McCulloch Williams writes. It would seem as if anyone intending to publish concerning natural history would at least familiarize himself or herself with the subject. It is discouraging to find a magazine like *McClure's* accepting and printing an article of this character.

JOHN B. SMITH.

NEW BRUNWSICK, September 12, 1901.

CURRENT NOTES ON PHYSIOGRAPHY.

THE RANGES OF THE GREAT BASIN.

THE mountain ranges of the Great basin in Utah and Nevada have been explained, chiefly by Gilbert and Russell, as due to block faulting, but without sufficient statement concerning the form of the region before faulting or of the amount of erosion since faulting. Hence the ranges have sometimes been imagined as presenting long, gentle back slopes where the pre-faulting surface has been tilted up, and abrupt frontal cliffs where the fault scarp is revealed; and in the absence of statement to the contrary it has been sometimes supposed that the faults by which the blocks are limited were determined by ordinary stratigraphic evidence.

Spurr now offers a new interpretation of these ranges ('Origin and Structure of the Basin Ranges,' *Bull. Geol. Soc. Amer.*, XII., 1901, 217–270, pl. 20–25). Finding monoclinal structure not persistent, finding much dissection on both slopes of the ranges, and finding no stratigraphic evidence of faulting along the base of the ranges, he discards the theory of block faulting and explains the mountains as residuals of a disordered and greatly denuded mass, the intermont depressions being regarded as valleys of erosion produced under a former greater rainfall and now clogged with waste since a drier climate has set in.

Attention is here called to the different values given by Spurr to the stratigraphic evidence of faults where both members of the faulted series are seen, and to the physiographic evidence where only one member is visible. Faults determined by ordinary stratigraphic evidence are spoken of as 'actually observed' (266), while faults announced by previous observers on physiographic evidence are altogether rejected, apparently because they are not confirmed by stratigraphic proof. As a matter of fact, no faults (meaning thereby surfaces of fracture on which movements of dislocation have taken place) have been actually observed as such in the Great basin; faulting is there as elsewhere a matter of inference. In the case of faults proved by stratigraphy, the termination of one series of strata against another may be more or less closely observed; and then instead of believing that both sets of strata were 'made so' in the beginning, it is reasonably inferred that they both originally had greater extension, that they were brought into their present relations by dislocation, and that the dislocated mass has been carved into its present form by greater or less erosion. This demonstration is commonly accepted as so compulsory and all other explanations seem so infinitely improbable, that faulting proved by stratigraphic evidence is often treated as if it were a matter of first-hand observation, and given an equal order of verity with the plain facts of strike and dip.

In the case of faults proved by physiographic evidence, the outcrops of a series of strata in an escarpment or on a mountain side are directly observed; and then instead of believing that they were made so, it is inferred that the invisible parts of the series have been in some way removed. On finding that their removal cannot be reasonably accounted for by erosion alone, the aid of faulting is invoked, a greater or less amount of erosion being supposed to precede and to follow. This argument of course involves such a knowledge of the observable facts of structure and form, and such an understanding of the processes of erosion and of the forms resulting therefrom, that, while certain forms (such as the Appalachian ridges of Pennsylvania) may be reasonably ascribed to erosion alone acting on a deformed structure, certain other forms (such as the Basin ranges) may as reasonably be held to be beyond production by erosion, without relatively recent faulting. This demonstration of faulting may be just as logical as that based on stratigraphy alone, but it is somewhat more complicated and it is much less commonly employed.

Now inasmuch as the block faulting of the Basin ranges has been determined in nearly every case by the physiographic method alone,

it is certainly desirable that discussions of the Basin range structure should include a consideration of the criteria for the demonstration of faults by this means, when only one member of the faulted series is visible. Yet no such consideration of the problem is given by Spurr. He confirms earlier work by finding that marginal faults are not to be determined along the base of the ranges (except in rare instances) by ordinary stratigraphic evidence. He reiterates the undisputed fact that great erosion has occurred since the ancient folding and faulting within the body of the ranges, and he illogically infers from this that recent faulting, marginal to the ranges, has not taken place. Instead of dealing with the problem at issue—the sufficiency of physiographic evidence to prove block faulting—he asserts without adequate discussion the sufficiency of erosion to produce existing forms, and after the briefest consideration he denies the peculiar faulting that has been reasonably inferred on physiographic grounds to be essential for the production of the ranges. This is very much as if one should deny the modern uplift of the Appalachian Piedmont district after its broad denudation, because no strata containing marine fossils lie upon it to attest its elevation. The block faulting of the Basin ranges may perhaps be some day disproved, but not until the evidence of faulting accepted by Gilbert and Russell has been shown to be valueless.

PHYSIOGRAPHIC EVIDENCE OF FAULTING.

The essential elements in the physiographic evidence of faulting in the Great basin are the impossibility of accounting for the presence of the mountain ranges if the intermont depressions have been produced by erosion alone, and the ease of accounting for them if the rough form of the region has been blocked out by faulting, leaving erosive processes only the smaller work of trimming the mountains into their present shape. The difficulty of dispensing with faulting is both qualitative and quantitative. In the first place, the structure of the ranges is commonly oblique to their border, so that the faulted margin passes indifferently from one structure to another, as in the accompanying figure; if the ranges were the residuals of a long period of undisturbed erosion, such a lack of correlation between border and structure would not be looked for; but if the ranges are limited by faults at one side or both, the

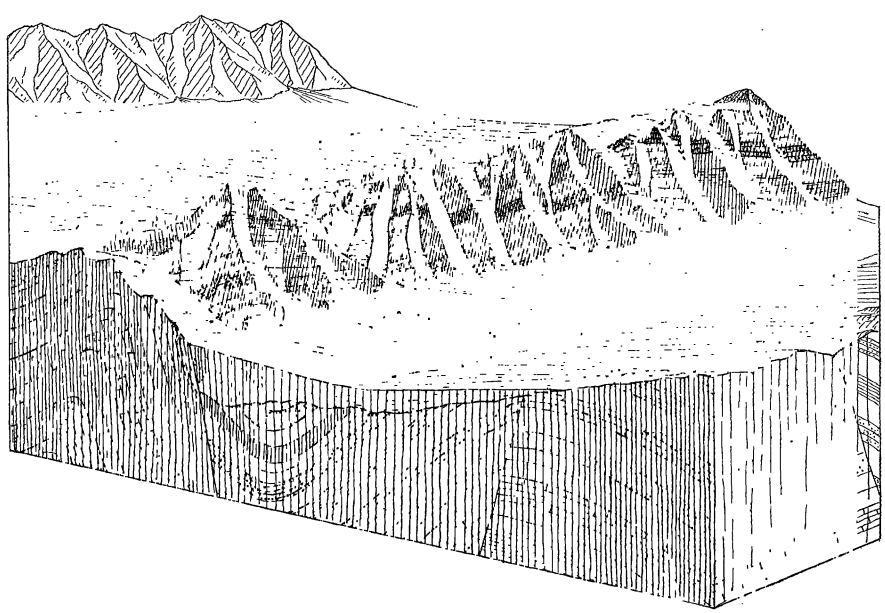

Fig. 1. Diagram of a mountain carved on a faulted block of previously deformed and denuded strata.

indifference of border to structure is natural enough. In the second place, the body of each range is usually continuous, although it may be incised by sharp-cut valleys; if the ranges were the residuals of a period of undisturbed erosion long enough to have permitted the excavation of broad intermont valley-lowlands, each range should be divided into isolated mountain groups by the opening of wide branch-valleys in its mass; but if the depressions and the ranges are blocked out by recent faulting, the continuity of the ranges is to be expected.

Both these tests are best met in southern Oregon, where the ranges as described by Russell are very little affected by erosion after faulting. Neither test is well met by certain ranges in southeastern California described by Fairbanks as almost worn down to grade. In Utah and Nevada both tests are well borne; but no definite statement has yet been published concerning the amount of erosion that has taken place in this district since the block faulting; nor has any careful inference been made as to the form that the region had before faulting, some remnants of which may perhaps still be detected on the lower back slope of the ranges. The absence of steep scarps along the faulted border of a range does not bear closely on the problem, although Spurr attaches much importance to it. Recent and rapid faulting would produce a scarp; but similar scarps produced less recently would now be more or less completely dissected and destroyed. Gradual faulting, even if continued into the historic period, would produce only a low basal scarp; the upper part of the fault face would be battered back and ravined. The truncated ends of certain spurs of the Wahsatch range near Prevo, Utah, seem to result from faulting of this kind, the fresh scarp that follows the base of the range being the product of the most recent episode of faulting.

No features due to recent faulting are seen in the Appalachians. The ridges there are intimately dependent upon the harder strata, the base of a ridge always follows the strike of the individual ridgemaker, and the lowlands between the ridges are demonstrably excavated by erosion on weak rocks. All these are conditions which no one has shown to obtain in the Great basin; yet Spurr says: "Suppose the Appalachians, which likewise consist of parallel ridges eroded along lines of folding, should become arid, so that the rivers were unable to remove the detritus and the valleys become choked. There would develop in the course of time exactly what exists in the Basin region, namely, a nearly level desert, containing a series of parallel, synclinal, and anticlinal ranges" (p. 255). The strongest dissent from this unwarrantable comparison must be expressed.

THE KENTUCKY MOUNTAINEERS.

AN article that might serve as the type of many more is a description of the Kentucky mountaineers by Ellen C. Semple ('The Anglo-Saxons of the Kentucky Mountains: a Study in Anthropogeography,' *Geogr. Journ.*, XVII., 1901, 588–623). The dissected Alleghany plateau, which is of mountainous ruggedness in Kentucky and West Virginia, shares with the mountains of North Carolina the unenviable distinction of being less affected by civilization than any equal area east of the Rockies. So many old customs are there preserved that the people have been well named 'our contemporary ancestors.' Miss Semple's account of these primitive Americans is based on personal observation and affords many excellent illustrations of the consequences of living in a region too rough for easy movement and too poor to attract immigrants.

W. M. DAVIS.

THE UNIVERSITY OF CHICAGO'S FIELD WORK IN BOTANY, GEOLOGY AND ZOOLOGY.

PRESIDENT HARPER, of the University of Chicago, in his last quarterly statement gives the following details in regard to field work:

The work in biology at the Marine Biological Station at Wood's Holl, Mass., is largely in charge of University of Chicago men, the director and the majority of the staff being from this institution. The director of the Laboratory of the Brooklyn Institute at Cold Spring Harbor, Long Island, and one of the botanical staff this summer were members of this faculty. The work at both these