

courtesies be extended to the commission which it is customary to extend to other judicial bodies and other international committees. Suggestions, advice and objective arguments are welcomed, but polemics of all kinds will be consigned, unconsidered and unanswered, to the waste paper basket.

This public notice is given only after receipt of a number of letters couched in terms which it is exceedingly difficult to construe as within the bounds of professional courtesy or diplomatic usage.

CH. WARDELL STILES,
Secretary

THE ZOOLOGICAL RECORD

The Zoological Record, published annually by the Zoological Society of London, is now also the zoological volume of the International Catalogue of Scientific Literature, and is prepared with the active cooperation of the United States government, through the Smithsonian Institution. In spite of this, when the volume for 1909 came to hand recently, I was called upon to pay \$2.50 duty, a larger sum than ever before. I thereupon applied to the Smithsonian Institution, and was informed that the *Record* appeared to be entitled to free entry, according to item 517 on page 71 of the Aldrich-Payne Tariff Bill of 1909. Armed with this information, I took up the matter with the U. S. Treasury, and after a lengthy correspondence with the authorities in Washington, New York and St. Louis, have received a check for the amount paid. I publish these facts for the information of other subscribers. It should be added, that not only is the *Record* entitled to free entry, but all "books and publications issued for their subscribers or exchanges by scientific and literary associations or academies."

T. D. A. COCKERELL

PRIMITIVE COPPER HARDENING

TO THE EDITOR OF SCIENCE: In his notably sane address on "The Lost Arts of Chemistry,"¹ Dr. W. D. Richardson refers to the question, much mooted among archeologists,

¹ SCIENCE, Vol. XXXIII., 1911, p. 513 et seq.

concerning the hardening of copper in primitive art. While his general conclusion seems just, it is nevertheless liable to be questioned by collectors of primitive artifacts in this country and perhaps elsewhere. Some personal investigation of primitive copper artifacts indicates that for two reasons these are sometimes harder than is ordinarily attained by modern artisans. (1) While ordinary copper artifacts exhumed from mounds and other burial places are commonly coated with the green oxide, the edges of knives and sometimes other portions are patinated; and usually the patina (which may extend on both sides of the blade quite to its edge) is decidedly harder, albeit more brittle, than the unchanged copper. Not infrequently this patina is mistaken for the normal condition of the metal; and the collector regards his artifact as an evidence of artificial hardening beyond the reach of modern artisans. (2) Judging both from the condition of the prehistoric artifacts and from the methods pursued by primitive artisans, the copper implements of the American aborigines were commonly hardened by hammering, albeit rather adventitiously than intentionally. Now, in the process of working, the tools employed (corresponding to hammer and anvil) were not of steel or other resilient metal, but of stone; and experiment indicates that under the blows of an inelastic stone hammer on a thin blade resting on an inelastic stone anvil, the successive impacts are not so well distributed throughout the mass of the metal as are those produced by resilient steel tools; so that the blade undergoes a sort of skin-hardening, naturally culminating in the cutting edge. Of course this effect might easily be imitated by a modern artisan using primitive tools; yet it is a factor to be reckoned with in considering the widespread belief in the superior hardness of primitive copper artifacts. Speaking broadly, the notion of lost arts, which Dr. Richardson effectively combats, is a mischievous one. Of course throughout the long, devious and vacillating course of human progress, arts have disappeared—usually because replaced by superior arts. The indus-