machines. There are several hundred thousand blind persons in the civilized world, and benevolence has long vied with charity in lightening the burden of their afflictions, and mitigating the tragedy of their lives. One can not imagine a more speedy and effective means than this of stimulating their *esprit de corps,* arousing mental, educational and social progress, and of placing at their command the learning and science of the world. We are too slowly learning that there is no occupation, whether farming, mechanics, manufacturing, merchandising, or professional life, that may not be worthily, and that has not been successfully, carried on by those without sight. To place within the reach of these this most helpful and noble device would put them at a bound so in touch with one another, and with profitable employment, that other charities in their behalf would lessen in demand and in significance.

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COLOR-ASSOCIATIONS WITH NUMERALS, ETC. (FOURTH NOTE.) 1882–1906.

I have given in various places[1] some account of the associations of colors with numerals and letters at epochs in the years 1882, 1883, 1885, 1887, 1889, 1891 and 1895, in the case of my daughter Mildred. The note in *Nature* for July 9, 1891, is the most complete and gives a table which can be consulted by any one interested in this matter. I have recently (January 16, 1906) asked her to give me a list of the colors that she associates with (1) the days of the week; (2) the letters of the alphabet; (3) the numerals 1 ⋯ 10. Her answers are exactly the same as those given in *Nature* for June, 1891, except for the following very slight differences:

Friday, white with tiny dots; *E,* pink; *K,* grayish brown?; *P,* green, not very clear; *Q,* purplish blue, not very clear; *S,* cream, nearly yellow; *V,* white; *Y,* yellowish cream; 8, white; 9, blue; 10, black and cream (and both colors are seen); 0, cream.

[1] Science, Vol. VI., O. S., 1885, p. 242; *ibid.*, Vol. I., N. S., 1895, p. 576; *Nature,* Vol. 44, 1891, pp. 223–4.

The series of notes seems to be of value, as it records the results of experiments extending over a period of twenty-four years, made under exceptionally good conditions. To make the record complete it should be added that my daughter married some two years ago and is herself the mother of a daughter. It will be interesting to inquire if this child inherits color associations of the sort from one or both parents. I, myself, see no colors associated with numbers or letters.

Edward S. Holden.

U. S. Military Academy,
West Point,
January 18, 1906.

THE YELLOW-FEVER MOSQUITO.

To the Editor of Science: The communication of Professor Vernon L. Kellogg, printed in the number of Science of January 19, implies that yellow fever and the mosquito *Stegomyia fasciata* do not occur on the Pacific coast of America. Guayaquil, Ecuador, is a notorious hotbed of the disease and there have been numerous outbreaks at points along the Mexican and Central American coast—not to mention Panama. Caldera, the former Pacific coast port of Costa Rica, was abandoned on account of an epidemic, undoubtedly of yellow fever, which swept off a great part of the inhabitants. Upon a recent trip through Mexico and Central America, in the interest of Dr. L. O. Howard's forthcoming work on the Culicidæ, the writer found *Stegomyia fasciata* abundant in the following Pacific coast ports: Acapulco and Salina Cruz in Mexico, Champerico and San José in Guatemala, Corinto in Nicaragua and Puntarenas in Costa Rica. The only port visited which appeared to be free from this mosquito is Acajutla in Salvador, although the species was found at Sonsonate, about twenty-five miles inland. Perhaps on account of its very small size and the scattered disposal of the houses, Acajutla does not offer favorable conditions for this eminently domestic mosquito.

It would seem that at present the greatest danger of the introduction of yellow fever into Hawaii lies in the transportation route across the Isthmus of Tehuantepec, which will soon be connected by a line of steamers plying between Hawaii and Salina Cruz.

FREDERICK KNAB.

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SPECIAL ARTICLES.

THE PRIMEVAL ATMOSPHERE.

THE geological import of certain chemical work[1] carried out at the University of Heidelberg by Professor Krafft and his students seems to have been overlooked.

Krafft has determined for a number of metals the lowest temperatures at which they evaporate in a nearly perfect vacuum. He estimates the vacuum obtained as having a pressure of less than one millionth of an atmosphere. In order to avoid all action of gravity the evaporation temperatures were determined in a tube (1 to 1.5 cm. diameter) placed horizontally.

He has also determined the boiling points in vacuum of the metals, *i. e.,* the temperature it is necessary to reach to force a steady 'saturated' stream of vapor upwards from the liquid against the force of gravity.

In boiling under ordinary pressure it is necessary to force the stream of vapor upwards against gravity *plus* the atmospheric pressure.

Krafft finds that it requires the same number of degrees rise, within the limit of error of the experiment, to pass from the temperature at which evaporation in a vacuum begins to the temperature at which boiling in a vacuum occurs as to pass from the latter temperature to the temperature at which boiling at atmospheric pressure (760 mm.) occurs.

In other words, that the same rise of temperature is required to overcome the force of gravity at the earth's surface as to overcome the atmospheric pressure and from this the conclusion is drawn that gravity and atmospheric pressure are equivalent.

Krafft's experimental data are given in the following table, also the differences between the temperatures of the beginning of evaporation and boiling in a vacuum (Differences I.) and between boiling in a vacuum and boiling at atmospheric pressure (Differences II.).

Element.	Evaporation Begins in a Vacuum (0 mm.).	Differences I.	Boiling Occurs in a Vacuum (0 mm.).	Differences II.	Boiling at Atmospheric Pressure (760 mm.).
Mercury....	— 40°	195°	155°	202°	357°
Cadmium..	156	294	450	299	749
Zinc	184	366	550	370	920
Potassium.	63	302	365	302	667
Sodium.....	98	320	418	324	742
Bismuth...	270	723	993	707	1700
Silver	680	680	1360	680	2040
		2,880°		2,884°	

It will be noted that, whether a metal of low boiling point or one of high boiling point is taken, the two differences are for any given element very nearly the same. The lack of exact agreement is probably largely due to the experimental difficulty of measuring some of the temperatures.

The writer wishes to direct attention to the bearing of the above on the question of the character of the primeval atmosphere and on the theories of world formation.

The atmosphere is held about the earth by the action of gravity and from the above we are forced to the conclusion that the mass of the atmosphere is as great as gravity is able to control. Perhaps this will be made clearer by the crude comparison of the interaction of the earth and the atmosphere to that of a rotating bar magnet and its iron filings.

The magnet is capable of exerting a certain attractive force. When the filings are present in full amount, *i. e.,* when the magnet can hold no more filings, the attractive force of the magnet for the filings is exactly equal to the attraction of the filings for the magnet. If a less amount of filings were present the attractive force of the magnet would be greater than the attractive force exerted by the filings. If a larger amount of filings were placed in contact with the magnet a certain amount, the 'full amount' mentioned above, would be held and the rest would be thrown off, *i. e.,* the attractive force exerted by the iron filings

[1] *Ber. d. chem. Ges.,* XXXVI. (1903), pp. 1,690 and 4,344; XXXVIII. (1905), pp. 242, 254 and 262. A brief review of the work is given by Professor Renouf, *Am. Chem. Jour.,* XXXIII. (1905), p. 506.