appears that the number of complex phonetic shifts, for the most part determined by adjacent sounds, is enormous. These involve the loss of consonants, at times of whole syllables, the transformations of consonants and vowels, the leveling of old vowel-quantities with a redistribution of such quantities, etc. To such an extent have these wrought havoc that words have been transformed almost beyond recognition. Who would suspect that maistō'^{u}—"throat"—comes from *mekuntākani, ma'éx^{a}—"eye"—from *meckēncekwi, ho'íst^{a}—"fire"—from *ickutäwi? Yet it can be rigorously demonstrated. Incidentally the chronology of these shifts must be ever taken into consideration. Thus, the same Cheyenne sound may come from two distinct archetypes which have been merged, and in such cases the phonetic treatment often is determined by the original archetype. Another potent factor must also be reckoned with, namely, analogy. At times the plural of a noun has been influenced by the form of the singular, the reverse of what has happened in a few cases in Cree. The terms for bodily parts combined with possessive pronouns have frequently been rebuilt analogically. The so-called "intervocalic —t—" in verbal forms has been entirely wiped out. Thus it appears that the morphological transformations are due to phonetic shifts and analogy. I do not know a single Cheyenne morphological trait that is due to extraneous influence. The speech-form has remained Algonquian.

I am not in a position to report on Arapaho and Blackfoot, two divergent Algonquian languages, with any degree of confidence, save to say that I have worked out a number of phonetic shifts in both, with the result that the number of demonstrably Algonquian words has decidedly increased in both. This last applies especially to Blackfoot. Very fortunately in Cheyenne, Arapaho and Blackfoot the semantic transformations do not seem to be very radical. In conclusion it may be said that none of the above-mentioned languages contributes much towards the reconstruction of the parent Algonquian language, of which the historical languages are the descendants. An exception must be made in one or two cases where Cheyenne, though aberrant, is clearly archaic.

TRUMAN MICHELSON
BUREAU OF AMERICAN ETHNOLOGY

IRON TOXICITY FROM LIMING

IT has been found that one of the immediate effects of heavy liming rather acid soils with calcium carbonate is to greatly increase the iron content in the soil solution. Incident to liming the amount of organic matter in solution is greatly enhanced. Owing to the great increase in carbon dioxide in the soil, directly and indirectly the result of liming, the pH of the soil solution is maintained at a lower level until the excess carbon dioxide is largely dissipated. The first reactions in the soil are favorable for the holding of iron in the soil solution. As soon as the limed acid-soil comes to equilibrium the iron level falls back to a desirable amount for crop production. The adjustment period under field conditions would depend upon the weather, varying from several months to a year. This transitory higher level of iron in the soil solution, and perhaps other sesquioxides, apparently accounts for the toxic effects to farm crops from the use of large amounts of lime on some of the acid soils. In a case of the Caddo silt loam the use of a large amount of lime increased the iron content in the soil solution from 0.5 ppm to 50.0 ppm. The original reaction of the soil is pH 4.8.

A. H. MEYER
LOUISIANA STATE UNIVERSITY

SCIENTIFIC BOOKS

Manual of Meteorology, Volume IV, Meteorological Calculus: Pressure and Wind. BY SIR NAPIER SHAW, with the assistance of ELAINE AUSTIN. Pages XX, 359, xii, and 79 illustrations. Cambridge: At the University Press. New York: The Macmillan Co., 1931, $9.50.

THIS last volume of Sir Napier Shaw's great "Manual of Meteorology" is not a book to be read at a single sitting. There are 600 words, or more, to the page and many sections are so full of thought and suggestions as to require reading and rereading with much pondering and meditation. This never is owing to carelessness in expression, for Sir Napier is a master in saying things both clearly and elegantly, but to the inherent difficulty of the subject itself, and the necessity for some sort of limitation to the length of the exposition.

No other treatise on meteorology approaches in magnitude this four-volume manual, and yet apart from the historical and statistical portions, it essentially is restricted to the mechanics and thermodynamics of the atmosphere. It would be a great boon if Sir Napier would give us a supplementary volume or two on the acoustical, electrical and optical phenomena that also pertain to that medium. This further contribution from him we wish, but have not the face to request. The task he already has accomplished was Herculean, and he richly deserves all the holidays he wants. But will he rest? Certainly not, if we may judge the future by the past.