

I am quite aware of the need of increased facilities for publication, but I am convinced that we have a still greater need for a wiser use of those now available. The worker of to-day is confronted by an array of past publications vastly greater than that of a single generation before. It has been an almost hopeless struggle for abstracting and indexing to keep pace with the output. Should we not give more attention to these difficulties at their beginnings rather than merely satisfy our present wishes and let the future care for itself? The concentration of related subject-matter is a problem frequently considered, but the multiplication of small overlapping journals seems much more popular.

Some journals carry a large number of brief notes representing a quantity of detailed information "placed on record." These require an entirely undue amount of indexing and are practically useless without it. Surely they would be more satisfactory if compiled in some orderly fashion. Surely some of them are scarcely worth publishing and others might well be delayed for more effective presentation. Some authors seem to have a penchant for publishing in as many different journals as possible and thus scatter brief notes on a single topic. I have a special grievance against the short articles which state that a more complete account is being published (or will be) elsewhere. A well-known editor tells me that a large part of these never appear. Sometimes they are designed to merely call attention to work in progress and solicit cooperation and may be commendable. Often they give preliminary results, describe a new species or merely mention it without description. There seems little excuse for cluttering up the journals with these fragments.

A few years ago I sent a circular letter with similar suggestions to about one hundred biologists, including officers of several national societies and editors of their journals. The majority of the comments were favorable. As one put it, "When it comes to publication, we scientists certainly are unscientific." One taxonomist suggests that it would be desirable to have all descriptions of new forms published in revisionary treatments, but that the new forms are continually coming to light and that no revisionary work on the group is under way. As a matter of fact there seems a distinct tendency to describe the new forms in advance of other publication. Sometimes this is to avoid the introduction of such material into a general catalogue or manual in which brief and uniform treatment is essential. In other cases the original descriptions are closely followed by a general treatment (usually in a different journal) and it seems a question whether any gain is achieved.

In some quarters it seems much easier to secure

funds for mimeographing than for ordinary printing, thus resulting in a quantity of preliminary reports and a lack of substantial publication. It seems unfortunate that it is so easy to secure publication of brief notes or short articles and so difficult to care for the longer articles. Some progress has been made in recent years through the establishment of several publications designed especially for the latter group. We make little, if any, advance in handling those of the first sort. I would be disposed to accept the present conditions as necessary if it were not for the frequent encounters with articles which seem quite an unnecessary burden upon our limited publication space. We could profit by closer contact and cooperation in preparing the results of our investigations. Is delay in publication always so serious as it seems? Is it not possible to have more editorial supervision, especially along the line of contacting other workers?

One objection to delaying and to incorporating results with those of other workers is the possible loss of credit. Publications are one of the worker's chief assets. To have prepared something for presentation is indeed an accomplishment, but it is well known that too often an employer is concerned with a list of papers rather than with the worth of their content. If we can secure judgment based upon quality rather than quantity, we shall have gone a long way toward the improvement of publications. If the field of publication is limited, surely we should endeavor to utilize it to the best advantage. The investigator has a real duty to humanity by presenting his material so that it will be of greatest service.

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ARCHEOLOGY AS A TOOL FOR USE IN PREDICTING THE PERMANENCY OF AGRICULTURE

In a recent issue of *SCIENCE*¹ the results of the excavations in Kansas and Nebraska by Dr. Wedel were reported. He explained the alternation of agricultural and hunting phases in the prehistory of the central Great Plains as being caused by a corresponding alternation of humid and drought periods. During the more humid years agriculture was successful, but it could not maintain the people throughout an extended series of dry seasons.

Similar conditions to those found by Dr. Wedel in Kansas are to be found in the extreme southwestern portion of the Great Plains. East of the White Mountains in southeastern New Mexico are many sites of a lost group of the agricultural Pueblo peoples. Their fields were waste lands and their houses rubble-heaps when the Spanish entered the land; only wandering bands of hunters lived there then. Why did the little

¹ *SCIENCE*, 86: 2232: Supplement, 8-9, 1937.

shifting hunting camps replace the populous Pueblo villages? In an attempt to answer this question the writer has visited numerous sites in this and adjacent regions during the past three summers, studying the water supply, soil characteristics, topography and artifacts of each. From the pottery, which is being classified by the system of Dr. Mera of the Laboratory of Anthropology, a relative dating scheme is being developed for the times of settlement and abandonment of each of the sites.

The agricultural sites were of two types; those east of the Pecos River were in the rolling sandy prairie lying between the gypsum steppe, which borders the river, and the dunes of the Mescalero Sands further to the east; while the sites west of the Pecos were all in the alluvial bottoms of the small streams which flow eastward from the mountains. No agricultural sites were found or heard of on either the hard dry steppe or on the alkali flats of the Pecos. In general the sites are in locations which have in recent times been found to be the most suitable for agriculture. The use of deep wells has extended the range of arable land beyond that available to the Indians. Dry farming was practiced by the Pueblos on the sandy prairie, while they probably irrigated their stream bottom sites. It appears likely that the Pueblo people settled the entire region within the space of but a few years, but they abandoned the sandy lands long before they left their irrigated gardens beside the streams.

The abandonment of the sandy land sites was probably caused by the blowing of the soil, rather than by the pressure of nomadic tribes. At every site in the sandy lands there was ample evidence of wind-disturbed soil. Usually the soil was blown up into great dunes. Artifacts were abundant in the blows and part way up the windward sides, but were not to be found on the tops of the dunes. At a few sites the top-soil appeared to have been completely swept away, leaving only hard red barrens. Similar types of wind erosion are to be seen in the vicinity as the result of twentieth century mis-farming practices. Natural reclamation of such disturbed soil is extremely slow. Even though these blown-out fields have lain fallow for more than seven hundred years they are still barren wastes.

The irrigated sites in the valleys on the contrary show no evidence of permanent damage to the soil. Many such sites are now in cultivation, with no apparent signs of decadence. The earliest dwelling sites of the Pueblos along the little streams were on low ground by their gardens. There was no evidence of any regard or precautions for defense at these or the sandy land sites. They occupied these open sites in the Hondo valley somewhat later than the villages on

the sands east of the Pecos. This peaceful period came to an end, and the final phase of this culture was when they commenced building pueblos on the high, steep and rocky hills overlooking the Hondo in a manner closely resembling the Piro towns of Gran Quivira and Loma Pelada a hundred miles to the northwest. The final abandonment of the valley sites appears to have been the result of the pressure of the nomadic tribes rather than that of a series of crop failures. There is some evidence that the people were weakened physically, and possibly in numbers, too, by mineral deficiencies in their diet.

These archeological findings are in quite close accord with the present trends of agriculture in this far corner of the Great Plains, thereby giving some confirmation to the theory of Dr. Wedel that archeology can assist in predicting the permanency of agriculture in many regions.

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CELL SHAPE PHENOMENA INTERPRETED IN TERMS OF COMPRESSED LEAD SHOT

THE shape of parenchymatous cells such as those found in the pith of vascular plants is undoubtedly the result of several factors, among which contact and pressure, the plane of cell division, cell elongation and varying adjustments among all these may each play a part.

In an attempt to determine the effect of contact and pressure on the shape of uniform spheres, small lead shot which had been selected for uniformity were used. The shot were poured into a cylinder and compressed at various pressures.¹ In one test sufficient pressure was used to eliminate all the air spaces between the spheres. A study of over five hundred of these compressed balls, omitting the peripheral layer adjacent to the wall of the cylinder, gave an average of 14.17 contacts or faces per ball. In another test somewhat less pressure was used, all the spaces between the spheres were not eliminated, and the average for the hundred balls examined was 12.9 contacts. Still less pressure gave an average of 11.0 contacts for one hundred balls; and slight pressure, just sufficient to cause flattening at the points of contact between adjacent spheres, gave an average of 8.4 contacts for the hundred balls examined.

These results indicate that when lead balls are poured into a cylinder there is an irregular distribution of contacts between spheres, and the "cannon ball" stacking, in which every sphere is in contact with twelve other spheres, does not occur. This irregular

¹ The compressions were made possible through the courtesy of the Civil Engineering Materials Testing Laboratories of Columbia University.