

Ninety-five Thousand Dollars to be expended approximately as follows:

- (1) For a Roadway leading in from the so-called Atlantic-Yellowstone-Pacific Highway to the North-eastern corner of the present Monument area, and thence along the site of a proposed lodge and over the main mesa by the site of the planned Field Museum to an exit on the Southwest corner, being in all a distance of about one mile and a half, the sum of seven thousand dollars.
- (2) For a suitable bridge across a deep ravine best traversed by the preceding proposed highway, the sum of three thousand dollars.
- (3) For the proposed guest, students and visitor's lodge, with development of water supply for lodge and museum, the sum of twenty thousand dollars (items being Water, \$5,000, Lodge, \$15,000).
- (4) For the erection of a simple but substantial, and lasting *Field Museum* on the main Mesa front as planned, the sum of fifty thousand dollars.
- (5) For preparation, installation and display of exhibit of the cycads with illustration of the meaning of the phenomena of petrification, the sum of twelve thousand dollars.
- (6) For low set obelisks marking the geologic divisions and horizons about the Museum, and for the tasteful care of the immediately surrounding grounds, the sum of three thousand dollars,—the sum total provided for the several purposes enumerated in the present Act being as stated *Ninety-five Thousand Dollars*; while finally it is understood that the future care of this monument will be provided for by the monies Congress has already set aside for Parks and Monuments, or will set aside for such and related worthy purposes, it being the intent in carrying out the foregoing items of development to accentuate the museum on the mesa front and the display within it.

WHENCE, any sum left over while carrying out the lesser items enumerated in this Bill, necessary and closely estimated though they be, should be applied to the two major items (4 and 5), plainly of such significance that in the long future a larger sum of money, whether from public or private source, could well be expended upon them.

It is advised that the Monument area be eventually added to up to at least one, or better two, squares miles.

In closing these notes I wish to record a very pleasant fact indeed, one of a genuine international meaning. There lie more or less hidden in the Apennines, along the shores of the Isle of Wight, and also the Isle of Portland, and especially in the Galician Carpathians, forests of the same kind and age as that in far fuller view at Fossil Cycad National Monument; and Europeans because of their direct interest in our venture have contributed wonderful comparative materials from all these localities.

Because of such a friendly fact, such a world-wide interest in sheer ideals, does it not become rather

absurd that certain of our American specimens of first importance to our greater recovered series are known to have been dragged out of view by parties possessed indeed by a frantic curiosity, but entirely and sadly ignorant of scientific values and with far less of use in view than the Etruscans had for *Cycadeoidea etrusca* over four thousand years ago? As related to the Fossil Cycad National Monument series we have also the occurrence of remarkable related types scattered about in the San Juan Basin. A large collection of these including three species is now at Yale and has been frequently mentioned in print. It is peculiarly desirable to learn the exact features of the flowers of this free-flowering group. One specimen in the hands of a local dealer appeared to have the floral features. It was promised for use in research, but was subsequently stubbornly withheld. One could wish that research might not encounter anything like that! Clearly, no individual in this or any country should be allowed to sequester materials valuable in the study of paleontology which he is utterly unable to use or understand; and it is greatly to be doubted if the state or province should have an undisputed right to do so either. Fortunately, there are always many who in addition to curiosity have the boundless, wonderful wish to be useful; many who are ever ready and anxious to aid in the assemblage of unusual paleontologic materials and data. The principle of eminent domain carried to its fullest and logical conclusion must ever protect the interests of all the people of a great nation now and for the far future. The task of delimiting and obelisking featurewise an ocean-bound country can not be else than long. Let no one mistake the real values, and let simplicity and economy ever prevail.

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THE LOWER SONORAN IN UTAH

READERS of Professor Cottam's¹ interesting article on the effect of the heavy frost in January, 1937, may be pleased to know that, after all, Utah is in no danger of losing her claim to the Lower Sonoran life zone.

Stimulated by the above-mentioned article and having an opportunity to drive through southwestern Utah in August, 1937, the writer took note of the condition of the Lower Sonoran vegetation, both in the region around St. George and in a considerable area on the alluvial fans west of the Beaver Dam Mountains.

Particular attention was paid to four typical Lower Sonoran plants—creosote bush, *Larrea divaricata*; mesquite, *Prosopis chilensis*; burro weed, *Franseria dumosa*; and desert willow, *Chilopsis linearis*. All these species showed the effects of the frost, but not

¹ W. P. Cottam, SCIENCE, 85: 563-564, June 11, 1937.

a single plant was noticed which was completely dead. Numbers of plants of *Larrea* and *Prosopis* had been frozen to the ground, but all these observed were sending forth a vigorous growth of shoots from the base which were already 10 to 50 centimeters tall. The wholesale destruction of the vegetation implied by Professor Cottam's observations of "brown water-soaked cambium layers even at the crown of most shrubs" was not evident along any of the forty or fifty miles of road traveled by the writer in this life zone. Also the bronzing of the junipers in the Upper Sonoran zone noted by Professor Cottam had disappeared, at least in the Beaver Dam Mountains and the regions of Zion and Bryce Canyons.

Interesting was the evident variation in resistance to the frost of plants even of the same species. Some of the difference in effect was doubtless due to difference in altitude and exposure. The areas at the extreme upper edge of the Lower Sonoran, 900 to 1,000 m in the St. George area and somewhat higher west of the Beaver Dam Mountains, in general suffered more, except where sheltered. But of specimens of *Larrea* growing side by side, with no apparent difference in conditions or size of plant, one would be frozen to the ground, while another might have only the tips of the branches nipped. Every degree of injury excepting actual death was present in a small area of uniform altitude and exposure. However, all plants of *Larrea* had evidently produced far less fruit this year than is usual for this species.

Contrary to Professor Cottam's conclusion that this occurrence "emphasizes the inadequacy of Merriam's theory of zonation in its failure to take into consideration temperature data of the dormant period," these later observations would indicate that, in this instance, at least, the ignoring of the dormant period was quite justified. And a week of sub-zero weather would seem to be quite a severe test. The facts suggest that the life zones are states of equilibrium reached by the vegetation as a result of the action of definite climates over a long period of time, and that they are not likely to be profoundly disturbed by brief intervals of "unusual weather."

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EXPERIMENTAL STUDY OF THE SURVIVAL VALUE OF ACRIDIAN PROTECTIVE COLORATION

THE problem of protective coloration has recently received renewed attention in the scientific press: (Shull;^{1,2} Carpenter;³ McAtee;⁴ O'Byrne;⁵ Sumner;⁶ Cockerell;⁷ Carrick;⁸ *et al.*).

¹ A. F. Shull, *SCIENCE*, 81: 443-452, 1935.

² A. F. Shull, *SCIENCE*, 85: 496-498, 1937.

The writer has for several years been carrying on a series of experiments attempting to determine the efficiency of native and domestic birds in discovering for food those grasshoppers whose color patterns appear to blend perfectly with the background of their environment.

The predators, *real enemies*, were mocking-birds, sparrows, cardinals, turkeys and bantams. Acridians noteworthy for their concealing resemblances, at least as far as the human observer is concerned, were the prey.

A garden plot 12×16 feet was marked off into squares 16×16 inches. These squares were arranged in checkerboard fashion to represent four different types of natural background: black, white and red soils; the fourth green, transplanted bermuda. The acridians were picketed on the various squares of the checkerboard plot or for some experiments anesthetized.

The native birds could be easily observed and checked from a screened porch and from the house windows. The domesticated birds permitted experimenters to follow their every movement.

The records of 33 experiments (June 9 to July 1, 1937) show that out of 459 acridians placed on non-harmonizing or non-protected backgrounds of the checkerboard plot and subjected to predator depredations, 405 or 88.24 per cent. were eaten by the birds, while 54 or 11.76 per cent. survived.

On the other hand, of the protectively colored acridians placed on harmonizing backgrounds 276 or 60.11 per cent. were missed by the birds, while only 183 or 39.85 per cent. of the acridians protected by concealing colors were eaten.

Since over 72 per cent. of the specimens used in these experiments were matched pairs it is evident that the more conspicuous were eaten, while the concealed or partly concealed were the individuals most likely to escape the keen eye of the predators. Further, it should be noted that in these matched pair tests a normally protected grasshopper became a non-protectively colored individual only because it was placed on a contrasting soil background rather than a harmonizing background. Therefore, when the bird-predator skipped a cryptically colored specimen of the same species, it was clearly a test of bird visual-perception.

The evidence shows that birds intent on securing acridians as insect-food often failed to see and repeatedly skipped or passed over protectively colored

³ G. D. H. Carpenter, *SCIENCE*, 85: 356-359, 1937.

⁴ W. L. McAtee, *Quart. Rev. Biol.*, 12: 47-64, 1937.

⁵ Harold O'Byrne, *Ent. News.*, 44: 57-61, 1933.

⁶ F. B. Sumner, *Proc. Nat. Acad. Sci.*, 21: 345-353, 1935.

⁷ T. D. A. Cockerell, *SCIENCE*, 84: 203-206, 1936.

⁸ Robert Carrick, *Trans. Royal Ent. Soc.*, 85: 131-139, 1936.