

Proceedings of the Iowa Academy of Science

Volume 68 | Annual Issue

Article 50

1961

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Recommended Citation

Frankforter, W. D. (1961) "Problems of Paleontological Preservation in Iowa," *Proceedings of the Iowa Academy of Science*: Vol. 68: No. 1, Article 50.
Available at: <https://scholarworks.uni.edu/pias/vol68/iss1/50>

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Problems of Paleontological Preservation in Iowa

W. D. FRANKFORTER¹

Abstract. A brief review of vertebrate paleontological work in Iowa reveals an early utilization of fossils in Pleistocene studies followed by a lapse in collecting and research until revived during the past decade. Legal measures enacted to protect paleontological materials have, in the opinion of many paleontologists, resulted in numerous federal and state regulations which are unrealistic and a hindrance to scientific endeavor. Efforts to modify or remove federal rules and regulations governing fossils are discussed. Legal restrictions do not constitute the primary problems of paleontological conservation in many states, including Iowa. Instead, the problems are those of (1) public education regarding the scientific value of fossils, (2) gaining the cooperation of individuals in reporting discoveries to qualified institutions, and (3) financing and handling the collection, preparation, curating, and study of paleontological specimens. These problems may be partially solved through sensible legislation, distribution of popular information about fossils, and encouraging non-professionals to assist in the program.

BRIEF REVIEW OF PALEONTOLOGICAL WORK IN IOWA

Early in this century Iowa was a center of research on Pleistocene vertebrates and glacial geology. Although the latter studies have continued unabated, vertebrates have received little attention since the original flurry of interest. Notable among the many contributors to the unraveling of Pleistocene history in the early days were McGee, Chamberlin, Calvin, Bain, and Shimek. Both Calvin (1909, 1910, 1911) and Shimek (1910) reported the occurrence of vertebrate fossils in gravel beds of western Iowa and utilized them to substantiate correlations with other gravels where similar forms appeared. Particularly were the fossils important in correlation of the "Aftonian" beds which lay between glacial tills believed to be Nebraskan and Kansan in age. The culminating study on vertebrates was published by O. P. Hay (1914) when he compiled an impressive list of Iowa finds, discussing and illustrating them thoroughly. Thus, we see an early use of vertebrate fossils in geologic studies in Iowa. The concept of an "Aftonian" fauna became so entrenched in Pleistocene studies that the validity of its age was not challenged until recently (Frankforter, 1957). Current investigations indicate the so-called "Aftonian fauna" may be younger than previously believed and it is possible that once more this fauna may be important in a correct interpretation of stratigraphic sequences in western Iowa.

¹ Sanford Museum, Cherokee, Iowa.

Following Hay's work interest in the vertebrates of Iowa lagged, broken only by Clement (1932) in the form of an unpublished thesis for the degree of Master of Science in the Department of Geology at the State University of Iowa, Iowa City. About a decade ago Sanford Museum was established at Cherokee, Iowa, and a program of paleontological collecting was begun. At present, this is the only institution in Iowa actively engaged in the collecting of vertebrate fossils although several other museums and universities accept objects brought to them.

PURPOSE OF PALEONTOLOGICAL RESEARCH

It may be of interest to mention some of the practical as well as intangible results which can be expected from the recovery and study of paleontological material. (1) Fossils, both zoological and botanical, furnish important evidence regarding geologic deposits which often have great commercial value. Fossils supply data which assist in correlation of deposits and the establishment of stratigraphic sequences, in ecological interpretations, and in addition, constitute the substances utilized in radiocarbon dating. (2) They furnish evidence for an accurate knowledge of the evolution of life and, for instance, provided Darwin with important evidence for his monumental work, "The Origin of Species," which has had such far-reaching influence on scientific thought. (3) Paleontology is a field of scientific research and, as such, invites investigation simply because fossils exist and man has devised ways of learning about them. And (4) fossils, as relics of the past preserved until today, become in effect a part of the present as well as a part of the earth's history and our heritage, and thus they deserve our attention.

DISCUSSION

It is the opinion of many paleontologists that conservation of paleontological material cannot be achieved through legislation and, in fact, some believe present laws tend to hamper more than they help scientific investigations in this field. This attitude may seem incongruous with the efforts of other scientists to establish more control for the protection of archeological specimens and/or nature areas. However, many paleontologists recognize major differences between their problems of conservation and those of other fields, and therefore contend that the same controls should not apply. In addition, they maintain that the federal law was primarily set up for the preservation of archeological specimens and was not intended to include paleontological items.

I should like to mention some of the arguments paleontologists have presented in support of this attitude, point out why this stand is not shared by all in the field, and discuss some other problems of conservation.

In comparing the problems of archeological and paleontological conservation it can be noted first, that archeological objects have much greater appeal to the average person for historic, aesthetic, or monetary reasons. Therefore, these objects are more avidly sought by the general public.

Secondly, archeological manifestations are more susceptible to destruction because they are often restricted to the surface or shallow subsurface and may be considerably limited in areal extent. In contrast, fossils commonly occur in extensive deposits buried at considerable depths. Under normal circumstances only a small portion of the potential yield is exposed at any one time and the supply is being renewed continually through natural erosion, a gradual process permitting considerable time for specimens to be discovered before destruction occurs. It should be noted, however, that this situation is true in major fossil producing regions but does not apply to Iowa and much of the eastern half of the United States. In these areas most paleontological finds are the result of commercial activities such as gravel pit operations, quarrying, and excavations for highway and other types of construction. In these situations discovery and destruction of fossils may occur almost simultaneously.

Thirdly, archeological materials are relatively scarce in most sites. Thus, indiscriminate collecting or excavation of archeological sites may completely destroy important evidence. Theoretically, paleontological objects are more abundant and occur over wider geographic areas, e.g., the Karroo Beds of South Africa and the Oligocene Badlands of South Dakota. Although the number of fossils available at any particular time may not be great, paleontologists rest secure in the knowledge that time will reveal more of them.

Again, this abundance of fossils is not true of the eastern part of the country. However, most large institutions sponsoring paleontological work devote their resources to the collecting of fossils in areas where they are abundant or where extensive geologic deposits are exposed. Many of these areas are unproductive for commercial purposes and as a result have remained a part of the public domain under either federal or state ownership. This fact and the relative abundance of fossils in those areas may explain the attitude of the paleontologists who object to restrictive legislation.

In the fourth place, archeology is concerned with man and his cultural changes which may occur rapidly. Thus, significant changes may be recorded in sediments only a few inches thick. Data must be collected in minute detail if an accurate reconstruction of cultural history is to be obtained. On the other hand, paleontology is a different type of science, dealing with biological species subject to natural laws of development. Osteological changes occur with extreme slowness in most vertebrates and detectable variations appear only after tremendous periods of time, usually thousands or millions of years. Generally, no evolutionary changes will be discernible between fossils in the lower and upper portions of a single stratigraphic unit unless it is of great thickness.

ANTIQUITY LAWS

The federal law of 1906 entitled "An Act for the Preservation of American Antiquities," is couched in terms permitting broad interpretation as to its exact coverage. It states: "Permits for the examination of ruins, the excavation of archaeological sites, and the gathering of objects of antiquity upon the lands under their respective jurisdictions may be granted by the Secretaries of the Interior, Agriculture, and War to institutions which they may deem properly qualified to conduct such examination, excavation, or gathering, subject to such rules and regulations as they may prescribe: *Provided*, that the examination, excavations, and gatherings are undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation in public museums."

Paleontologists have sought to sever connections with this act on the grounds that it was not intended to cover fossils in the first place, and secondly, that the rules and regulations governing the collection of fossils prevents or hinders the scientific investigation of them. In 1952 the Society of Vertebrate Paleontology appointed an Antiquities Act Committee to look into the matter. Their activities resulted in a meeting in 1957 with government representatives from the departments of Agriculture, Army, and Interior (including the National Park Service, Geological Survey, Land Management, Indian Affairs, and Solicitor's Office), as well as the Smithsonian Institution. Also present were representatives of the American Geological Institute and the National Research Council. Details of this meeting were reported by Patterson (1957). In brief, the problems mentioned above were discussed with the result that the

Committee was asked to submit a suggested procedure under which they would be content to operate. However, they were not encouraged to believe that any immediate or far-reaching action could or would be taken.

The Committee prepared such a draft which was submitted to the Society of Vertebrate Paleontology and approved at their annual meeting November 4, 1957. The Committee was instructed to consult other interested societies and, after obtaining their suggestions and approval, again approach appropriate government officials to seek a meeting for discussion of the draft. The only further action on this matter to be reported took place when a draft of the proposed rules, prepared by the Committee, was inadvertently published in the *Journal of Paleontology* (vol. 32, no. 3, pp. 642-643) as though it were an official communication from the Secretaries of the Interior, Agriculture, and Army. In reporting on this incident at the Society of Vertebrate Paleontology meeting in 1958 it was stated that "No serious ill effects appear to have resulted."

A further complicating factor occurred when the Society, at its 1956 annual meeting, adopted a resolution in support of the Archeological and Paleontological Salvage Program of the Smithsonian Institution River Basin Surveys. This was interpreted by the government as evidence that the Society was divided in its opinion regarding the wish to see fossils withdrawn from the purview of the Antiquities Act, since this act provided the enabling legislation for the Surveys. The officers of the Society pointed out that few if any of the members knew of the legal connection between the River Basin Surveys and the Antiquity Act and thus the apparent conflict was due to ignorance and not to faction.

The federal act was followed by state laws designed to protect antiquities and although some have not explicitly mentioned fossils, others have included them along with such items as sea-lions and "fossilized feet prints." To discuss in any detail the state laws controlling the collection of antiquities is impossible here. The reader is referred to a very complete bibliography on this subject by Agogino and Sachs (1960) in a recent article criticizing the museum orientation of these laws. The authors point out that legislation which restricts the final disposition of materials to institutions within the state and discourages or prevents the collection of objects of antiquity by institutions outside the state, is shortsighted and contrary to the best interests of science since many states do not have qualified, financially able, or interested institutions to conduct the work. Thus, archeological materials may be destroyed by

erosion or other agencies, while qualified institutions willing to undertake the work are prevented by law from doing so. In this criticism of state antiquities laws Agogino and Sachs echo similar objections raised by paleontologists.

Most states have laws intended to preserve and protect state history and about half of them specifically mention archeological and paleontological specimens. Among other rules they include such regulations as requiring permits and setting fees for them, requiring that 50 percent of all material collected be retained in the state, expressly reserving all rights to excavate to itself, forbidding exportation of materials collected, and establishing fines for violations. In general, these laws seek to retain ownership for the state and in some cases specify the repository where the objects are to be housed.

OTHER PROBLEMS OF CONSERVATION

The real problems of paleontological conservation in many areas of the United States, including Iowa, are not the rules and regulations imposed by federal or state laws but are problems such as (1) the dissemination of information about paleontological objects to the general public, (2) gaining the cooperation of individuals and organizations in reporting discoveries to qualified institutions, and (3) establishing and financing a workable program for the methodical collection, preparation, and study of fossils.

So far as can be determined no system has ever been devised for distribution of popular information about fossils to those who may be in a position to discover them. So far, we have depended on intellectual curiosity to prompt workmen to notice and save such objects. Occasionally, those who do this have sufficient curiosity to take the items to a museum or university for identification. Usually, the professional to whom the fossils are brought has many other duties and can afford only enough time to identify the specimen and encourage the discoverer to continue looking. Occasionally, fossil finds are reported in newspapers and although this helps focus attention on the subject, invariably the stories are slanted toward the novel aspects rather than the scientific value of the discovery. One encouraging recent development has been the increase in time devoted to the subjects of geology and paleontology in secondary and primary school curricula.

Undoubtedly, many scientifically valuable fossils are destroyed annually because they go unrecognized or are deliberately ignored. The increasing tempo of highway and commer-

cial construction in Iowa supports a thriving gravel industry with the result that new pits are opened each year, multiplying the opportunities for the discovery of fossils. Most vertebrate fossils in this state are found in gravel pits although some are discovered during highway construction and commercial excavations.

At present, the only possibility for fossils to be recovered during these operations lies in the chance that a workman may notice and be curious about a foreign object in the gravel or excavation. Occasionally, it has been possible to make arrangements to save these items through personal contact with a foreman or other employee, and in a few instances these individuals have agreed to make collect phone calls if discoveries are made which require specialized handling.

Few discoveries of paleontological specimens have been made or, at least, reported in Iowa as the result of highway construction. Since federal highway work has been instigated on a large scale some states have taken advantage of the provisions for archeological and paleontological salvage contained in the Highway Construction Bill. Through this bill it is possible for states to arrange for the archeological and paleontological materials discovered in the course of federal highway work to be recovered at federal expense, since the bill provides for financing of such work.

The discovery of paleontological or archeological material and the time required to collect such objects may cause some delay or inconvenience to the contractor who, on other than federal highway work, has no opportunity for compensation. Understandably, the contractor feels he cannot afford undue delay. Thus, he must be convinced that the objects causing the delay or inconvenience are important enough to justify this action. Actually, there is seldom need for much delay since his machinery can be kept busy on another part of the project during the few hours or days required to collect the specimens. Therefore, it is the scientist's job to convince contractors that the objects are scientifically or culturally worth the inconvenience and every effort should be made to credit him for his act of public service.

Another problem is the lack of institutions where paleontological finds are wanted and may be properly handled. This involves knowledge of field collecting techniques, and facilities for laboratory preparation, identification, and cataloging. All are necessary to insure the maximum value of the specimens as scientific objects will be realized. Financing collect-

ing trips and maintaining a laboratory can be expensive. At Sanford Museum, both problems have been partially solved through the help of interested non-professionals. A volunteer program has been established which affords individuals an opportunity to participate in interesting scientific endeavors and, at the same time, furnish valuable assistance to the Museum. Some activities of this group have been reported in a recent article (Frankforter, 1960). This system works well provided professional supervision can be supplied until the techniques are mastered. Also, it is important that this help be acknowledged in some concrete manner, either through publicity or in publications such as newsletters.

Additional help may be available through general science classes or science clubs. For several years we have worked closely with local junior high school general science classes and have developed a program whereby students may earn extra credit for laboratory work at the Museum. Their initial visits each year are in the form of a class tour but subsequent work is by appointment after school hours. Through this arrangement students learn not only laboratory techniques but have an opportunity to discuss the objects being prepared with the professional in charge. Again, this arrangement requires adequate laboratory space and the time of a professional who may have few minutes to spare from regular duties.

CONCLUSIONS

In view of the above discussion the following are proposed as partial solutions to the problems of paleontological conservation in Iowa.

- (1) Enact a state law pointing out the reasons for preserving paleontological materials and requiring that discoveries of such items on state or county property be reported to proper authorities.
- (2) Draw up a set of procedures to be followed by state and county agencies to facilitate reporting of paleontological discoveries.
- (3) Publish a booklet illustrating typical fossils of Iowa and presenting a popular version of their histories. This should include information regarding the scientific and cultural values of fossils, as well as a brief outline of collecting and preservation techniques. This booklet should be distributed to individuals who are apt to discover fossils because of the nature of their work.

- (4) Arrange for a series of illustrated articles on fossils to be run in newspapers throughout the state.
- (5) Arrange for interested non-professionals to assist in the collection and preparation of fossils where facilities permit, and acknowledge their help in every way possible.

It is recognized that implementing these proposals will entail considerable time and effort on the part of a very few scientists who are concerned about the conservation of fossils. However, with the moral support of other scientists and all who are interested in conservation in general a partial solution to current problems seems possible.

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