graph to a loud-speaker. The phonograph record has at the given place the corresponding letter in speech. So the printed letter is reproduced as sound. The blind man thus hears the letter which is printed in the original print.

It is also possible to let him feel it instead of hearing. To this purpose the current moves the letters of a Braille alphabet which are fixed on levers.

The same principle could be of course also applied to translating letters into secret codes, or letters into figures, or letters of a language into the sound of another one. But the chief application projected is for the use of the blind to allow them to hear or feel ordinary print.

Science News Letter, September 16, 1933

PLANT PHYSIOLOGY

Plants May Produce Some Oxygen For Own Needs

OXYGEN needed by the roots of plants may be to some extent supplied by the plants themselves, from the oxygen generated as a by-product in the manufacture of food in the leaves. Evidence on this point has been obtained in experiments by Prof. W. A. Cannon of Stanford University, who has made preliminary reports to the Carnegie Institution of Washington and to *Plant Physiology*.

Prof. Cannon set jars containing shoots of willow and other plants in darkness and in light, and compared the rates at which their roots used up oxygen. He found in the larger number of cases that the illuminated shoots needed less oxygen from the outside, and therefore reached the tentative conclusion that the extra supply of the needed element was being provided for internally.

Science News Letter, September 16, 1933

TECHNOLOGY

Electric Process Makes More Efficient Sandpaper

SANDPAPERS that are claimed to be 50 per cent. more efficient than the best previously manufactured brands are now made by a 75,000 volt electrical process.

This intense electrostatic field sprays the cutting particles of garnet, aluminum oxide and silicon carbide on to the glued paper more evenly.

Science News Letter, September 16, 1933

ECOLOGY—ANTHROPOLOGY

Shifting Corn Belt May Have Influenced Culture Migrations

THE GREAT American corn belt, that rich agricultural empire that now centers in eastern Iowa and western Illinois with its borders extending from Indiana to central Nebraska, seems to have been more or less of a migrant during past ages, swinging from west to east and back again in sensitive response to change in climate. Evidence that its center was once as far east as Ohio has been found in the records of prehistoric Indian cultures by Prof. Paul B. Sears of the University of Oklahoma.

Much evidence for changing climates in North America during the past ten thousand years or so has been produced by the study of pollen grains and other plant remains buried in peat bogs, and a good correlation between these changes and similar ones in Europe has been worked out. In these researches Prof. Sears has made himself a leader.

The succession of post-glacial climates has been cold-moist, cool-dry, moist, warm-dry, moist again. With each succeeding type of climate a characteristic type of vegetation has developed in any given part of the eastern United States. In the Ohio region it worked from forests of evergreens in early post-glacial times up to a rich mixed forest of hardwoods some five thousands years ago. Then came the period of warmth and comparative dryness. The forest became more open, invaded by open grasslands. This set up conditions most favorable for the cultivation of corn and for the invasion of bison herds. This phase ended in the return of a moister climate and the re-growth of the heavy forest which white men found when the first explorers entered the Ohio valley.

The archaeological records examined by Prof. Sears indicate that with each type of natural vegetation there was probably associated a special type of Indian culture. At the crucial time when the Iowa-like prairies invaded Ohio and made corn-growing and bison-hunting possible, there was in possession of the land a predominantly hunting people, of the Algonkian Indian culture group. As their native forests retreated eastward they went with them, and their place was taken by a corn-raising Indian people from the West, a people we know now only from their mound-building culture, one high type of which we call the Hopewell. They held the land and built their monuments; but when the climate switched to forest-favoring humidity again they had perforce to return whence they came, where cornfields and buffalo-hunting were still possible. As they left, the forest-dwelling Algonkian re-possessed themselves of the land.

Histories of similar culture-migrations following the migrations of natural vegetation as influenced by climatic fluctuations have been traced by Prof. Sears for other parts of the country; he terms the study "the archaeology of environment."

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