



Cromwell's Two Skulls

WE COMMONLY think of the fossil remains of an animal as something final and conclusive, like a tombstone. Here, we can say, a dinosaur, or a mammoth, or a man, laid him down to die, and here, thanks to lucky accidents of the right kind of burial, the trickling of mineral-charged water, and other suitable conditions, part or all of the bones became fossilized.

But one animal leaving more than one complete fossil? That smacks too much of the old story of the provincial museum in England, which boasted the possession of two skulls of Oliver Cromwell, one taken when he was a little boy, the other his grown-up-man skull. No. One animal, one fossil skeleton: that would seem to be only common sense.

It is only common sense, insofar as it is limited to animals that wear their skeletons inside, as we do, and as the dinosaurs did—and likewise Oliver Cromwell. But there are plenty of animals, and have been in all geologic ages, that wear their skeletons outside, and shed them periodically, to appear in new ones. Lobsters and crayfish, scorpions and insects do that nowadays; you frequently find their shed "skins."

So also in past ages did the primitive relatives and ancestors of the lobster-crayfish tribe, ranging from the lowly trilobites which are among the earliest of all known fossils, up through the six-foot "sea-scorpions" or eurypterids, and the armor-cased ostracoderms which apparently were the ancestors of fishes, and through them of all other vertebrates.

These animals were for the most part dwellers in or on the silty bottoms of quiet waters. When they outgrew their shells and cast them off, the discarded outer skeletons were left on the bottom,

frequently to be silted over and eventually to harden into rock.

One trilobite or ostracoderm could thus easily leave ten or a dozen outgrown suits of armor-skeleton, of which several or all might become fossilized. One museum might, therefore, by lucky chance possess two or more fossils of the same animal—just as the historic museum of the old tale might really have made good on a boast of having two of Oliver Cromwell's cavalry breastplates, one from the time when he was young and slim, the other from his more robust maturity.

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## ECOLOGY

## Native Grasses Most Efficient In Holding Soil Against Water

EROSION resistance of a given type of soil varies greatly according to the kind of vegetation growing on it and the way that vegetation has been treated.

This fact was dramatically developed in a series of direct tests on samples of prairie soil, carried out by Prof. J. E. Weaver of the University of Nebraska and Dr. George W. Harmon of the U. S. Soil Conservation Service. Their results are reported in a special bulletin of the Conservation and Survey Division of the University of Nebraska.

Drs. Weaver and Harmon lifted several four-inch-deep samples of prairie soil intact from their places, enclosed in secure wooden frames. These frames were placed on a washing frame with a ten per cent. slope, and a hose played back and forth over them under uniform conditions of flow and pressure, after all top growth had been shorn off. The time was measured, in which the various soil samples were washed away.

The sample of big bluestem sod proved highly resistant. Superficial soil was washed off in a muddy stream in between five and eight minutes, but after that the matted roots held the rest of the mass firmly for over two hours. Only at the end of two hours and forty minutes of hard "squirting" with a small stream of water were the roots robbed of their soil.

A second test with big bluestem showed the comparative resistances of ungrazed sod. The ungrazed sample held its soil against the water's attack for 3 hours 28 minutes; the grazed sample yielded almost an hour sooner.

Little bluestem grass and needlegrass samples resisted for 3 hours 32 minutes and 3 hours 20 minutes respectively.

The soil-binding power of weeds proved negligible, in comparison with that of the grasses. A sample in the annual-weed stage was completely washed away in 41 minutes.

Clean-cultivated cornfield soil was even weaker, though it contained a couple of cornstalks and their upper roots. It was a complete washout in 18 minutes.

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## BIOLOGY

## Turtle's Tank-Like Armor Not a Certain Defense

See Front Cover

OVERDEVELOPMENT of defensive armor has been demonstrated as a weakness and a snare time after time in the history of life on earth, yet there are animals that persist in it still. Turtles and tortoises for millions of years have been depending on their horny cuirasses, disdaining the use of claws and teeth, or of long legs to run away when they cannot fight. Coupled with ability to conceal themselves in mud or under earth, plus a fair prolificness in reproduction, it has "got them by."

Some of the early saurians did the same kind of thing; and there were also the glyptodons and the plate-armored knights of the fifteenth century. But always, when a creature has put too much dependence on an impenetrable shell, there has come a stronger, who taketh away the armor wherein he trusteth, and distributeth the spoils—whether it be a tyrannosaur, or a saber-tooth cat, or a yeoman with long-bow and clothyard shaft, or a vacationing small boy with a chunk of rock.

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## RADIO

Tuesday, September 3, 3:30 P. M., E.S.T.  
OUR HIGHWAYS, ARTERIES OF THE NATION, by Dr. S. S. Steinberg, University of Maryland.

Tuesday, Sept. 10, 3:30 p. m., E.S.T.  
AMERICA'S EARLIEST MAN, by Charles Amsden, Secretary, Southwest Museum.

In the Science Service series of radio addresses given by eminent scientists over the Columbia Broadcasting System.