insignia of homage that the nations had vied with each other in conferring upon him.

As time goes on, we shall come more and more to recognize in Lister an experimental genius of the first order. His trouble was that, being in every instance years in advance of his time, among men of lesser mould he was apt to be misunderstood. He had no gift of brilliant exposition by which he could rivet the attention of an indifferent public, and, with his innate modesty of nature, he had to rely for his ultimate vindication simply upon strenuous application to the work of his choice. The young assistants who loyally banded themselves around him, perceiving his merit, his sterling honesty to fact and the astonishing success of his methods, could guess at but could scarcely analyze his mental processes. They called him "a great thinker." They saw the outward Lister; they could not quite see what Wordsworth calls "the very pulse of the machine." There was, however, one experienced eye that had followed Lister's career from stage to stage with unabating interest. There was one man who could appreciate and closely follow every single experimental step he took. That was Sharpey. It was to Sharpey that the eager young student had first come with his microscope, seeking to examine for himself the structures of which the teacher spoke. It was Sharpey who had encouraged, advised and stood by him from the beginning, and before this inspiring and trusted counsellor died in 1880, he had the quiet satisfaction of knowing that his brilliant pupil had made what would probably prove to be one of the world's greatest discoveries.

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CHANNELS, VALLEYS AND INTERMONT DETRITAL PLAINS

AN article in the March number of the *American Journal of Science* by O. F. Evans on the "Origin of Certain Stream Valleys . . ." describes a common type of valley in the interior-plains region as having "a broad flood plain with a deep narrow trench winding through it." Is not this "trench" simply the river channel, filled to overflowing at time of flood, and occupied only by a dwindling, channel-bed stream during the rest of the year? In arid regions the prevailingly empty river channels, the beds of which are either dry or are followed only by the small flow of their low-water streams, contrast strongly with the well-filled river channels of humid regions, where a relatively constant flow covers all the channel bed and rises well on the channel banks. The most striking case of the arid-region kind that I have seen is in the interior of South Africa, where a channel over 100 feet in width at the rim and perhaps 30 or 40 feet in depth had, at the dry-season time of my visit, every appearance of a young valley, new-cut in a plain in consequence of river juvenation by uplift or otherwise, so deep was the channel bed below the surface of the plain and so small was the trickling stream that ran along the bed. Yet residents there assured me that, at time of great floods, the little stream expands until it fills the whole valley-like channel and overflows on the plain in which the channel is incised. Such a channel is truly trench-like; but it is nothing more than a channel after all. Its impressively large dimensions result simply enough from the great difference in volume of its river in low-water and in flood stages. Hence, unless the typical valleys described in the above-cited article are peculiar in some unspecified respect, it seems undesirable to adopt a new name, like trench, for their river channels. It would be unnecessarily redundant to have two names for one thing.

It is, on the other hand, true that we seem sometimes to have only one name for two geographical things, and there the poverty of our language in respect to appropriate names for the two features is embarrassing. For example, those lop-sided ridges which mark the outcrop of gently inclined, hard formations between more worn-down, weaker formations were long without any one-word name, until Hill of Texas introduced the Spanish word "cuesta" to designate them. They had previously been unsatisfactorily called "escarpments" by British geographers, who thus gave to the whole form the same name that is applied to one of its parts; namely, to the steep outcrop face of the determining hard formation, in contrast to the arched upland of the crest and the long and gentle declivity of the back slope. Cuesta is now coming to be more and more generally accepted as the technical, generic name for such forms.

But the poverty of our geographical terminology is sometimes rather apparent than real. Such is the case when a single name is used for two unlike features, although separate names are really available for them. Thus it is to-day customary in the Great Basin province to call the broad intermont detrital areas "valleys," as if the simple name, "plains," were not applicable to them and as if the equally simple name, "valleys," were not already fully enough employed in designating linear depressions, excavated under the guidance of streams or rivers, which are, like rivers, arranged in systems, with twig joining branch and branch joining trunk in down-grade suc-

cession. Unmindful of the earlier preemption of "valley" for forms of such erosional origin, that term is now taken over in the west to name broad and smooth surfaces of depositional origin.

For example, the extensive detrital plain in central Arizona, now redeemed from its original desert condition by irrigation from the waters of Salt River stored by the Roosevelt Dam in the mountains farther east and thereby converted into a superb oasis around Phoenix, the capital of the state, is universally called "Salt River Valley" by its prosperous residents. Yet the plain of the oasis seems level to the eye, except where rocky buttes of smaller or larger size rise through it, and it really has the form of a very broad and gently sloping alluvial fan. If the fan is crossed on a line transverse to its mid-rib, the surface is found to be faintly but characteristically convex. Its alluvial deposits are of great thickness; one of the many wells driven in them is 1,500 feet deep without reaching the solid rock of the depressed basin floor. The agricultural value of the apparently level irrigated area depends largely upon its possession of the regular and gentle, radially disposed slope that the fans of good-sized streams are necessarily given as they are built up; for in consequence of that slope, the construction of the canals which lead the stored-up water from the river, as it issues from the mountains, to all parts of the great oasis has not involved any great work of cutting or filling; and the fields into which the oasis is now subdivided are easily irrigated from the canals without regrading, by reason of their gentle slope.

As one drives over the plain, it seems geographically ludicrous to call it a "valley," yet there is no likelihood that the misnomer will be abandoned. Indeed the official map of Arizona shows that the name "valley" is repeatedly applied to the broad and desert intermont plains which occupy so large a share of its southwestern half. Further embarrassment arises from the fact that the plains are not infrequently traversed by valleys of small or moderate depth, which have been excavated in normal fashion by the intermittent rivers of the region; and these are unquestionably true erosional valleys, for they possess the four elements of form by which such valleys are known; namely, limiting side slopes, more or less frayed out by lateral wash; a smooth floor sometimes showing flat strips in faintly terraced arrangement, the lowest strip being the flood plain of to-day; a channel in the flood plain, usually dry but occasionally filled to overflowing; and a continuous down-stream slope. A fifth element of form, the reception of branch valleys at accordant level, is often added. The Gila, that long and slender tributary of the Colorado which crosses two states in a flow of irregularly increasing and decreasing volume, frequently follows shallow, gently terraced valleys of this kind, which it has slightly excavated in the broad intermont detrited plains; one such valley characterizes its course near certain isolated mountain ranges, some miles to the southwest of Phoenix, where the river has been driven by the fan of Salt River above mentioned.

On the other hand, the San Pedro, an affluent of the Gila which rises in the southeastern part of Arizona, has excavated a valley several hundred feet deep—one of the deepest of its kind in the state—in its northward course along the axis of a well-defined and heavily aggraded intermont trough. The width of this valley is much increased and its sides are much frayed out by many lateral wet-weather washes, as may be well seen from the main line and from the Douglas loop of the Southern Pacific railway, and from several state highways. In both these cases, the change from a former phase of aggradation to the present phase of excavation appears to be associated with the maturing of the Gila river system as a whole, but that is another story. Certain small and recent, but problematic changes in the channels of valleys of this kind have been lately discussed by K. Bryan. In view of the occurrence of these normal excavations, it is doubly unfortunate that the term, valley, is so generally used to designate not the excavations, but the intermont plains in which the excavations have been made. The proper term, plain, is thereby displaced from the aggraded surfaces which it names so well, and the term, valley, is misplaced from the erosional features to which it should be applied.

The numerous and extensive intermont detrital plains of the Great Basin province usually exhibit well-defined but gently inclined slopes of relatively coarse gravels, slanting forward from the base of the enclosing mountains and uniting in a broad, medial floor of finer soil and nearly level surface. The medial floor may or may not be incised by a true valley. When one stands on either detrital slope of such an intermont plain, an open view is afforded all across the medial floor to the opposite detrital slope; except that in plains of unusually great width, the opposite detrital slope may be lost in the distance. And from any part of the medial floor, which is everywhere lower than the detrital slopes that slant down to it, an open view is afforded of the gradual ascent by which the detrital slopes rise to the mountains. The slopes thus seen gain an appearance of exaggerated steepness by foreshortening. In the southeasternmost county of Arizona, the city of Douglas, where copper ore is smelted for Bisbee, a mining city that is crowded in a

steep-sided valley in the near-by mountains, has plenty of room for growth on a typical intermont detrital plain; but the plain is unfortunately known as Sulphur Springs Valley. Hence no generic name is left for the true though narrow and shallow valley that is excavated in the plain by the ephemeral wet-weather drainage which flows southward into Mexico. When one looks northward along the smooth medial floor of the plain, it seems to rise gradually to the skyline, as if in a distant ridge; but the ridge recedes as one travels towards it; it is simply the ocean-like horizon of the nearly level surface.

The intermont detrital plain on which the flourishing residential and university city of Tucson stands, not so near the southeastern corner of Arizona as Douglas by about 100 miles, occupies a well-aggraded intermont basin of depression, which departs in a peculiar manner from the typical form that is seen in the Sulphur Springs Plain. The detrital slopes that slant forward from the encircling mountains around Tucson are clearly enough seen when one is near them; but they are out of sight from a good part of the plain between them, which is not level but has a gently undulating surface, as if it had recently been warped. Its faint swells and hollows, well exhibited for several miles next north and east of Tucson, are clearly unlike the shallow valleys that have elsewhere been normally excavated a little below the surface of the plain by several small intermittent rivers. The undulations are frequently strong enough to hide a cross-plain view of the piedmont slopes; indeed, if one stands in the center of a faint hollow, the outward view, instead of being unobstructed for many miles as it should be on the medial floor of an undisturbed plain, is rather closely circumscribed in nearly all directions, as it should not be.

Some justification for attributing the faint swells and hollows of the Tucson plain to deformational warping is found in the southeastern part of the same intermont basin, where the detrital deposits are clearly seen to have been strongly tilted and elaborately dissected and degraded since their deposition. The plain in the neighborhood of Tucson must have been deformed at a later date than this dissected southeastern extension of the intermont area, for it is practically undissected, except along the margins of its normal valleys. Another indication of warping is found in the present course of the Rillito, a wet-weather stream that flows westward across the aggraded basin not far north of Tucson and but a few miles south of the Santa Catalina Mountains, the highest of the enclosing ranges. The stream ought to have been pushed much farther away from these mountains by the abundant outwash of detritus that their deep-cut, steep-sided valleys have supplied to the intermont area; but the deformational warping appears to have compelled the stream to shift northward toward the mountains, in spite of the detrital outwash from them. In consequence of that shift, the piedmont detrital slope is sharply undercut by the northward encroachment of the stream upon it, and its dissection by washes from the mountains is thus promoted to an exceptional degree. The deformation of the plain seems, indeed, to have extended beyond the west-flowing Rillito, for between its contrained course and the base of the mountains, the detrital slope has assumed various irregular forms with a relief of 200 or 300 feet. Yet 20 or 30 miles farther west, the intermont plain has a strikingly level surface and so continues much farther, as if it were there in process of undisturbed aggradation.

There is, as above noted, little likelihood that the people of Arizona will change the nomenclature that has been so unsystematically applied to the intermont detrital plains on which many of them live; but for geographical purposes it is eminently desirable to call the plains by their proper name, and to recognize their subdivision into piedmont slopes and medial floors, as well as the not infrequent excavation of true valleys across them; and to recognize also the warping by which at least one of them seems to be gently deformed.

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SCIENTIFIC EVENTS

THE ELEVENTH EXPOSITION OF CHEMICAL INDUSTRIES[1]

WHEN the doors of the Eleventh Exposition of Chemical Industries are opened on September 26, those who will avail themselves of the opportunity will be impressed by the large number of diverse exhibits which will show something of the tremendous advancement that has been made, thanks to the continued application of science in cooperation with sound finance. Some 350 exhibitors will display a wide range of chemicals, chemical products and the apparatus, equipment and scientific instruments used in producing them, as well as many of the required raw materials.

The exhibits will be chiefly from this country, but there will be many representatives of foreign activities. The raw materials to be shown are from the Southern, the Southwestern and the Pacific States, and from the Dominion of Canada, displayed by government departments and railroads concerned with the industrial development of their territory. The section of chemical and chemical product exhibits is three times as numerous as five years ago. The machinery

[1] *Industrial and Engineering Chemistry.*