plenty of legumes and grasses on which to feed. The fur-bearers, the hawks and the owls feed on the rodents, snakes, insects and birds, both game and non-game species. The food of the rapacious species will vary from time to time. If any prey becomes over-abundant, it will receive concentrated attention until its numbers go back to normal.

The presence of rodents and snakes will tend to divert attention from the game. The burrowing species of rodents, worms and insects tend to keep the soil in excellent condition for plant growth. While ill-situated surpluses of game are subject to attack and elimination, the presence of adequate cover and food effectively guarantees the protection of game up to the limit of the carrying capacity of the area. The snakes, hawks, owls and fur-bearers set similar limits to the rodent population, consuming only an ill-situated surplus, but tending to hold the animals very distinctly in bounds.

We have the climate, soil and animal and plant population operating as a balanced enterprise, both biologically and economically. Let us examine some of the economic implications of diversification, as extended to natural as well as cultivated crops.

The trees, of various species, can be cut or used for lumber or wood, on a sustained yield basis.

The game can be taken in season—the luxuriance of food and cover guarantees an abundance; the presence of good escape cover helps to avoid too extreme a harvest.

The fur animals can be trapped when their pelts are prime, providing a further source of income, a much appreciated cash return to farm boys and trappers.

Recreationally the area is a good deal more attractive than any "one species of tree" stand could possibly be. As a site for picnics, camps or outings, it is appealing because of its variety of flowers, berries, shade, trees and game.

Fish are abundant in the streams, as there is ample vegetation to regulate the flow of the water to keep it clear, and plenty of insects and plant life to serve as food and shelter for fishes.

Accelerated erosion is prevented because the protecting mantle of vegetation, from the ground cover up, is that adapted by nature to prevent over-rapid run-off.

The soils, instead of being depleted, are conserved and enriched, not only by the variety of legumes, but by the effects of burrowing rodents, insects, worms, protozoa and bacteria. There is no problem of depletion here, as the whole system is in balance.

The waters, as above indicated, instead of running off in one great flood, are permitted to flow moderately and steadily, accomplishing a maximum of good with a minimum of difficulty.

Insect, rodent and predator problems are reduced—as the enemies of potential pests are all present in normal numbers.

Note that among the essential items in maximum and diversified wildlife production are the weed trees, the miscellaneous brush, the over-mature trees, the standing dead snags, a variety of herbaceous plants, the rodents, the snakes, the insects, the hawks, owls, fur-bearers and predators.

Eliminate any of these natural features and the production of beneficial wildlife may be impaired.

There are exceptions to this ideal situation, of course. The practices recommended for diversified farming may not always work out. Occasionally an unusual combination of climatic and other conditions may result in abnormal numbers of rodents or insects or game, in spite of natural controls. Then man must take a hand, although nature, through quick infection of surplus populations with epizootic disease, concentration of enemies or otherwise, ultimately brings under control species that attain plague status.

Man's own unwarranted interference is by far the most difficult problem. Use of land and resources on a quick-crop-quick-profit basis, rather than on a basis of sustained yield, profoundly and inevitably alters the natural set-up.

WALTER P. TAYLOR

BIOLOGICAL SURVEY
U. S. DEPARTMENT OF AGRICULTURE
COLLEGE STATION, TEXAS

PROTOPLASMIC SPECIFICITY

PROTOPLASMIC specificity of form and of function is undoubtedly to be regarded as the resultant of the interaction of the various components which make up the protoplasmic system. In the egg-cell, the components by whose interaction specificity is expressed are usually named "nucleus" and "cytoplasm." More exactly these components are four: nucleus, cytoplasmic inclusions, ectoplasm and ground-substance.

The important rôle of the nucleus in maintaining morphological specificity is too well known to warrant discussion. Similarly, the evidence for specific chemical structure of nucleo-proteins needs no rehearsal here. Of the cytoplasmic inclusions, the yolk of all eggs of marine animals known to me shows a high degree of specificity. Since my original notice that in eggs of *Nereis* and of *Platynereis* completely reversible hydration reveals that the yolk-sphere is a lipin-protein structure,[1] I have learned that yolk of other eggs has this same make-up. This structure I find is revealed as specific by its mode of water intake

[1] Just, *Anat. Record*, 1925; *Physiol. Zool.*, Vol. 1, 1928; *Protoplasma*, Bd. 10, 1930, p. 24, p. 33.

and output as well as by its staining reactions. Both in structure and in behavior the ectoplasm of animal eggs is a diagnostic of specificity. In addition, it is a diagnostic of the successive stages in the embryonic development of any animal egg.

Evidence can be adduced to show that nucleus, cytoplasmic inclusions and ectoplasm should be considered as derivatives of the ground-substance of the cell. During several years I have accumulated evidence which convinces me that in the ground-substance one can detect specificity. By methods inspired by Reichert and Brown's[2] I have succeeded in demonstrating specificity in the ground-substance of eggs. A method of my own, which allows very rapid precipitation, likewise demonstrates specificity. Further, thanks to a suggestion given me by Dr. A. P. Mathews while I was a student of his, I have used dyes to show progressive changes in the ground-substance during development. In this manner I have studied the actual time and place both of the loss of embryonic potency and of the building up of nuclear stuff out of the cytoplasm. Finally, by methods of spectroscopy also I can show specificity in the ground-substance.[3]

A detailed report giving methods will follow. It is also hoped that it will be possible to extend these investigations.

E. E. JUST
HOWARD UNIVERSITY

THE AUDIBILITY OF ESPERANTO

THE article in the Supplement in SCIENCE for June 12, on "The Audibility of Language," contained certain allusions to Esperanto (and to the problem of an international language which it essays to solve) which would appear to justify a few additional comments.

The original creator of Esperanto, Dr. L. L. Zamenhof, was not guided in his choice and treatment of material by any one single objective; since the ease of learning, ease of utterance, ease of auditory perception and adequacy for expressing a wide range of ideas had to be considered jointly, and each in proper proportion to the others. But in the matter of acoustic quality it is now interesting to note that Esperanto as actually created does appear to conform more closely than our English to those phonetic requirements for audibility which were discussed in your previous article.

For example, you pointed out that words ending in "ng" were especially subject to misunderstanding during the Los Angeles tests. But no Esperanto word can possibly end in "ng," since that nasal sound is not employed at all in Esperanto.

You also noted that words ending in a vowel have been found in general to be more readily understood than those ending in consonants. Actual count has shown that on an average Esperanto page five eighths of the words end in vowels, against only two eighths on an average page of English. Moreover, only two Esperanto words (the prepositions "trans" and "post") end in more than a single consonant.

Of course, audibility does not depend on final syllables alone. The consonantal combinations which form the joints between the vowels have an important influence on the sound effects. This opens up a wide and complicated field. From a member of the Esperanto Association comes a query whether the family of four "explosives" (the *ch* in "chairman," the *dg* in "badger," the *ts* in "tse-tse," and the *dz* in "Kedzie") may not be among the highest of sound combinations in ear-catching power, because in each of them a breath-stoppage and a sibillant or buzzing dénouement are welded into what is practically a single sound of explosive quality. This may be a good field for further experimental research. At any rate, a recent count in the first 2,000 syllables of the book of Ruth in our English Bible finds the sounds of this quartette occurring only 30 times in all. While in the first 2,000 syllables of Ruth in the Esperanto Bible these sounds are employed 83 times.

Esperantists often mention with satisfaction that on one occasion when a broadcast by the late King George V failed to be audible in Geneva because of unfavorable atmospheric conditions, the Esperanto translation of the address which immediately followed was understood clearly and was the sole source of the first reports in the Swiss newspapers.

E. G. DODGE,
Chairman of Executive Committee,
Esperanto Association of North America
WASHINGTON, D. C.

THE PHILOSOPHY OF PHYSICS

IN his latest book, "The Philosophy of Physics," Planck refers to the theory of relativity on five different occasions without once mentioning Einstein's name. Planck's quantum is referred to six times, but Planck's name appears each time.

On page 35 there appears this statement: "Every science, like every act and every religion, has grown up on a national foundation. It was the misfortune of the German people that this was forgotten for many years."

I wonder. Just precisely what has happened to the Grand Old Man of Science in Germany?

BENJAMIN HARROW

[2] Publication No. 116, Carnegie Inst. Washington, 1909.

[3] My first studies with the spectroscope on this problem were made as early as 1923. It gives me great pleasure to acknowledge my indebtedness to my colleague, Professor Frank Coleman, department of physics, Howard University, for his valuable aid.