ponents: *"No one* has demonstrated that phase *does not* influence quality of tone. Special apparatus permitted us a continuous change of phase with independent control of intensity and frequency. . . . For each cyclic phase shift, the sensation components vary in loudness. . . . The results are inconsistent with resonance analysis."

If filters could filter out "sensations," one could change a sung bass note into a soprano. G. O. Russell[4] tried it: "Filters cutting out frequencies below 500—but oddly enough, observers still do not hear it as changed to a feminine voice; yet the lowest physical frequency still present is well up in that range."

Let us repeat our warning. Electric filters do not filter out sensations. They physically destroy "Fourier Components." It is true, in ninety (or more) cases out of a hundred the sensations are also gone. But the exceptions, the sensations unexpectedly remaining, are of far greater importance for acoustical science, for they prove that *the cochlea, while being the analyzer, is not a Fourier analyzer*[5].

MAX F. MEYER

UNIVERSITY OF MISSOURI

A SOURCE OF STUDY MATERIAL FOR THE COUNTRY MAMMALOGIST

WHILE engaged in an investigation on the food and feeding habits of New York fur-bearers during the past few years, the writer has come into contact with a number of trappers and fur buyers. Acquaintance with these men has made it possible to secure for study large numbers of the carcasses of skunk, weasel, mink, raccoon and fox.

Many of these fur buyers travel about their respective counties, buying furs, a good proportion of which are in the form of unskinned animals. These are brought to the buyers' headquarters, where they are skinned, and by previous arrangement with the writer the carcasses are saved. Trips are made every few days to these localities, the viscera removed, weights taken of unskinned animals and further notes made. During freezing weather, visits are made once a week. That a great deal of material can thus be secured is attested by the fact that one buyer of the writer's acquaintance handled over fifteen hundred skunks during the past season (1931–32) as well as many hundreds of other animals. Approximately one half of these were received in an unskinned condition and the bodies made available for study.

Suggested topics for study other than that of food are:

(1) Weights. Sexual and age variation, likewise loss or gain of weight during the fall and winter season.

(2) Reproductive Cycle. The rutting season may be determined in some forms; the period of appearance of first litters, etc.

(3) Hibernation. By keeping data on weather conditions, and noting the number of animals caught over a wide period of time, the influence of temperature and precipitation may be partly determined as influencing factors in the date of hibernation, also the appearance of the animals from a state of winter sleep. For example, it has been noticed in the case of skunks, that the females are seldom caught during the cold weather of December and January, while the males may be tolerably abundant.

(4) The dates of full primeness in fur bearers, with data on color changes, such as weasels.

(5) The ratio of the sexes; do the males or the females appear most numerous?

(6) Abnormal animals. While this perhaps is not as important as the others, the fur buyers and trappers are always willing to hold out unusual specimens for the student to examine. Considerable data on freak forms may be revealed in this manner.

It has been found that advertising for stomachs and writing trappers of one's wishes is of little value. It is possible to supply them with tags and crocks, containing a 10 per cent. solution of formaldehyde, in which they might drop the viscera after skinning the animals. While this is not as satisfactory a method as examining the entire carcass, it has the advantage of saving one numerous trips and much time. The data might be faulty on such specimens.

Such material carefully studied will give one a working basis on which to submit suggestions for changes in existing game laws, where these appear at present unfavorable to the animal's natural increase and perpetuation.

W. J. HAMILTON, JR.

CORNELL UNIVERSITY

AMERICAN LINGUISTICS

IN SCIENCE of May 6, p. 491, Dr. Boas has noted that we may hope to learn most in regard to the history of American languages from a study of those stocks which have developed the greatest number of markedly distinct dialects. This has induced me to report briefly upon some of the results of my recent investigations of Cheyenne.

Cheyenne is a strongly divergent member of the Algonquian stock. It seems as if the transformation has been self-evolved and not due to extraneous influence. Thus, the number of even plausible Siouan loan-words is but a handful. On the other hand, I have a collection of more than seven hundred words and stems which are demonstrably Algonquian, even if these are but a fraction of the total vocabulary. It

[4] G. Oscar Russell, "Speech and Voice," p. 171. 1931.

[5] Max F. Meyer, "The Hydraulic Principles Governing the Function of the Cochlea." *Jour. Gen'l. Psychol.*, 1: pp. 239–265. 1928.

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.