establish a course in hormone chemistry in the medical department beginning in April. This is said to be the first course of its kind. The cost of maintaining the laboratory for the course has been donated by the Society for the Advancement of Pharmacology in an amount believed to be between 200,000 and 300,000 yen. Dr. Akira Ogata will be promoted to the rank of professor and placed in charge of the laboratory; he has been studying hormone chemistry in Europe for two years.

WILLIS A. SLATER, engineering physicist of the U. S. Bureau of Standards, has been elected research professor of engineering materials and director of the Fritz engineering laboratory in the department of civil engineering at Lehigh University.

DR. BENJAMIN ALLEN WOOTEN, professor of physics at Washington and Lee University, has been appointed head of the department of physics of the University of Alabama. Dr. Robert W. Dickey, professor of electrical engineering in the university, will replace Dr. Wooten as head of the physics department for the coming year.

DR. T. L. PATTERSON, professor of physiology at the Detroit College of Medicine and Surgery, has been appointed acting professor of physiology for the summer quarter of 1928 at Stanford University and will be located at the Hopkins Marine Station, Pacific Grove, California.

THE summer session of Cornell University, which will open on June 30, will have on its teaching staff thirty professors from colleges and universities in addition to regular members of the Cornell faculty. These include in geography and geology: Dr. Collier Cobb, of the University of North Carolina; Professor Harry Leighton, of the University of Pittsburgh; Dr. J. P. Rowe, of the University of Montana; Professor M. H. Stow, of Washington and Lee University. In physics: Dr. William F. G. Swann, of the Franklin Institute; Professor Robert E. Loving, of Richmond College; Carl A. Heeler, of Columbus, Ohio.

WILSON F. BROWN, instructor in chemical engineering at the Ohio State University, has been appointed to an associate professorship at the Kansas Agricultural College to take charge of the work in industrial chemistry and chemical engineering.

THE electors to the newly-established Rouse Ball professorship of mathematics at the University of Cambridge have elected John Edensor Littlewood, F.R.S., fellow of Trinity College and Cayley lecturer in mathematics, to the professorship.

DR. GEORG B. GRUBER, of Innsbruck, has been appointed professor of pathology at Göttingen.

DISCUSSION AND CORRESPONDENCE

OXIDATION-REDUCTION REACTIONS

IN a recent delightful address of Professor Albert P. Mathews[1] he states that it remained for the *physical chemist* to discover what was really at the bottom of oxidations, namely, that when an oxidation takes place one or more electrons are lost by the substance oxidized. This view does, indeed, prevail to-day but in the numerous recent papers which have been written to explain oxidation in the light of the electron theory, no one, apparently, has attempted to trace back this idea to its origin. The reason for this is probably that the original publication took place long before the electron theory had been enunciated and our present conception of oxidation-reduction reactions was not due at all to one who might be called a "physical chemist."

In the third edition of Douglass and Prescott's "Qualitative Analysis," published in 1880, special attention is called to the chapter on oxidation-reduction written by Otis Coe Johnson on the basis of the theory of *negative bonds.* This section appears as Part IV of the fourth edition published in 1883, and the section by Johnson is mentioned on the title page of this fourth edition as well as in the preface to the third edition. Later editions of this well-known book bear the name of Prescott and Johnson as authors. If one substitutes the word *electron* for what Johnson called a *negative bond,* it is clear that his theory is exactly the same as that which has been rediscovered by so many of the younger chemists during recent years. Inasmuch as it is not very far-fetched to call an electron a negative bond, it seems rather remarkable that Johnson in 1880 should have anticipated so closely the present electronic conception of oxidation.

Another statement occurs in Professor Mathews' address which illustrates how long an old theory will persist in literature. He writes "And when the electrical and electronic nature of valence was finally understood, *a few years ago,* it was seen that in every case of oxidation the oxidized substance lost a negative electron and thus gained a positive charge, in other words in every oxidation there is always a *flow of positive electricity, since the current is always supposed to be in the direction of movement of the positive, from the oxidizing to the oxidized body.*"

Such a statement is likely to lead to confusion. Since even the high-school pupil of to-day knows that the so-called "flow of electricity" is theoretically a flow of electrons, it is absolutely inconceivable that there should be such a thing as a flow of positive electricity. It is quite true that some fifty years or so

[1] "Some Applications of Physical Chemistry to Medicine," SCIENCE, 66, 606, 1927.

ago there was a single fluid theory which was practically the reverse of our present electron theory. In terms of this old theory, the positive electricity flowed in the positive to negative direction. According to a later theory, the positive electricity moved in one direction and the negative electricity in the other, but now this double fluid theory has been discarded and it is quite generally believed that only the negative electricity moves in the passage of an electric current through, or over, a wire and in oxidation-reduction reactions. To be sure, a positively-charged body is attracted to a negatively-charged one, and if the former is fixed in position, as the cathode when dipped in an electrolytic cell, then the positively-charged body will move, but in every case of a transfer of electricity it is the light electron that changes position and never the heavy proton. Consequently, in oxidation-reduction reactions there is a flow of negative charges from the reductant to the oxidant and never a flow of positive electricity from the oxidizing to the oxidized body.

Teachers who persist in indicating the direction of an electric current in terms of discredited theories help to bring confusion into the minds of their pupils.

William T. Hall

PSEUDO-ARTIFACTS FROM THE PLIOCENE OF NEBRASKA

In Science of May 20, 1927, there appears, on page 482, a genealogical diagram by Henry Fairfield Osborn, showing his recently modified conception of the origin of man and of his culture. Near the base of the family tree is indicated the geological position of the well-known Hesperopithecus tooth and of certain accompanying fossil bone fragments, thought to be implements. Indirect textual references to the latter are to be found in the same issue (Science News, page xiv) and also in Science of May 6 (Science News, page x).

In Science of December 16, Professor W. K. Gregory published a belated article setting forth his matured views regarding the famous tooth under the explanatory title, "Hesperopithecus apparently not an Ape nor a Man." It seems timely, therefore, that available observations on the associated bone "implements" should also be made known without further delay and I accordingly submit my findings as originally set down in August.

The occurrence of anthropoid remains in the Snake Creek beds at Aldine, Nebraska, being still under dispute, the existence in these Pliocene deposits of bone objects suggestive of a tool-making being be-
tion. Observation, unfortunately, is further limited
comes a subject calling for more than ordinary cau-
by the fact that in the absence not only of human skeletal remains and of hearth-sites, but also of stone implements such as could have been used in the production of bone artifacts, the question of man's presence comes to depend entirely on the evidence furnished by the peculiar bone specimens themselves.

Having been requested for an opinion concerning these bones, it was at once assumed that the occasion demanded something decisive. The entire available collection—or rather selection—has therefore been subjected to systematic study. To check my own observations, the material was looked over independently by a laboratory assistant who had previously shown some aptness, *e.g.*, in detecting frauds among our old Indian collections. More precisely stated, this examination involved the scrutiny of nearly 3,000 specimens with a magnifying glass and by the aid of the best obtainable light. In short, all reasonable mechanical precautions have been observed. By way of further precaution I have also, as a matter of course, asked myself these questions: What now is it you are looking for? What precisely are the standards by which you are to measure these specimens? Expressed in other terms, what are the diagnostic characters indicating bone artifacts?

Without giving a complete inventory of primitive bone implements and ornaments, it may here suffice to say that implements divide into two major groups or classes, *viz.*, sharp-pointed and sharp-edged. The ornaments, or at any rate the objects less distinctly utilitarian, separate into tubular forms (cylindrical beads, flutes, etc.), and thin flat forms of varying outlines, rectilineal and curvilineal. And what distinctive features normally characterize each and all of these four outstanding classes of objects? First of all, a certain more or less easily recognizable shape or design. In the second place, implements are generally marked by evidences of wear, often resulting in a high degree of polish. Generally, too, they are marked by abrasions, if not actual perforations; and they almost invariably show certain unmistakable straight-line cuts and scratches running diagonally or transversely across the natural striations of the bone itself. Assuming, therefore, that the bone specimens to be examined were worked or utilized in a fresh state, and that at least some of the more deep-going evidences of artificial treatment have been preserved in the fossilized objects now available, we have remaining these criteria: shape, wear, polish, cutting marks, chopping marks, abrasions and perforations. These are perhaps not infallible proofs but they are all that we have. In matters of observation pertaining to objective facts no man is entitled to call up a standard for judgment out of his own inner consciousness.