On this, of course, much evidence has been gathered and there are deeper mines than in his day.

He refers to the crust lying on the lava as comparable to the "state of a raft of timber floating upon water; in which, if we remark one log whose upper surface floats much higher than the upper surfaces of the others we are certain that its lower surface lies deeper in the water than the lower surfaces of the others." This would, of course, be true of logs of the same material, say pine, but as I pointed out in a talk which I gave in Washington, if some of the logs were pine and others oak, we might have logs of pine projecting higher than those of the oak, while the bottoms were all at the same level, and this would be as Pratt pictures it.

Pratt does not agree with the hypothesis for the following reasons:

(1) That the hypothesis "supposes the thickness of the earth's solid crust to be considerably smaller than that assigned by the only satisfactory physical calculations made on the subject—those by Mr. Hopkins, of Cambridge. He considers the thickness to be about 800 or 1,000 miles at least."

We now know from the calculations of the seismologist that there is a much thinner crust than this.

(2) "It assumes that this thin crust is lighter than the fluid on which it is supposed to rest. But we should expect that in becoming solid from the fluid state, it would contract by loss of heat and become heavier."

But it is now generally accepted that there is a lighter layer, the thickness of which has been given by various recent writers from ten to fifty kilometers, but practically all recent writers, including Daly and Holmes, accept some such lighter layer.

(3) The third point that he makes is that if for every "protuberance outside this thin crust there must be a protuberance inside it would be equally true that wherever there was a hollow as in deep seas, in the outward surface, there must be one also in the inner surface of the crust corresponding to it."

This is the region which Meinesz has recently been investigating.

Finally, it will be noticed that Pratt assumes that "as the crust formed, and grew thicker, contractions and expansions may have taken place in any of its parts, so as to depress and elevate the corresponding portions of the surface." If then, he goes on to say, these changes "took place chiefly in a vertical direction, then at any epoch a vertical line drawn down to a sufficient depth from any place in the surface will pass through a mass of matter which has remained the same in amount all through these changes."

Obviously, this is not in harmony with the tremendous overthrusts which geologists are now finding, not to mention such ideas as continental drift.

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THE DELUSIVENESS OF FILTERING COMPOUND SOUNDS

THE invention of electric filters to cut out of a compound current certain frequencies, while the others are but inconsiderably weakened, has opened the way for the convenient study of certain phenomena in the psychology of hearing. But caution is needed. Electric filters are not sensation filters.

The ambiguity of interpretation dates farther back than the few years ago when electric filters were put in practice. The old Ohm-Seebeck controversy of 1841, in *Poggendorff's Annalen,* will never die until experimental actuality triumphs over mathematical beauty. The highly musical Seebeck emphatically stated his observations that the fundamental tone of a compound is heard more strongly than it should be heard if the ear were a harmonic analyzer. The totally unmusical Ohm (he compares himself with the color blind) emphasized that, if the ear performed a Fourier analysis, it would *only moderately deviate* from Seebeck's experiments. The physical brotherhood has supported Ohm's rationalization until to-day.

In 1898, I published[1], among numerous other experimental facts, the following: A whistle tone "8" is made so weak, that while clearly audible alone, it is completely masked by a lower tone "5" of constant intensity and rather strong. "5" is now sounded first. At the moment when "8" is physically added, it is *not added* to the sensation; and clearly observable are now the physically *non-existing* tones "2" and "1." And yet we assert that the cochlea performs a Fourier analysis.

A few years ago the Bell Telephone Laboratories distributed a series of highly interesting filter records for the phonograph. I quote from "Record BTL-5-A, Vocal Tones, Illustrating the Recognition of Pitch." "This record is to show how *the ear supplies* tones actually not present. The sung vowel ah is heard with its fundamental eliminated. You notice a quality difference, but the pitch remains the same." Nevertheless, Dr. Fletcher[2] says: "The . . . *brain* may aid in making interpretations." Needless to say, no one has published any conception of a brain function adequately analyzing sound.

But there are dissenters. W. C. Beasley[3] experimentally attacked the stronghold of Ohm's defenders, the alleged irrelevance of phase shifts of the com-

[1] *Zeitschrift für Psychologie,* 16: p. 6. 1898.

[2] Harvey Fletcher, "Speech and Hearing," p. 122. 1929.

[3] *Jour. Gen'l. Psychol.,* 5: pp. 331, 347, 348. 1931.

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].

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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.

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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.