It is probable that the most potent influence turning the tide toward Germany rather than toward France, at least for the sciences, is to be found in the attitude of the American professors themselves, in the advice they give their students. This, however, cannot be held as an ultimate explanation.* Why do these men in American universities advise their students to go to Germany? Why are the scientific libraries in this country so much better stocked with German literature than with French literature? I cannot help the feeling, though I have no statistics, that on the whole Germany has, within the past forty years, produced more scientific men and more scientific literature than has France. It is doubtless true that we neglect unduly French scientific literature in this country. But it is probably also true that to-day, as forty years ago, we justly look to Germany as the seat of the leading spirits in the progress of biological science.

As a second reason cited by some to account for the lack of American interest in French universities, is the apparent distance placed by the French professor between himself and his students.

Finally we have the possible barrier of the difference in race, with all that this implies. Science is supposed to know no racial boundaries; but even scientific men are influenced by the hereditary and acquired ideas and ideals of their race.

Frederick C. Newcombe.

Ann Arbor, April 14, 1900.

THE SENSES OF PRIMITIVE MAN.†

There is a general belief that savages are able to see things that are invisible to the European, and the question is how far this alleged superiority is due to power of observation or to actual acuteness of vision. For the elucidation of this and many other problems in experimental psychology exact investigation is necessary on savages under natural conditions. This Dr. Rivers was enabled to do during the recent expedition to Torres Straits and New Guinea, which was organized by Dr. A. C. Haddon. Although the Torres Straits islanders are not now savages, they may fairly be described as primitive since a generation ago they were naked savages. The greatest amount of work was done on Murray Island, and the people readily allowed themselves to be experimented upon. The conditions were, as a whole, very favorable, the great majority of the natives investigated did their best as is evidenced by the smallness of the mean variation in most of the quantitative investigations. The Murray islanders are dolichocephalic Papuans with a very dark skin and the typical black frizzly hair. They also have the characteristic excitable Papuan temperament.

The visual acuity of these people was found to be superior to that of normal Europeans, though not in any very marked degree. The visual powers of savages, which have excited the admiration of travellers, may be held to depend on the faculty of observation; starting with somewhat superior acuteness of vision by long attention to minute details coupled with familiarity with their surroundings, they become able to recognize things in a manner that at first sight seems quite wonderful. But such exclusive attention as they have learned to pay to objects of sense appears a distinct hinderance to the development of the higher faculties. This view might at first seem paradoxical, since sense impressions are the foundation of the intellectual processes; but, on the other hand, the intellectual superstructure must suffer if too much

* As bearing on this topic, see 'Notes on the History of Foreign Influence upon Education in the United States,' by Hinsdale. Report U. S. Commissioner of Education, 1897-98. Vol. I., p. 591.

† Abstract of three lectures delivered by Dr. W. H. R. Rivers, before the Royal Institution of Great Britain, London, on Jan. 18, 25, and Feb. 1.

energy is expended on the sensory side. In the same way the savages lack of æsthetic appreciation of scenery may be accounted for, since distinctness of detail seems sometimes antagonistic to æsthetic enjoyment. The commonest defect of eyesight among Europeans is myopia, but this was found to be almost completely absent among savages. The opposite condition, hyperopia, which is apparently the normal condition of the European child, was very common among them, and, as it involved accommodation for distant vision, it is possible that the apparent visual acuity of the savage had something to do with a power of quicker and more exact accommodation acquired by constant practice. Some observations were made on vision at low luminosities, and while these were not altogether satisfactory they seemed to indicate that the natives of Torres Straits were able more quickly to adjust their eyes for darkness after light, and to see better in the dark than Europeans. Their binocular vision was normal.

An investigation of the color sense is important in studying the relation between language and ideas. There is a marked paucity in the color vocabulary in the Homeric poems and other ancient writings, Gladstone, and later Geiger, argued from this that there was an actual deficiency in color sense among the ancients and that an evolution in color sense has taken place within historical times. Dr. Rivers has carefully studied the color nomenclature of various races. The simplest he found was among some North Queensland natives, a number of whom had only three color terms. The next simplest was at Kiwai Island, at the mouth of the Fly River, British New Guinea, where there was no name 'for blue apart from black.' The two Torres Straits languages, Murray Island and Mabuiag, were more extensive. In these four vocabularies four stages may be seen in the evolution of color languages exactly as deducted by Geiger, red being the most definite, and the colors at the other end of a spectrum the least so. It was noteworthy, too, that the order of these people in respect to culture was the same as in regard to development of words for colors. The Eskimo, Dr. Rivers observed, differed radically from the languages of the tropical peoples he had examined in possessing an extremely well developed color vocabulary. The epithets used for colors in Homer were discussed and the conclusion was arrived at that the features of his color language were essentially of the same nature as those found among primitive peoples of the present day.

Speaking of the objective examination of color sense in Torres Straits, Dr. Rivers said the people show no confusion between red and green, but they did between blue and green. The investigation of their color names, he thought, showed that to them blue must be a duller and darker color than it was to us, and indeed the tintometer had afforded evidence of a distinct quantitative deficiency in their perception of blue, though the results were far from proving blindness to blue. Dr. River's then discussed some of the objections that had been urged against the theory of an historical evolution of color sense, coming to the the conclusion that it was not to be lightly put aside, though it could not be regarded as fully demonstrated. Next he considered some of the factors that determine the special characteristics of primitive color language, giving some instances, from widely separated parts of the world, in which names of colors seemed to be derived from the same natural objects.

None of the Torres Straits natives were superior in acuteness of hearing to one member of the expedition, while the majority were inferior. No great weight, however, could be attached to the observations, because all the men were divers—an occupa-

tion that certainly damaged the ears to some extent. To investigate their range of hearing a Galton's whistle was used, and it was found that they could hear very high notes.

Their sense of smell was tested by means of a series of tubes containing solutions, of varying strength, of odorous substances like valerian and camphor, and the results, while not altogether satisfactory, tended to show they had no marked superiority in this respect over the members of the expedition.

With regard to taste it was very difficult to get information, as the natives, naturally enough, did not like strange objects being put into their mouths. One fact, however, was noticed, which was interesting when it is remembered that sweet and bitter are probably our most definite taste sensations, and that was the complete absence of any word for bitter. For the sense of temperature the *data* were very scanty, but it was found that the natives had points on their skin specially sensitive to cold exactly as is the case with Europeans. As to touch, when tested to see how close the points of a pair of compasses must be put on the skin before they ceased to be felt as two, their sensitiveness was in general better than that of the members of the expedition. There is a consensus of opinion that savages are less sensitive to pain than Europeans, but there is always the doubt whether they are really able to bear pain with fortitude. However, the conclusion that the Murray Islanders were distinctly less sentitive than the European in the expedition was supported not only by their subjective statements, but also by objective tests depending on the condition of the skin pressure.

In the discrimination of weight it was curious that these natives who had no abstract idea of weight, and no word to express it, and who, moreover, could have had no practice, were more accurate than a practiced European.

Finally Dr. Rivers, while commenting on the defective knowledge of some of the senses he had treated, and on the absence of comparative *data*, concluded that, in general, the sense organs of the savage were not markedly superior to those of the normal or average European, and that the recorded instances of apparent extraordinary acuteness were to be explained by his habits of observation and specialized knowledge.

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*OLIVER PAYSON HUBBARD.**

Oliver Payson Hubbard was born in Pomfret, Conn., March 31, 1809, and died in New York, March 9, 1900. After graduating at Yale College in 1828, he remained in that institution as assistant to Professor Silliman until he began his study of medicine, which he completed in 1837, when he received the degree of M.D. from the South Carolina Medical College, at Charleston.

Prior to his graduation in medicine, he was made professor of chemistry, pharmacy, geology and mineralogy in Dartmouth College. In 1871 the chair was restricted to chemistry and pharmacy, and no longer required his full time, so that he was able soon afterwards to make New York his home during much of the year. In 1883 he felt that he had already passed the age when one should retire from a professorship, and resigned his position, becoming *professor emeritus*. Thereafter he remained in New York City.

His youthful love of science led him to Yale, that he might study under Professor Silliman, then the prominent teacher of science in our country. His first publication, entitled 'Geological and Mineralogical Notices,' having reference to localities in northern New York, appeared in the *American Journal of Science* in 1837, and was followed in 1838 by a somewhat more elaborate article upon the White Mountains.

* Read before the meeting of the Section of Geology and Mineralogy of the New York Academy of Sciences on April 16, 1900.