ANTIGRAVITATIONAL GRADATION

Nowhere on the face of our globe, we now know, are the effects of the gradational processes so completely or so conspicuously exemplified as on the broad intermont valleys of arid regions. There the graded plain is the dominant feature of landscape. It attains a degree of perfection that is wholly unknown elsewhere. It is more even than is theoretically demanded of the ideal or finished peneplain. It is, as Passarge astutely remarks, smoother than any peneplain possibly can be. Yet never has relief element been so generally misunderstood or so entirely overlooked.

In the course of the wide discussion which the subject recently has aroused in almost every land it is fortunate that so many localized illustrations have been so carefully described. For the first time we are now able to cite definite references. The present aspect of the theme centers around the topic of local dissection and terracing of the steeper slopes immediately encircling many desert mountain ranges—the belt designated by physiographers as the *bajada,* the title being an adapted Spanish name.

The remarkable phenomenon of bajada-terracing does not appear, as urged by Salisbury, to be a necessary consequence of the general lowering of the highland by stream-action while the intermont lowlands are being filled up, because some of the best examples of terracing border broad plains having rock-floors. For the same reason it does not appear possible that there ever occurs during so-called topographic maturity an adjustment by water-action between one bolson and another adjacent but lower one which results in the terracing of the higher, as suggested by Davis. There is little or no evidence to show that bajadas were all formed during periods of glaciation, as advocated by Barrell, since some of the most typical forms of this class are found surrounding low knolls near sea-level and far below all possible altitudes of glacial action in the region. Neither does it seem likely that bajadas were constructed during interglacial epochs of materials which accumulated in the mountains when the latter were covered by ice, as argued by Huntington, for this does not explain the many bajada-belts with rock-floors. Nor is it any better to postulate a recent increase of temperature and a different distribution and amount of rainfall abetted by the advancement of the area in the geographic cycle, as proposed by Visher, for the terracing is now going on before our very eyes at an astonishingly rapid rate, and as quickly is it also completely obliterated.

Terracing of desert tracts appears to be confined mainly to the foots of the loftier ranges; and its accomplishment is fully described elsewhere. Under the ordinary conditions of deflative action we would expect the locus of maximum lowering to take place in the middle part of the bolsons. According to this recognition of conditions eolic erosion necessarily operates from the lower to a higher elevation. As shown by Professor Davis, the winds in their action are not dependent like water on the gradient of the land surface for their gravitational acceleration; they may blow violently and work effectively on a perfectly level surface. Unlike water they may also erode vigorously up-hill; and this is exactly what they manifestly and constantly do on the bolson-plains.

Notwithstanding the fact that wind erosion operates both up and down the slope there is, owing to the peculiar configuration of each basin-shaped tract, a preponderance of effect on the up-slope part of the course. There also appears to be a limit to the gradient on which the wind is able to blow sands erodingly and extensively up-hill, and this limit seems to lie chiefly between a two and a four per cent. gradient. It is for this reason seemingly that the intermont plains are so smooth, so uniform in grade, so high in gradient. Eolic gradation thus mainly works from a lower to a higher level. The direction of greatest activity is directly opposite that of stream-work. It is mainly up-hill.

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