Discussion Papers

DESCRIPTIONS AND AIRPHOTO CHARACTERISTICS OF DESERT LANDFORMS by Clarence K. Davis and James T. Neal

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PEDIMENT-BAJADA RELATIONSHIPS

Davis and Neal,[1] in a recent article in this Journal, describe pediments as "slightly inclined rock plains extending from near the base of the mountain rim down toward the basin where they disappear beneath the bajada or alluvial fan." They also state that pediments have "a greater slope than the adjoining alluvial fans." These conceptions are not entirely correct and probably stem from a misleading description in a current geomorphology text.

The term "pediment" was first used in a geologic publication by Clarence E. Dutton[2] in a purely descriptive sense for a gently sloping surface at the foot of an escarpment in the arid southwest. He was undoubtedly influenced by the superficial resemblance, at least in part, to the Greek architectural pediment. The term was later used in a restricted genetic sense by McGee[3] who attributed pediments to the erosive action of sheetfloods. Although there is considerable difference of opinion regarding the relative importance of the pediment-forming processes, there is agreement that the surface is degradational.

The term "bajada," as far as the writer is aware, was first applied by Hill[4] to "extensive slopes of degradational and aggradational origin." Hill recognized the need of terms for each of these types, hence it is not surprising that Tolman[5] suggested that the term bajada be restricted to the detrital slope flanking the mountain front and built up of terrestrial deposits. According to this interpretation, which has been in vogue for half a century, the bajada is an aggradational feature consisting of a series of confluent alluvial fans along the base of a mountain slope instead of at a distance, beyond a flanking pediment, as indicated by Davis and Neal.

Part of the misconception may stem from confusion regarding short and long-term effects in the development of pediments and bajadas. Pediments, as gross features, indicate long-term competency of streams to transport their sedimentary load away from the mountain front. This sedimentary load is represented by the thin, uniform veneer of alluvium that mantles the rock surface of the pediment. The alluvium is an integral part of the pediment; it is thin enough so that it can be completely trenched by the pediment streams in flood. Short-term factors, such as unusually wet and dry cycles, may temporarily result in slight trenching of the pediment or the dumping of small alluvial fans at its head. These more or less ephemeral phenomena are comparable to the minor episodes of erosion and deposition along streams that have attained the profile of equilibrium in humid climates.

Bajadas, on the other hand, indicate a long-term incompetency on the part of the streams to transport their load away from the mountain front. The material is deposited as fans which grow in size and finally coalesce to form a bajada. During wet cycles, the bajada may be subject to minor trenching, but as long as the long-term trend remains unchanged, the net result is aggradation.

In areas of rising base level, the outer margin of a pediment may be progressively buried under an encroaching sedimentary fill. The edge of the fill beyond the pediment is not, however, a bajada. A bajada may overlie a pediment only at the mountain front, and only in consequence of a long-term change in stream regimen. Snail fans may temporarily encumber the pediment head. David and Neal do not indicate how alluvial fans are distinguished from rock fans in air photos.

As for the statement that pediments have a greater slope than associated alluvial fans, this is not borne out by the facts. If we agree that alluvial fans are formed at the mountain front, then the very act of deposition must mean that the former pediment gradients were too low for continued transportation of debris across it. The writer has measured declivities exceeding 2− degrees on some of the large alluvial fans in Death Valley and elsewhere, but has nowhere encountered pediments with gradients exceeding 5 or 6 degrees even at their very heads.

For further consideration of these and re-

lated aspects of the pediment problem, the interested reader is referred to a former article by the writer[6].

REFERENCES

1. Davis, C. K. and J. T. Neal, 1963, "Descriptions and Airphoto Characteristics of Desert Landforms," PHOTOGRAMMETRIC ENGINEERING, Vol. XXIX, No. 4, pp. 621–631. See p. 628.
2. Dutton, C. E., 1882, "Tertiary History of the Grand Canyon District," U. S. Geological Survey Monograph 2. See caption to Atlas Plate V.
3. McGee, W J, 1897, "Sheetflood Erosion," Geol. Soc. Amer. Bull. 8, pp. 87–112. See pp. 92, 110.
4. Hill, R. T., 1896, "Descriptive Topographic Terms of Spanish America," *Nat. Geogr.*, Vol. 7, No. 9, Sept., pp. 291–302. See p. 297.
5. Tolman, C. E., 1909, "Erosion and Deposition in Southern Arizona Bolson Region," *Jour. Geol.*, Vol. 17, pp. 136–163. See pp. 140–141.
6. Howard, A. D., 1942, "Pediment Passes and the Pediment Problem," *Jour. Geomorph.*, Vol. 5, No. 1 and 2, pp. 3–31, 95–136.

TRUE STEREO VIEW IN SINGLE PHOTO* by Louis Desjardins

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Mr. Louis Desjardins' discovery of stereoscopic properties of a single photograph rests on the relatively simple geometry of a photographic perspective comprising a reflecting surface which produces a second, inverted, image of the natural object on the exposure.

The general theory of this subject has been established by Prof. Zaar at the turn of the century and published in the International Archive. Reference to this is also made in several text books on photogrammetry under headings as "Single-Plate-Photogrammetry, Mirror-Photogrammetry, or Mono-Photogrammetry," (e.g. O. Lacmann: Photogrammetry and its Application in Non-Topographic Fields).

In a paper presented in 1954 at the semi-annual meeting of the ASP titled "New Aspects of Mono-Photogrammetry" published in PHOTOGRAMMETRIC ENGINEERING, March 1955, pp. 39–49 the writer reviewed the principle involved and expanded it to photography with several artificial reflecting surfaces, making use of the advanced art of lens design and production of precision mirrors. Natural mirror surfaces are occasionally supplied by lakes which, when sufficiently calm, afford the photogrammetrist the exciting opportunity to produce a one-shot stereo picture of metric properties provided that the interior orientation of his camera and the height of the perspective center above the water level are known. (Figure 1) Mr. Desjardins is referring to this special case of mirror photography. Because the base of such a stereogram is vertical it is necessary to rotate

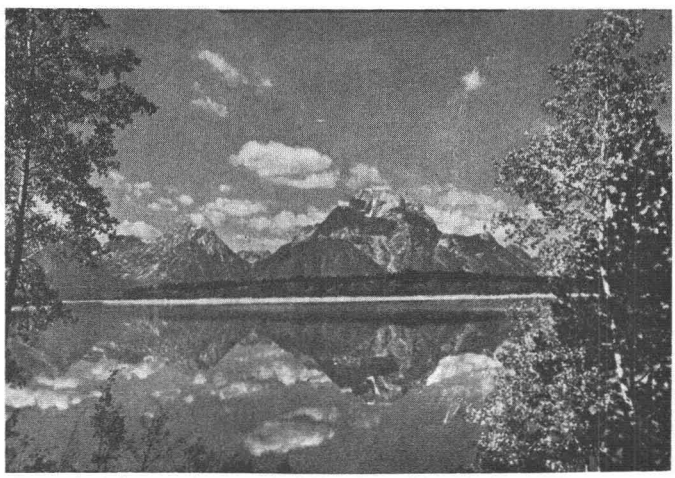

FIG. 1

* July 1963 Issue. Vol. XXIX, No. 4, p. 680.

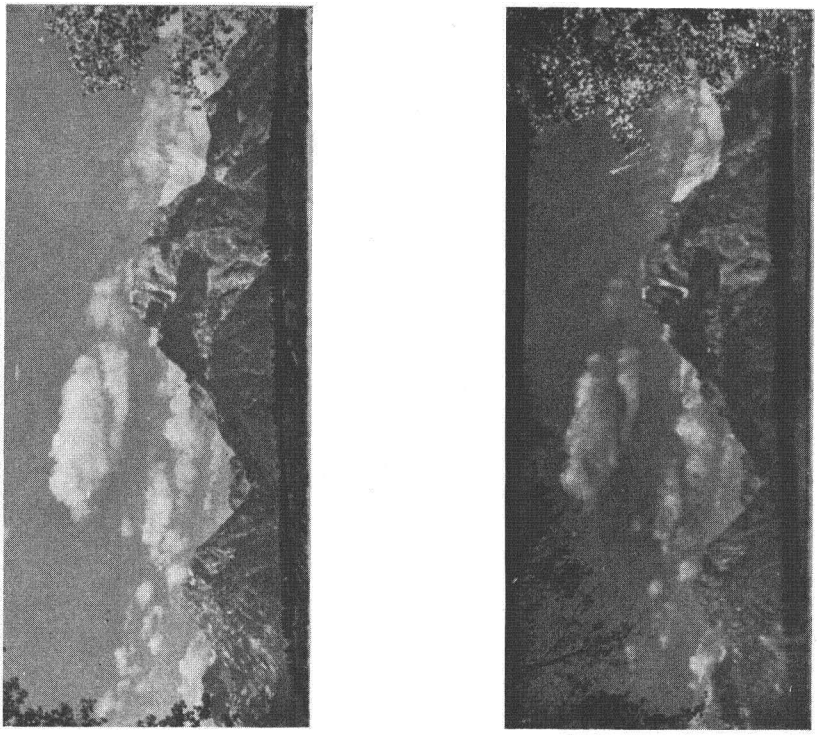

FIG. 2

the photographic images 90° from their normal viewing orientation in order to establish the parallax condition necessary to produce the depth impression upon fusion of both images while the eye base is horizontal. (Figure 2)

The application of Mono Photogrammetry to topographic mapping of the earth surface is very limited. When artificial mirror surfaces are used its field of employment on objects and phenomena of small dimensions is unlimited.

RE-ALIGNMENT OF THE PUBLICATIONS COMMITTEE

A change in jobs with added responsibilities has caused the resignation of Mr. Robert L. Chartrand from the Publications Committee. The position of Associate Chairman is now being filled by Mr. Leon J. Kosofsky. With an assist from Mr. Kosofsky until he gets the feel of this critical position, Mr. Kalvero N. Maki is scheduled to take over as Deputy Chairman for Technical Review. While juggling these two tasks, Mr. Maki will break in Mr. Ivan R. Jarrett as the incoming Deputy Chairman for the Newsletter. Mr. Walter R. Seeling will continue as Deputy Chairman for Planning and Solicitation of Technical Papers. With the help of the Deputy Chairmen, the undersigned will continue as Chairman of the Publications Committee for the time being.

ABRAHAM ANSON, *Chairman*
Publications Committee