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Title: Criteria for Establishing the Scientific Value of Natural Science Collections

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museums, and by some measures taken to provide their active protection.

One of the most important criterions in valuing a museum's geological collections is its significance for the protection of the natural and cultural heritage. The opportunity, if we take it, will also have implications for a museum's collecting policy, including the acquisition and disposal of geological collections as a result of research and educational activity.

The inanimate nature monuments in the world are protected in a different manner, in accordance with the legislation of nature conservation of a given country. They are dependent upon the inherent natural conditions characterizing the particular environments whhich are also influenced by native traditions, customs and economic, cultural history of the country concerned. Some actual problems concerning inanimate nature conservation protection in Poland will be discussed.

Today, particularly important from a museological view point is the safe-guarding of mobile monuments in various kinds of protected areas and sites. Generally we shall distinguish the following main categories of mobile monuments of inanimate nature:

- collections of specimens from most valuable natural area and sites protected by law in global, regional and local scale (e.g. national parks, nature monuments, landscape parks, documentary sites). Recommendations for safe-guarding in museums of such objects is in the first List of World Heritage Geological Sites Inventory UNESCO (1990). A good basis for of estimation of museum inanimate monuments could be useful studies on the construction of unified criteria network of Sites of Special Scientific Interest (SSSI), Regional Important Geological Sites (RIGS) and other international and national initiatives (e.g. European Association for the Conservation of Geological Heritage - ProGEOL);
- collections of preserved rare or unique geological specimens (minerals, rocks, fossils as well as meteorites) from great scientifically important and classical localities long since exhausted (e.g. old mines, quarries, outcrops). Note that many valuable specimens cannot be collected today and may be only clues to the geology of these sites. It is especially important now, as man modifies the Earth with increasing vigour;
- historical collections connected with names of eminent scientists, discoverers, collectors and history of establishment of natural history cabinets, museums and other scientific centers. These collections represent the cultural and scientific heritage of natural science and science history. Lastly, we must remember - Earth Science moves on and finds new uses for the old material. Museums are still motivated by a quest to decipher the natural world recorded in the existence of the object.

Apart from scientific values, mobile monuments of inanimate nature play an important role in museums educational activity, especially the problem of nature conservation. They are excellent material for educational exhibits. Geological specimens are especially "museable". Display collections of minerals, rocks, fossils are for visitors "the real thing", in other words "natural" nature objects, different from other natural history museum specimens of the recent living world which are only dead objects torn from its natural environment. Possibilities of stimulating the imagination through direct contact with real nature is an extremely essential factor for the popularization of both natural sciences and the fundamental problems of nature conservation as a basis for preservation of man's natural environment.

CRITERIA FOR ESTABLISHING THE SCIENTIFIC VALUE OF NATURAL SCIENCE COLLECTIONS.

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Valuation can be a very subjective process, particularly where there is no established frame of reference or procedure for arriving at a valuation. The philosophical basis of science is one of objectivity. Therefore it should be possible to construct an objective set of criteria for establishing the relative value to science of natural history collections.

The act of collecting is not in itself a scientific exercise, but may be a component of one. Once observations have been made, the preservation of material evidence is only important to science when its loss would prohibit repeated observation of a reported phenomenon, either because the evidence is unique, or re-collection is impractical.

Taxonomy and nomenclature are fundamental to many aspects of the natural sciences. Whilst the stability of nomenclature requires the designation and preservation of type specimens, other material requires preservation when there is, or might in the future be, reasonable doubt about its identity, or observations made from it. Specimens which do not form the basis of published observations have no intrinsic scientific value. However, they may be of value to the process of science, for example as reference material to aid identifications. Potential for scientific study cannot be a criterion for assessing the scientific value of collections, although it may be an important factor in collections management or acquisitions policy.

In assessing the relative importance of natural science collections, the number of type, figured, and cited specimens may be used as a rough guide, but it is reliable only in the case of very large collections. In zoological and botanical collections, counting taxa tends to even out distortions caused by a variety of factors, for example large type series, or differences in practice between scientists. It is assumed that in the eyes of science, all species are considered of equal importance. The following formula may prove to be useful for comparisons if collection parameters are compatible;

$$n = (f - T)(T + g) + R$$

Where
- T = number of species represented by type material
- f = number of species which are figured
- g = number of genotype specimens represented
- R = number of cited and referred taxa

The formula is weighted to emphasise the importance of certain categories of material and should fairly reflect the value of material in smaller collections. It does not take into account the usefulness of comprehensive reference collections as this would be difficult to measure objectively. As computerised databases become increasingly widespread it should be possible to obtain the statistics required relatively easily. It is hoped that if sound objective criteria can be established for assessing the scientific value of collections, the case for promoting better management and

financial support for scientifically significant collections will be enhanced.

WHAT'S IMPORTANT?

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This paper will essentially concern the fallibility of the collecting and curatorial process. It will test the basis on which decisions are made concerning the evaluation of collections; the role of connoisseurship; and the underlying assumptions of the collecting process. It will then go on to examine how value judgements concerning specimens are involved in the curatorial process - acquisition through to disposal - and how the process of collecting alters our perceptions of the material concerned.

Basically my argument is that natural science collections are too complex to evaluate effectively - they originate from a diversity of causes and then are wrapped up in a web of subjective assumptions in the hope that they will ultimately fulfil some immeasurable potential. Is it possible to make objective judgements about the value of natural science collections?

I do not intend to go into the valuation of collections - really my arguments concern the process that precedes valuation.

A DUTCH EXERCISE IN THE VALUATION OF NATURAL HISTORY COLLECTIONS

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A massive rescue operation for the preservation of cultural heritage in The Netherlands was initiated in 1990. This government sponsored national programme required a complete inventory of the considerable backlog in the conservation, restoration, housing, registration and documentation of collections in museums and archives of all sorts. This inventory involved a classification of all the state-owned collections and their included objects into four categories of relative importance, A through D, applicable to all cultural heritage disciplines, from the arts to archives. Top level material, e.g. type material in natural history collections, is in category A; bottom level material, unsuitable for storage or any further action other than complete disposal, comes in D. This nationally uniform approach to valuation questions was a *conditio sine qua non* for setting priorities in the allocation of funds by the government agency concerned, ie the Ministry of Welfare, Health and Cultural Affairs. The application of the A-D valuation system to natural history collections required a further refinement and more precise definition of the four categories. This was achieved by the formulation of straightforward criteria representing widely accepted indicators of biological, geological, and display values, as well as some supplementary curatorial criteria, such as ownership status. In The Netherlands the system is now widely used, not only for grant allocation, but also in planning documents, acquisition proposals and other collection management tools. In this paper the A-D categorization is described and problems encountered in its application as a tool in implementing collection management policies are discussed.

AN ATTEMPT AT VALUING THE ZOOLOGICAL REFERENCE COLLECTION OF THE DEPARTMENT OF ZOOLOGY, NATIONAL UNIVERSITY OF SINGAPORE.

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An attempt is made to review the scientific, cultural and monetary value of the Zoological Reference Collection of the Department of Zoology, National University of Singapore (ZRC). We feel that its overall value is essentially the same as many other established zoological collections.

The ZRC consists largely of the original zoological collection of the former Raffles Museum, presently the National Museum of Singapore. It is a repository for research collections of Southeast Asian fauna and is one of the largest and most complete in the Sundaland region. It is unique and irreplaceable because a lot of the material originates from biotopes which are lost to development. Therefore, it is valued as a "natural heritage" for the region. The specimens continue to form the basis of many scientific publications. Although mainly consulted by taxonomists and systematists, the ZRC is also used by other biologists, as well as illustrators.

The ZRC plays a significant part in Singapore's cultural history and is valued as a "national heritage". It was founded by Sir Stamford Raffles, who was also the founder of modern Singapore. Assembled sometime before 1887, it has survived the Second World War and unfavourable government policies in the 1970s. Many specimens were donated by famous personalities in Singapore's history. A small part of the collection is on display for educational purposes.

It is very difficult to assess the monetary value of the ZRC. Ways of valuing each specimen through division of the amount used to procure and maintain resulted in ridiculously high prices. The only way to come up with a "reasonable" price is through arbitrary quotation. We concur that the collection is priceless as many species are presently endangered and are quite irreplaceable in our rapidly changing world.

THE COST OF COLLECTING: COLLECTION MANAGEMENT IN UK MUSEUMS.

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Lord Cultural Resources was engaged by the Office of Arts and Libraries to conduct a national study on the cost of managing collections in British museums including systematic collections. This pioneering study combines quantitative survey data with detailed case studies of representative museums to develop a profile of the state and costs of collection development and management, and