeting there, and facilities regarding customs as well as railway and hotel accommodation usually given to the fellows of the society.

Ottawa is easily reached from all railway centers and is one of the most progressive cities of the Dominion, being the seat of government and the headquarters of the Geological Survey Department. This official survey, which began in 1842, has continued its operations uninterruptedly and there is now attached to the department a Museum of Geology, for petrography, general geology and historical geology, as well as for paleontology. Type specimens of Canadian fossils, described by Billings, by Whiteaves, Sir William Dawson, by Rupert Jones and by various other well-known authors, are deposited in the collections and can be seen to advantage.

A large attendance is expected at this meeting, many having already signified their intention of being present. A local committee has charge of the details of the meeting, and the evening sessions promise to be of an interesting nature. The annual dinner of the society will be followed by a reception at which the governor general will be present. The Russell House will be the headquarters. Rates are very reasonable, and every comfort will be provided for the guests attending the meeting. All parcels serving to illustrate papers to be presented at the meeting will be admitted free of duty by the commissioner of customs if addressed to Dr. H. M. Ami, Headquarters of the Geological Society of America, Russell House, Ottawa, Canada.

The society met at Ottawa in 1892 under the presidency of Professor B. K. Emerson. This year Professor Raphael Pumpelly is the president.

THE ROYAL SOCIETY'S MEDALS.

THE following is a list of those to whom the Royal Society has this year awarded medals:

The Copley medal to Professor Dmitri Ivanovitch Mendeléef, of St. Petersburg, for

[3] I am indebted to Professor R. S. Woodworth, of Columbia University, for valuable suggestions and references to literature. He is not, however, responsible for the conclusions advocated.