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# COLLECTION FORUM

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**Opinion**

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***Lest We Forget***

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The Society for the Preservation of Natural History Collections was created in order to develop a communication network between and among persons working with, responsible for, or just concerned about natural history collections. Members of the Society work with large and small collections and are employed in large and small institutions. They work in many different natural history fields but a few have realized that knowledge developed in one field, discipline or science can be applied in others. The Society is a member-driven group of professionals, that is, our members develop ideas about what is important for our Society to do. For example, we should survey the software and computer programs that collection staff use.

But how does SPNHC actually work? Our bylaws tell us how to do things and who does what. Our officers and Standing Committees keep the Society going from day to day and month to month. For example, the Membership Committee searches out new members, handles membership applications, re-evaluates membership forms, and recommends changes in membership dues. The Sessional Committees are established and disbanded by the President of the Society. For example, I, as President from June 86 – June 88, established several sessional committees, among them the Conservation and Computer-use committees. It will be up to our new President, Cesar Romero-Sierra, to establish his sessional committees which he believes will provide fruitful results for our members.

Our Bylaws guide the Society but the Councillors (President-elect, Secretary, Treasurer, Past-president, and six Members-at-large) manage and direct it. Each councillor has one vote at council meetings.

The Annual Meeting and Workshops is an annual event which takes place somewhere in North America. It is an event where members can meet one another and develop invisible colleges. There, individuals can show their peers and colleagues what they are doing about collection management, conservation, preservation, etc. Members of our committees can meet and discuss their differences; members can attend workshops, and learn modern techniques.

The Society's publications keep the membership informed; the journal of the Society is *Collection Forum* which is published in spring and fall. The Society's Newsletter is published in summer and winter.

*Daniel J. Faber*

## Application of an Inventory of a Museum Collection

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Rafi, F. 1988. Application of an inventory of a museum collection. *Collection Forum* 4(1): 3-5

### Abstract

*Researchers remain largely uninformed of the nature and contents of museum collections. Curators and collections managers should take an active role in communicating the value of their collection to specialists. A relatively low-cost approach is the preparation of an inventory, itemizing unidentified taxa by geographic location. Such a system provides easy access to the collection for specialists who wish to study the material.*

### INTRODUCTION

Museums are resource centres where specialists can get required information and raw materials. It is therefore essential that the collections should be readily available. There is a need to establish in the scientific community a sense of the value of collections management. A computer-based inventory of unidentified specimens can help, by playing a significant role in satisfying the information requirements of staff and by making the collections more accessible to research workers, which could result in a closer bond between museums and other research institutions. On local, national and international levels more informed communication between specialists and museum professionals should result in improving the standards of collections management.

Museums have an obligation not only to manage and care for their collections but also to provide access to them. However, most museums have limited internal resources to identify the objects in their collections. In any museum, large or small, curators can play a role in communicating the contents of their collection to specialists.

Researchers remain largely uninformed of the nature and content of collections housed in museums. In order to communicate this information effectively, a museum must have detailed and accurate information about the specimens in its collection. To help overcome this problem the Crustacean Section of the Zoology Division, National Museum of Natural Sciences, has developed a computer-based inventory system which can be used to inform systematists of the potential value of the collection and to enable curators to identify those taxa which are either quantitatively or qualitatively under-represented.

### DEVELOPMENT

The availability of a microcomputer capable of holding basic inventory information made the establishment of crustacean inventory programme possible. Use of the computer for this purpose is an economical and efficient way of using limited staff resources to their best advantage. Individuals in the section realized that rapid access to collection data could be provided to specialists if an inventory was developed and computerised.

The crustacean inventory which was started in 1986 covers 3 categories of specimens: type, identified, and unidentified material.

The first step in this system was to select data fields that were useful for inventory purposes. The field selected should form a fairly limited set that serves to identify the object within the collection. Each of our inventory records contains 3 to 5 categories, comprising: accession number; location; collector's name; species' name; and, catalogue number. Naturally, the amount of information to be included depends on the type of inventory required.

The following provides a sample of the set of data fields used in three different inventory projects:

**Type Specimens** (See Fig 1), included the following:

- species name (binomial or trinomial), author and date, type designation, and catalogue number.

**Identified Specimens** (See Fig 2), included the following:

- species name (binomial or trinomial), author and date, and whether catalogued.

**Unidentified Specimens** (See Fig 3), included the following:

- geographical location (province or state), collector's name, accession number, and station number.

Requests from researchers have placed an ever increasing burden on the Crustacean section for accurate and up-to-date information regarding its holdings. These demands, along with the proven success of published records of inventory projects (Neufeld 1983; Sarasan and Neuner 1983) and the section's inventories of type material and identified specimens, encouraged us to attempt an item-by-item inventory of unidentified specimens.

### METHOD

Specimens collected during a field trip are brought back to the Museum for processing. A unique (accession) number is assigned to each expedition's collection. After accessioning, the collection is sorted into various taxa. The resulting specimen lots, usually consisting of several species, are treated as individual records. At the time of collection, field sheets (See Fig. 4) are completed for each station lot by the collector.

Crustacea Type Inventory		(NMC-C-19...)	Holotype	Allotype	Paratype
Phylum, Subphylum, or Superclass Crustacea Pennant 1777					
Class Cephalocaridea Sanders 1955					
Order Brachyopoda Birstein 1960					
Family Lightiellidae Jones 1961					
Class Branchiopoda Latreille 1817					
Order Cladocera Latreille 1829					
Superfamily Daphnoidea Straus 1820					
Family Chydoridae Stebbing 1902					
Alona borealis Chengalath & Hann 1981					
		80-418s	82-98		82-98s
A. freyi Idris & Fernando 1981		84-1140s	84-1141		
A. lapidicola Chengalath & Hann 1981		80-415s	80-416s	82-97	
			80-417s	82-97s	
Alonella pulchella Herrick 1884 Neotypes		80-421s		82-103	
Chydorus bicollaris Frey 1982				82-5s	
				82-56s	
C. canadensis Chengalath & Hann 1981		80-424s	82-99		
Dunhevedia americana				86-873s	
Rajapaksa & Fernando 1987					
Eurycercus (Ballatirons) longirostris			81-217		
Hann 1982				81-217s	
				81-218	
				81-218s	
Ilyodromus lanoensis Victor & Fernando 1981	82-91			82-92	
Kursia brevilabris				86-869s	
Rajapaksa & Fernando 1986					
Notalona freyi Rajapaksa & Fernando 1987				86-870s	
Notalona globulosa australiensis				86-871s	
Rajapaksa & Fernando 1987					
Oxyurella brevicaudis Michael & Frey 1983				82-59	
				88-0027	
Pleuroxus chiangi Frey MS	88-0025	88-0026		to 0030	
Family Daphnidae Straus 1820					
Daphnopsis ephemeralis Schwartz 1985	84-1472	84-1473	84-1475		
		84-1474	84-1548		
			84-1549		
Family Macrothricidae Norman & Brady 1867					
Macrothrix malayensis Idris & Fernando 1981	84-1138			84-1139	
Subclass Sarcotrachea Tsch 1969					
Order Anostraca Sars 1867					
Family Branchipodidae Simon 1886					
Eubranchipus intricatus Hartland-Rowe 1967					
Class Remipedia Yager 1981					
Class Maxillopoda Dahl 1956					
Subclass Cirripedia Burmeister 1834					
Order Thoracica Darwin 1854					
Suborder Balanomorpha Pilsbry 1916					
Superfamily Balanoidea Leach 1817					
Family Balanidae Leach 1817					
Balanus (Balanus) altissimus Cornwall 1936	85-125				
Subclass Copepoda Milne-Edwards 1840					

Figure 1 - Example of a page from the crustacean Type inventory.

CRUSTACEA INVENTORY			
List of Unidentified Isopods			
Country, State or Province			
Locality	Collector	Accession No	Station No
Canada, N.B.	Bousfield, E.L.	1951-53	-
Canada, N.B.	Bousfield, E.L.	1958-85	82
Canada, N.B.	Bousfield, E.L.	1958-85	W1
Canada, N.B.	Bousfield, E.L.	1960-180	88, 10, 16, 29
Canada, N.B.	Lee, R.K.S.	1972-238	5330-5339
Canada, N.B.	Lee, R.K.S.	1972-238	5340-5345
Canada, N.B.	Linkletter, L.	1974-102	-
Canada, N.B.	Linkletter, L.	1974-102	-
Canada, N.B.	Bousfield, E.L.	1958-85	813
Canada, N.B.	Bousfield, E.L.	1958-85	820
Canada, N.B.	Bousfield, E.L.	1958-85	814
Canada, N.S.	Bousfield, E.L.	1958-89	L9
Canada, N.S.	Bousfield, E.L.	1958-85	C15
Canada, N.S.	Bousfield, E.L.	1958-85	M2
Canada, N.S.	Bousfield, E.L.	1958-85	M17
Canada, N.S.	Bousfield, E.L.	1958-85	M19
Canada, N.S.	Bousfield, E.L.	1960-180	B11
Canada, N.S.	Bousfield, E.L.	1960-180	S11
Canada, N.S.	Bousfield, E.L.	1967-253	-
Canada, N.S.	Wolff, N.D.	1980-487	-
Canada, N.S.	Wolff, N.D.	1980-487	-
Canada, N.S.	Jeistad, R.D.	121984-30	-
Canada, N.S.	Jeistad, R.D.	121984-30	-
Canada, N.S.	Bleakney, J.S.	121984-30	-
Canada, N.S.	Bousfield, E.L.	1962-166	S8
Canada, N.S.	Bousfield, E.L.	1962-166	S12
Canada, N.S.	Bousfield, E.L.	1962-166	A12
Canada, N.S.	Bousfield, E.L.	1962-166	A21
Canada, N.S.	Bousfield, E.L.	1962-166	A34
Canada, N.S.	Bousfield, E.L.	1962-166	A35
Canada, N.S.	Bousfield, E.L.	1962-166	A68
Canada, N.S.	Frank, Peter G.	1979-211	79-6
Canada, N.S.	Bousfield, E.L.	1963-293	S13
Canada, PEI	Bousfield, E.L.	1958-85	P6
Canada, PEI	Bousfield, E.L.	1960-180	P33
Canada, PEI	Bousfield, E.L.	1960-180	P34
Canada, PEI	Bousfield, E.L.	1960-180	-

Figure 2 - Example of a page from the crustacean inventory of identified specimens.

These data are transferred to labels, and become the raw data used to create inventory records.

The basic inventory was taken directly from the specimen lots in the collection, manually entered to data sheets and subsequently, entered into the computer. Data are first entered into temporary files, which can be checked on the screen for errors. Any discrepancies can then be noted as needing further scrutiny. Once the data have been checked, they can be transferred to a permanent file. Checking for accuracy is essential to enable later information retrieval.

### USES OF THE SYSTEM

There are many possible uses for museum inventories, such as auditing, managing and disseminating information. Audit programmes demonstrate accountability to external authorities. To support collection management, accurate answers on e.g., how many specimens lots from a particular locality there are, can easily be provided. With the aid of an inventory the dissemination of information to systematists about the scope of the unidentified material is much less of a problem.

Organizations that might be interested in making use of the system are many and varied. They comprise:

- museums;
- universities;
- government institutions; and,
- private industries.

Contact and liaison with a very large number of institutions and specialists will also be a vital part of the job.

CRUSTACEA INVENTORY		Uncat	Cat	Unident
Superorder Peracarida Calman 1904				
Order Speleogriphacea Gordon 1957				
Family Speleogriphidae Gordon 1957				
Order Mysidacea Boas 1883				
Suborder Lophogastrida Boas 1883				
Family Eucopiidae Sars 1885				
Eucopia grimaldii	Nouvel 1942		2	1
Family Lophogastridae Sars 1870				
Gnathopausia gigas	Willemees-Sum 1875		2	1
Suborder Mysida Boas 1883				
Family Lepidomysidae Clarke 1961				
Family Mysidae Dana 1850				
Acanthomysis columbiae	(W. Tattersall 1933)			3
A. stelleri	(Derjavin 1913)			1
Acanthomysis sp.			2	
Alienacanthomysis macropsis	(W. Tattersall 1932)			13
Amblyops abbreviata	(M. Sars 1869)			6
A. kempii	(Holt & Tattersall 1905)			11
Archaemysis grebnitzkii	Czerniavsky 1882			94
Boreomysis arctica	(Kroyer 1861)			13
B. nobilis	G.O. Sars 1885			9
B. tridens	G.O. Sars 1870			9
Boreomysis sp.			2	
Bowmanella banneri	Bacescu 1968			1
Columbiaemysis ignota	Holmquist 1922			4
Erythropus abyssorum	G.O. Sars 1869			1
E. erythropthalmus	(Goes 1864)			42
Exacanthomysis davisi	(Banner 1948)			21
Heteromysis formosa	S.I. Smith 1873			11
H. odontops	Walker 1898			3
Holmesiella anomala	Ortmann 1908			15
Holmesiella costata	(Holmes 1900)			40
H. nuda	(Banner 1948)			16
H. sculpta	(W. Tattersall 1933)			25
H. sculptoides	Holmquist 1979			5
Inusitatomysis insolita	Li 1940			9
Inusitatomysis sp.			5	
Meterochryops robusta	S.I. Smith 1879			43
Mysidopsis bigelowi	W. Tattersall 1926			2
Mysis gaspensis	O. Tattersall 1954			91
M. litoralis	(Banner 1948)			20
M. mixta	Lilljeborg 1852			14
M. oculata	(G. Fabricius 1780)			46
M. relicta	Loven 1862			2
M. stenolepis	S.I. Smith 1873			169
Mysis sp.			1	
Neomysis americana	(S.I. Smith 1873)			125
N. andersoni	Schmitt 1919 (ident. uncertain)			1
N. ussachensis	(Brandt 1851) (ident. uncertain)			3
N. integer	(Leach 1814) (ident. uncertain)			2
N. mercedis	Holmes 1896			41
N. rayii	(Murdoch 1885)			22
Pacificanthomysis nephrophthalma	(Banner 1948)			7
Praunus flexuosus	(O.F. Muller 1776)			17

Figure 3 - Example of a page from the crustacean inventory of unidentified specimens.



# Preservation of Sitka Spruce for Museum Display

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Romero-Sierra, C. and J.C. Webb 1988. Preservation of Sitka spruce for museum display. *Collection Forum* 4(1) 6-7.

## Abstract

*A preservation formula has been developed for Sitka spruce that proved effective for the retention of needles, while causing some discolouration. The treatment consisted of immersing the branches in a mixture of chemicals for a period of up to two weeks. They were subsequently rinsed in water and glycerin for another two weeks and finally air dried. These procedural steps are similar to those we previously reported, but the treatment formula differs substantially.*

## INTRODUCTION

We described a general method for preserving the structure and chlorophyll pigment of botanical specimens (Romero-Sierra and Webb 1986a). The chemical composition of the preservative formula was based on the results of our experiments with a broad variety and large number of botanical specimens. We later used this formula to treat new species with varying degrees of success. Also, we reported on the preservation of Douglas fir branches (Romero-Sierra and Webb 1986b).

We discovered that neither our general formula nor our formulae for Douglas fir yielded satisfactory results for Sitka spruce. This paper reports on our experiments to determine the effective formulation for Sitka spruce.

## MATERIALS AND METHODS

The procedure consisted of three basic steps, namely, 1) immersion in a bath of a preservative solution, 2) rinsing in clear water, and 3) subsequent immersion in a second bath of a holding solution. The temperature of the solutions was maintained between 15° and 21°C.

Clear glass jars of 600 ml capacity and with plastic lids were filled either with one of the various preservative solutions or with the holding solution. Small twigs of Sitka spruce were used to test the efficacy of the various formulae in these containers. We considered the results satisfactory or successful only when both needles and colour were retained for a month following treatment. Furthermore, two containers measuring 1 m<sup>2</sup> at the base and with 120 litres capacity coated and sealed with resin from the inside were used to process larger branches to corroborate the positive results obtained previously with a twig in a glass jar.

The Sitka spruce specimens were collected and shipped from British Columbia to Kingston. The preserving formula was a mixture of distilled water and chemicals that fixed and preserved the structure and pigments of the specimens. The duration of immersion in this mixture was generally two weeks. The holding formula was a solution of equal volumes of glycerol and water that influenced the water affinity of the specimens and caused them to retain their flexibility. Two weeks was normally required for this step, although specimens were left for extended periods of time until needed. As a final step the specimen was air dried for a few days, the length of time depending on the relative humidity in the room.

Some chemical ingredients, namely, formalin, glycerol and carboxylic acid, were tested in varying concentrations

with unsatisfactory results until cupric chloride was introduced in the preserving formula. In the laboratory we adhere to regulatory safety precautions when handling formalin, ethylene glycol, formic and propionic acids, cupric sulphate, cupric chloride and ethyl alcohol. The preserving bath was kept under a fumehood as was any uncapped volatile chemicals. The vat's lid which reduced the escape of fumes and prolonged the usefulness of the mixture was left on at all times for safety of handling and inspection.

Rinsing in water after treatment removed chemicals that emitted toxic substances into the finished products. Furthermore, it ensured that the water-glycerin bath remained clean. Once the branches were taken out of the holding solution, they were air dried until there was no trace of fumes. Tests conducted to assess the flammability of treated specimens showed it to be lower than in untreated specimens that had been left to dry naturally.

## RESULTS AND DISCUSSION

In repeated trials we observed that an increase of formalin was beneficial and that the ideal concentration of glycerol was 10%. We also found that an increase of carboxylic acid in the formula was beneficial for the prevention of shedding needles.

The best results were obtained with the preserving formula presented in Table 1. Without cupric chloride the formula caused the branches to turn dark brown. In our unsuccessful trials using our previous formulae, as well as several formulae reported by other authors (Fessenden 1951, 1955; Lutz 1969), the needles became detached from the branches during the immersion in the preservative fluid. Examining these branches with the aid of a magnifying lens, we observed that the capping junctions of the branch to the needles were dilated and thus not holding the needles. By contrast, the junctions of specimens treated with the Sitka spruce formula were observed to grip the needles tightly.

Table 1. Preservation formula for Sitka spruce.

Distilled water (ml)	500
Formalin (ml)	150
Ethyl alcohol (ml)	150
Glycerol (ml)	100
Formic acid (ml)	50
Propionic acid (ml)	50
Citric acid (g)	20
Cupric chloride (g)	30
Cupric sulphate (g)	20
Sodium sulphite (g)	7

1. formerly affiliated with Department of Biology.

It appeared that the beneficial effect of this formula was due to the proper concentration of the fluid chemicals used, in particular the carboxylic acids, which caused the junctions to tighten, and the formalin, which reinforced tissue preservation.

Cupric chloride proved mildly beneficial to retain structure. The principal benefit of this chemical is apparently due to its mordanting and modifying effects. It rendered the formula a vibrant green and counteracted the browning effect of the other chemicals on the chlorophyll.

As mentioned above, the duration of immersion of Sitka spruce specimens in the preserving solution was generally two weeks, however, if the mixture had previously been used heavily for treatment of a large amount of specimens, or if it was old, immersion required up to four weeks. Rinsing in water and immersion in the holding solution after treatment in the preserving solution (50/50 glycerol and water) were identical to the steps in the process followed for Douglas fir (Romero and Webb 1986b), except the rinsing time was longer for Sitka spruce. Older branches preserved less satisfactorily than younger branches. Similarly, sections of a branch were affected differently by the treatment, i.e., older sections benefitted much less than younger sections.

In our work on botanical preservation we viewed with concern the inconsistency in results of identical treatments of Sitka spruce specimens. The formula most successful for Sitka spruce (Table 1) did not always produce satisfactory results, indicating that factors which we did not take into account were operant.

Four major factors probably influenced the results, i.e., 1) the regions where specimens were collected (the higher the latitude of origin, the poorer the outcome of treatment); 2) the month in which specimens were collected (September was generally best); 3) the conditions of maintenance of specimens between collection and treatment (regarding

humidity and temperature); and 4) the time lapse between collection and treatment of the specimen (the shorter the better). Although these factors appeared to play a particularly large role in the successful preservation of Sitka spruce, the above mentioned factors (2, 3 and 4) are not surprising *per se*, because they are common to other kinds of vegetation that we have handled in the past. Factor (1) was based on the simple information received from the collecting and shipping team as well as the results subsequently obtained during the preservative treatment.

Many factors other than geographic location of the region of origin may influence the success of the preservation, e.g., the particular soil or the age of the plant. Further experimentation is required to identify which intrinsic factors related to its region of growth influence the preservation of a specimen. Such information is expected to assist in improving the present formula and provide for more consistent results. Work is presently underway to test the effects of preserved specimens and in particular the preservation formula on nearby untreated objects in displays.

#### REFERENCES

- Fessenden, G.R. 1951. Process for preserving plant tissues. United States Patent No. 2,567,929, issued 18 September 1951.
- Fessenden, G.R. 1955. Preserving animal and plant tissues. United States Patent No. 2,698,809, issued 4 January 1955.
- Lutz, E.L. 1969. Handbook of plastic embedding. Healdsburg, Calif., Naturegraph Publishers. 186 pp.
- Romero-Sierra, C. and J.C. Webb. 1986a. A chemical method of preserving green plant structures. *In* Proceedings of the 1985 Workshop on Care and Maintenance of Natural History Collections, edited by J. Waddington and D.M. Rudkin, Royal Ontario Museum, Life Sciences Miscellaneous Publications, Toronto, pp. 47-50.
- Romero-Sierra, C. and J.C. Webb. 1986b. Preservation of Douglas fir branches for display purposes. *Collection Forum* 2(2):10.

## Flat Fossil Molds with Silicone

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Watson, W.Y. and S. Grant 1988. Flat fossil molds with silicone. *Collection Forum* 4(1): 8-9.

### Abstract

*A quick, simple method of making flat silicone molds of fossil specimens in the field is described and illustrated.*

### INTRODUCTION

Managers of collections must be interested in maintaining specimens as perfectly as possible for as long as possible. We must be equally interested in leaving specimens *in situ*, if removing them to our institutions means lessening their value. Frequently, palaeontological materials are found where it is neither necessary nor advisable to remove the specimens themselves. For example, organisms in a fossiliferous reef should be left undisturbed, if at all possible, because of the significant phenomenon that such an assemblage represents.

In such circumstances it is advisable to obtain replicas of the specimens present. A simple, inexpensive method of making accurate and longlasting molds of such material is described here. The method is an adaptation of that described by Edmund (1985) for making bone replicas.

### METHOD FOR MAKING FLAT FOSSIL MOLDS

Four available caulking compounds were field tested. "Draft Stop", a transparent petroleum product, "Mono Acrylic" and "Mono Latex" were all very slow to cure and were therefore unsatisfactory for field purposes. Mastercraft™ "Silicone Sealant" had all the qualities necessary to make good reproductions of field specimens.

If applied reasonably thick, the silicone required no mother mold to prevent distortions and being flexible, it permitted faithful reproduction of moderately complex undercuts. In addition to the properties listed by Edmund (1985), this compound cured quickly without objectionable odour.

In making flat molds a maximum size of 15 cm by 15 cm proved practical to work with. Molds over this size should have a burlap or other fibrous backing worked into the silicone while it is still soft; this helped to prevent tearing or cracking. Specimens to be used were carefully cleaned of dust and rock debris with a soft or medium soft brush (Fig. 1). Once the specimens were cleaned, a series of photographs from various angles were taken. From these photographs fine details of the final castings were checked. Rigley and Clark (1965) suggested that porous specimens should be sealed before casting is done and list several materials for doing this. Ordinary shellac cut 1:1 with methyl alcohol proved satisfactory because it dried quickly and did not obscure details.

The specimens and some of the surrounding area were flooded with a thin layer of liquid detergent (Fig. 2) to act as a releaser. "Palmolive" green detergent, pH 7.8, diluted 1:1 with distilled water, was used. Care was taken to work a smooth film of detergent into all the cracks and undercuts without allowing it to foam.

Once the detergent has been applied, silicone can be layered on in overlapping parallel strips (Fig. 3). Any air



Figure 1 - Cleaning a specimen of *Scutellum* sp.

trapped beneath the compound can be forced out by pressing the silicone onto the specimen with wet fingers. Edmund (1985) suggests that the layers of silicone should be no more than 3 mm thick. In our work it was found that thicker molds could be made with single coats without losing any of the advantages.

After 24 hours the mold was removed without difficulty. If there is any reason to suspect that the mold is not cured, ie, damp weather, for example, the silicone should be carefully tested to insure that curing is complete. This can be done by pushing a small stick or a pin into the mold. If curing is incomplete, silicone paste will adhere to the pin.

When fully cured, the mold was lifted easily from the specimen. Some care was required to ease the mold out of certain undercuts.

To make a casting from the mold any of the standard techniques can be used (e.g. Wood, 1958). We found the following modifications to be useful if castings are being made in the field. A light cardboard dam 3 cm deep was constructed to surround the mold with a 5 mm space beyond any part of the mold. Medium grade molding sand was poured into the dam to a depth of 1 to 1.5 cm and tamped down firmly. The mold was then positioned on the sand in such a way that all parts of the mold were fully supported. Although not essential, it was sometimes useful to coat the impression sur-



Figure 2 – Applying liquid detergent to the specimen.

face of the mold with liquid detergent before pouring in the plaster.

Once the mold had been prepared a slightly fluid slurry of Plaster-of-Paris or dental plaster was then poured over the mold to a depth of at least 1.5 cm. Dental plaster was preferable because it was harder and finer grained.

When the plaster cast was dry and hard it was removed from the mold. Then the specimen surface of the cast was coated with a very dilute wash of india ink. This helped to accent surface contours that might not otherwise be seen on the plaster surface. The surface of the cast can be treated with a variety of paints or transparent finishes depending upon the results desired. Before using any of these paints however, the cast should be sealed with diluted shellac.

Although casts made in this way were not the real specimens, they can be accurate reproductions that serve usefully as voucher specimens. Of equal importance, however, is that no harm is done to the original specimen.

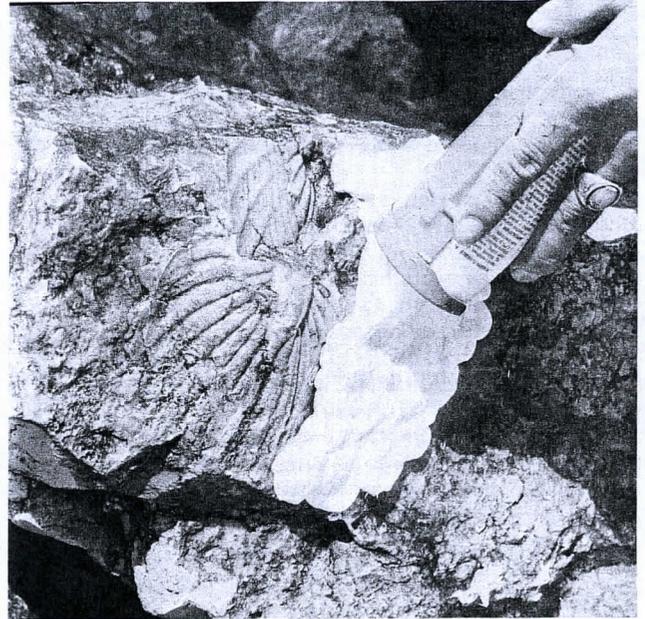


Figure 3 – Layering the silicone compound.

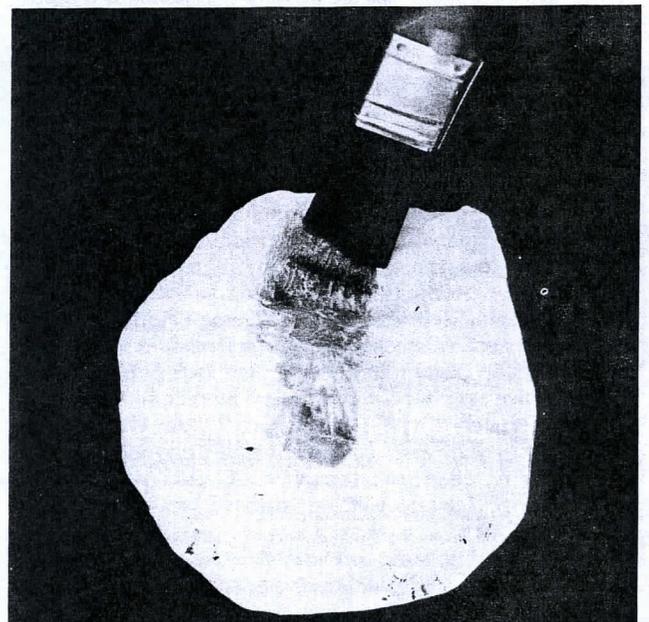


Figure 4 – The plaster cast showing the effect of an india ink wash.

#### REFERENCES

- Edmund, G. (1985) 1986. Mold-making using silicone caulking compound. Proceedings of the 1985 workshop on the care and maintenance of natural history collections. Royal Ont. Mus. Life Science Miscellaneous Publications. pp. 15-20.
- Rigley, J.K. and D.L. Clark 1965. Casting and moulding. pp. 389-413, In: Kummel, B. and D. Raup. Handbook of Palaeontological Techniques. W.H. Freeman and Co., San Francisco.
- Wood, A.A. 1958. Preparing Insect Displays. Publications of the Canada Department of Agriculture. 1032, pp 87, (Illustration), Ottawa.

## Improvements in Techniques for Freeze-Drying Vertebrate Specimens

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Romero-Sierra, C., J.C. Webb, P. Lane and G.W. Lyons 1988. Improvements in techniques for freeze-drying vertebrate specimens. *Collection Forum* 4(1): 10–11.

### Abstract

*We have reported on our method for preservation of biological specimens using freeze-drying techniques. Recently we made improvements on procedural variations regarding a) vascular flushing solutions, b) vascular injection of silicone vs. latex, c) dissection of nonfixed specimens, d) glycerin treatment, e) handling of treatment specimens, f) deep impregnation of specimens using nonthermoplastic elastomers, g) durability of preserved specimens, and h) suitability of treated specimens for further dissection and analysis.*

### INTRODUCTION

In the last three decades freeze-drying of biological material has become commonplace, because the basic procedure, namely, dehydration of specimens, is easily accomplished with a freeze-dryer. Low cost design of equipment (Wright 1983) is making it even easier to accomplish.

With some specimens, ie., small birds or amphibians, satisfactory results can be obtained by freeze-drying alone. Hence, many preparators make no attempt to perfect their preparations with additional treatment(s) or to test biological materials less amenable to simply freeze-drying. We believe other techniques in combination with freeze-drying often yield superior products.

One main disadvantage of freeze-dried specimens prepared for use as teaching or research aids is stiffness. In the last decade new methods that alleviate or eliminate this problem have been reported (Romero-Sierra and Webb 1977; Romero-Sierra *et al.* 1983; von Hagens 1979a, 1979b). These involve perfusion, vascular injection of polymers, evisceration, skinning, dissection, treatment of joints, wrapping and manipulation, acetone wetting, silicone treatment, curing, and drying.

This paper reports on the treatment of anatomical specimens to serve as teaching aids in anatomy museums and medical schools. These specimens place high demands on the preservation method as they must be didactically useful, pleasant to handle, as well as sturdy and durable to withstand extensive handling. The supply of fresh specimens is scarce and expensive and each prepared specimen therefore should last as long as possible. This methodology and technology is applicable also to other natural history specimens being prepared for museum displays.

### MATERIALS AND METHODS

The various chemicals used in the testing procedures were — polymers, solvents, fixatives, alcohols, and salts. The procedural steps were variations of those reported for treatment of cat specimens (Romero-Sierra *et al.* 1983).

The equipment consisted of — three freeze-dryers one was a VirTis unit, (available from VirTis Company, Route 208, Gardiner, NY 12525) and two others manufactured by the National Research Council, Ottawa; an upright and several

chest deep freezers; peristaltic pumps; stainless steel vats; and other laboratory equipment.

The main treatments including, 1) preliminary treatment, 2) freeze drying and 3) treatment following freeze-drying, are described below.

1. *Preliminary treatment*: The first step in preparation was to flush the vascular system. Cutdowns were performed and cannulae inserted into the common carotid, femoral arteries and one jugular vein. The vascular system was drained of blood and flushed at 2.27 kg pulsating pressure with one of the following flushing solutions: Calsec draining chemical (available from Embalming Supply Co., 42 Haas Road, Rexdale, ON M9W 3A2); Metaflow (available from Dodge Chemical Co., New York, NY); or any of those previously reported (Romero-Sierra *et al.* 1983).

After the vascular system had been cleared, either silicone or latex was injected. If the vascular tree was judged to be intact at this stage, the vessels were injected with Microfil™ solution (available from Canton Biomedical Products, Boulder, CO). However, because this material penetrates to the level of the capillary bed, it must be certain that the vascular tree was intact before proceeding. Microfil™ was injected carefully at 4.54–6.81 kg pulsating pressure simultaneously in as many cannulae as possible.

If the vascular tree was not intact, latex was used instead of Microfil™ (Romero-Sierra *et al.* 1983). Once the vessels were filled and the Microfil™ polymerized, evisceration and dismembering were performed. Specimens of the upper and lower limbs, thoracic torso, head and neck, brain, lungs, heart and abdominal visceral have been produced. Subsequently they were treated in one of the following manners: a) plastization by the use of plasticizers, b) block embedding by the use of hard setting polymers, or c) impregnation by nonthermoplastic elastomers (Simmons *et al.* 1968; Driscoll *et al.* 1971; Romero-Sierra *et al.* 1983).

The treatment using nonthermoplastic elastomers by surface impregnation (limbs) or deep impregnation (brains) is an improvement. Specimens were skinned and dissected. Skinning of the various regions was done carefully (Romero-Sierra *et al.* 1974) in order to preserve the skin. In head and neck specimens the skin was divided into two sections by a mid-coronal incision. Such specimens, however, were not entirely successful. Extraordinary care in dissection is required to produce a good specimen.

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For a good skin, limb, head, neck or thorax specimen, the skinning procedure is tedious. Care must be exercised throughout the procedure to ensure that neither the skin nor the underlying muscles, nerves and vessels are damaged. This is best done by blunt dissection. We found it convenient to remove as much subcutaneous fat and fasciae as possible with the skin. The skin was then placed in rock salt (Romero-Sierra *et al.* 1974) and the rest of the specimen was ready to be dissected. After dissection had been completed, the major joint spaces were injected with 10 ml of glycerin and manipulated extensively to distribute it to all recesses.

2. *Freeze-drying*: For anatomical preparations the freeze-drying process followed the procedures of Romero-Sierra *et al.* (1983).

3. *Treatment following freeze-drying*: These steps, i.e., immersion in acetone, bone cleansing, unwrapping, massaging of tissues, soaking in glycerin solution(s), silicone impregnation and fine dissection of structures, were carried out with the following variations: a) The specimens were first soaked for five minutes in a lukewarm 10% glycerin aqueous solution. Subsequently, they were soaked for another five minutes in a 25%, 50% or 75% solution and then left loosely covered with a wet cloth for 24 hours prior to silicone treatment. b) The specimen's surface was impregnated with either red or unpigmented silicone after which fine dissection was performed. Uncovered specimens dried out within three months, whereas bagged specimens dried in two to six months. c) Specimens that required deep impregnation, e.g., brains, were first soaked in acetone and then immersed in a silicone bath. Subsequently they were placed in a vacuum until substitution of the acetone from the tissue spaces by the silicone was nearly complete. At the end of this process a mixture of hard-curing resin was added to the silicone. Once the substitution was completed, final curing was accomplished at 20°C and 9/10 atmospheric pressure.

In summary, our methods produced well preserved specimens with excellent shape and colour retention as well as natural texture (flexibility). They were attractive, sturdy and easy to handle and store. They were inexpensive to produce and maintain.

## DISCUSSION

Our results over the last fifteen years have improved with new steps before and after freeze-drying. It might appear that such steps only serve to complicate a simple technique and add needless cost and effort, but the opposite is true. Some specimens treated ten years ago in the manner described have been extensively handled in continuous instruction in the health sciences and still retain the qualities they had when freshly preserved. The treated specimens not used for instruction were kept in plastic bags in storage areas with room

temperatures oscillating between 15° and 23°C and humidities from 40% to 90%. During this ten year period we detected no changes.

The procedures presented here pertain particularly to the preparation of human anatomical specimens. But these same procedures may be used based also on the results that we have obtained using other mammals.

When comparing the costs-benefits of a brain specimen treated with the procedure of Romero-Sierra *et al.* (1983) with those reported here, we find that for general teaching purposes the previously reported method was not only less laborious in preparation and less costly in materials but also produced esthetically superior specimens. One of the positive features of the silicone deep impregnation method described here, however, is that it produces specimens that can be used for subsequent dissection and detailed study of internal structures. Capable of bringing about such versatile final products, these methods help to produce not only better preserved biological specimens but also to expand their usefulness.

## REFERENCES

- Driscoll, J., J.K. Desmarreau, K.C. Carlson, J. Webb, and C. Romero-Sierra. 1971. A new method of preparing and displaying the heart as an anatomical specimen. Laboratory Technical Report No. 60, Control Systems Laboratory, Division of Mechanical Engineering, National Research Council Canada. 17 pp.
- Romero-Sierra, C., P. Lane, and J. Webb. 1974. A technique for the preservation of human skin. Unpublished Department of Anatomy Report No. 3-6-74, Queen's University, Kingston, ON.
- Romero-Sierra, C. and J.C. Webb. 1977. Preservation of animal specimens. Canadian Patent Application No. 284215, August 5, 1977.
- Romero-Sierra, C., J. Driscoll, W. Lyons, and P. Lane. 1983. A technique for the preparation of specimens of the meninges of the brain. In: D.J. Faber, ed., Proceedings of a 1981 Workshop on Care and Maintenance of Natural History Collections, *Syllogeus* 44:45-48.
- Romero-Sierra, C., P. Lane, and G.W. Lyons. 1983. An overview of formalin techniques for the fixation of cadavera. In: D.J. Faber, ed., Proceedings of a 1981 Workshop on Care and Maintenance of Natural History Collections, *Syllogeus* 44:49-52.
- Romero-Sierra, C., W. Lyons, J. Driscoll, P. Lane, and J.C. Webb. 1983. Techniques for the preparation of whole brain specimens. In: D.J. Faber, ed., Proceedings of a 1981 Workshop on Care and Maintenance of Natural History Collections, *Syllogeus* 44:53-56.
- Romero-Sierra, C., J.C. Webb, P. Lane, and W. Lyons. 1983. Preservation of biological specimens by freeze-drying techniques. In: D.J. Faber, ed., Proceedings of a 1981 Workshop on Care and Maintenance of Natural History Collections, *Syllogeus* 44:57-63.
- Simmons, M.E., E.A. Hall, C. Romero-Sierra, and W.S. Sparrow. 1968. Improved plastic embedding of wet biological specimens. *Medical and Biological Illustration* 18(4):260-262.
- Von Hagens, G. 1979a. Impregnation of soft biological specimens with thermo-setting resins and elastomers. *Anatomical Record* 194(2):247-256.
- Von Hagens, G. 1979b. Emulsifying resins for plastination. *Präparator* 25(2):43-50.
- Wright, B. 1983. Freeze-drying at the Nova Scotia Museum. In: D.J. Faber, ed., Proceedings of a 1981 Workshop on Care and Maintenance of Natural History Collections, *Syllogeus* 44:65-67.

## Features

# Memoires of a Collection Addict<sup>1</sup>

By David M. Baird, O.C.

I am honoured to have been invited by Dan Faber to this renowned hall where many of the great men of Canadian geology have held forth in the past one hundred years or so. Indeed, in this very auditorium, packed to the rafters with the overflow classes of the late 1940s, I gave my first university lecture, substituting for my favourite professor, T.H. Clark, who feigned illness to put his graduate assistant to the test! I am also honoured when I look at the variety of people before me — directors, curators, managers, technologists, and collections experts from many provinces of Canada and from places as far away as Spain, Texas and Hawaii.

Let me confess at the outset that I have been an inveterate collector for as long as I can remember. My first collections were zeolites from the Triassic of Nova Scotia at Kingsport, when I was about seven. Since then I have collected sands of the world, airsickness bags from 75 airlines, 150 axes, Newfoundland and Canadian stamps of some note, backfly larvae to help a biologist pal doing research, fossils from many different countries, and minerals wherever I could find them. I collected airplanes — more than 30 of them — for the National Aeronautical Collection while I was director of the National Museum of Science and Technology. I also collected steam engines, other bits of trains, 80 automobiles, scientific apparatus, ship models, and in Alberta, dinosaurs and fossils galore.

I have lived through the period in the National Museums of Canada when we had already developed at the National Museum of Science and Technology a first-class registration system. I looked on sadly as the federal government spent tens of millions of dollars on an enormous centralized computer, when it would have been far more useful to place small computers in each museum.

When I became director of the National Museum of Science and Technology in 1966, I found the museum's artifacts scattered in unorganized warehouses among the collections of the other federal museums. The next year we had a building of our own and artifacts were literally piled into available corners. Over a five-year period there was a rapid evolution from open racks to closed and secure rooms with racks, and eventually several tens of

thousands of square feet of warehouse space with a highly developed index card system with pinpoint location of each specimen. We scored 98 percent every time the Auditor General turned up with his surprise visits. From there, another seven years of evolution lead to an in-house computer system.

In looking over the subjects of papers in your program for the next couple of days, I see items of special interest to distinctive parts of the collections community. My approach to collections in these following remarks is really an offshoot of an interest in museums in the broad sense and in how I believe they should be run. Having built two major museums, the National Museum of Science and Technology in Ottawa and the Tyrrell Museum of Palaeontology in Drumheller, I look back on two very successful museums from the public's point of view. I look back with pride on two museums that were organized so they could function smoothly and accord an important place to collections management.

In surveying modern museums, one has to realize that there are many varieties of institutions. In some, little more than collections, have made them museums. At the other end are museums that are very successful in the public sector but have no collections whatever. And, of course, all gradations between these two extremes exist in the museum world. The most successful museums are the science centres of present day and, aside from things on display, most of these have no collections. It is interesting to note, however, as they matured over a few years, collections began to appear.

In 1967, the government of Canada reorganized the national museums under the National Museums of Canada Act. It is interesting to look back on how that act described the purposes of the national museums as the demonstration of the products of nature and the works of man and the promotion of interest therein. The act went on to say that to carry out the demonstration and promotion functions, the museums may collect, preserve, exhibit, do research, and many other activities. The primary functions of museums were listed as the demonstration and promotion of cultural things, and that prominent in the carrying out of these activities were

collection, preservation and research. I have felt throughout my museum career that there are three primary divisions of activities in museums whose heads, under such titles as assistant director, vice-president, or another, should report straight to the director within a management committee. These divisions are general administration, public programs, and curatorial functions, which of course include collections and collections management. I see natural history collections and their management under the same principles as all other collections and I have always maintained that the registrar should be one of the senior officers in major museums.

The responsibilities of the registrar or senior collections manager should center on management and cataloguing of the inventory of the museum. The registrar should be responsible for the security of the collections, and for the well-being of the collection, i.e., its maintenance and preservation through a program of systematic inspection, repair, and so on. The registrar should be responsible for access to the collection, making it possible for those to be there who have legitimate business, and excluding those who do not. Access means that curatorial input should be easy and natural. If there is no curatorial staff, as in some small museums, the registrar may be responsible for acquisition of collections. If there is curatorial staff, the professionals, each in his or her own field, should be responsible for the actual content of the collections in that field.

When one examines the duties of collections managers, one has to examine the purpose of the museum and the purpose of the collection in that museum, be it research, backup for displays, documentation of a particular time or times, or all of the above. The purpose is a policy matter that should be decided in other places and is not essentially a duty of a registrar or collections manager, although it is a matter of great concern to him or her. A second area of direct concern is the availability of space. Is it large enough, suitable in terms of controlled temperature and humidity, reasonably secure, accessible? The third area revolves around the facilities for preservation. Do suitable facilities exist for the control of insects

1. This was the Keynote Address at the Second Annual Meeting of SPNHC in May, 1987, at the Redpath Museum.

in furs and feathers? Are zeolites and specimens of evaporites kept under anhydrous conditions? This area is closely related to the restoration function in a museum and indeed often overlaps it. Programs of regular inspection to see what needs to be done in these related fields are shared between registrars and curators. In technology museums, for example, with large numbers of automobiles, agricultural implements, marine engines, electrical generators, aero engines and similar artifacts, it is necessary to have a program of turning over moving parts and lubricating them on a regular basis. Registrars should be responsible to see that batteries are removed from automobiles, cameras, and the like.

Another area of concern is a system for access to collections. Internal access for staff of a museum — curators, for example — has, in my experience, caused problems when curators have insisted on unlimited access to the areas where specimens of their particular interest were stored. My policy was very firm, if the registrar was responsible for the specimens and their preservation, they must also be in charge of security and, therefore, access. In my museums, curators were expected to sign into secure areas under the jurisdiction of collections managers. Scholars from the outside also needed access, and a system had to be developed to protect the specimens and also the scholarly privilege of access to precious artifacts.

A last major concern involves acquisition and disposition. The limitless attic, which a lot of museums have become, often results from a lack of clear policy on collections. What a collection is meant to do would dictate limits on its size and quality. When one begins a museum, for example, one may have little in collections. I remember well when the National Museum of Science and Technology acquired its first Model T Ford. A decade later, it had six Model T Fords, clearly too many; a disposition policy was accordingly

developed. It was quite wonderful to see auditors in disarray when the actual number of Model T Fords on hand was less than the number purchased — two of them had been pirated for parts to make the remaining four perfect!

These general principles of collections are more or less universal, but in natural history, some of them would be emphasized while others played down. Some particular problems occur, such as the inevitable deterioration of dead life forms, the slow hydration or dehydration of mineral specimens, disintegration of fossil-bearing shales, and so on.

It is clear that a collections management system or Policy has to be tailored to fit the needs of individual institutions. The most fundamental part of good collections management seems to rest on a clearly established policy for the museum itself, both as to its basic purpose and the purposes of collections inside that institution. How big should collections be in numbers and kinds of specimens, how much space should be allocated to them, what are the areas of collections and interests, and how large a staff should there be? Registrars have a large and important role in a well-run institution and should be senior officers. I say this sadly, as I recall the struggles in two civil services to get a proper classification for registrars in order to attract well-qualified personnel.

We developed a card index system as our first registration system in the National Museum of Science and Technology. It was carefully engineered to satisfy the requirements of a broadly based collection, from scientific instruments to agricultural combines, from fine watches to fire engines, from one of the world's largest and most significant aeronautical collections to several 300-ton steam locomotives, from boxes of radio tubes to giant castings weighing tons. It told what the object was, when it was collected, by whom, exactly where it was located in the warehousing

system, what condition it was in, what preventative maintenance was required, on what dates, pictures to identify the piece, a careful system of accounting for specimens on loan, on exhibit, or in study areas — all of these things are now more or less standard. We created a complete duplicate system and stored it in a different building in case of fire. In the mid-seventies, a shift began towards the computerization of this superb system which was developed in-house. It was based on a small computer which was generally ideal for that particular museum. The system continued to evolve to the state where the registrar was able to say, albeit laughingly, "it was now even curator proof!"

For natural historians all the living world is a collection. The preservation of vanishing species is certainly a special responsibility. How to preserve and display extraordinarily fragile specimens where every conceivable law is contravened is special. What to do about historical collections — Darwin's original beetles or those of pioneer geologists in northern New York state — or what to do with them when they become redundant or shabby-looking?

The central purpose of science museums remains the contribution that they can make to the scientific and technological literacy of the population-at-large. It is becoming more and more important for mankind to realize what it is he is dealing with in problems of population, of food supply, of the destruction of ecological frameworks, of the pollution leading to that destruction, and of our general abuse of the natural world we live in. It is here that custodians of collections should find their greatest satisfaction in serving society.

I leave you on an optimistic note saying: Be of good cheer, for museums and collections and those that labour in them have an important role in society. With wit and imagination you can do your part in a worthy cause.

*Dr. David M. Baird is a consultant for managing and developing museums. He is presently helping to develop the Rideau Canal museum in Smiths Falls, Ontario. He lives in Stittsville, a small town just west of Ottawa.*

# The Embryological Collection of the Hubrecht Laboratory

By G.C. Bangma

The Hubrecht Laboratory Embryological Collection is an extensive, unique collection of microscopical slides and embryos preserved in alcohol pertaining to the normal development and placentation of vertebrates. This paper outlines the origin and present state of this collection, offering possibilities to use the collection for research purposes.

## Founders of the Embryological Collection

The greatest part of the Embryological Collection was assembled by two prominent zoologists, Professor A.A.W. Hubrecht and Professor J.P. Hill. A.A.W. Hubrecht (1853–1915) (Fig. 1) was Professor of Zoology and Comparative Anatomy at the University of Utrecht from 1882–1910 and in 1910 he was appointed Extraordinary Professor of Comparative Embryology. Hubrecht took great interest in vertebrate phylogeny. In his opinion, comparative studies of normal development and placentation would clarify phylogenetic relationships of vertebrates. He collected material of many insectivora, prosimian and primate species from all over the world, but particularly from the Indonesian Archipelago, then a Dutch colony. His observations on mammalian embryology and placentation were published in 28 papers, including three Normal Tables. When Hubrecht died in 1915, he left a large collection of microscopical



Figure 1 – Ambrosius Arnold Willem Hubrecht (1853–1915).

slides and preserved material. To maintain this valuable collection, his family raised a sum of money to serve as capital for the "Hubrecht Fonds", which is supervised by the Royal Netherlands Academy of Sciences.

The interest was used to establish an international centre for embryological research, the Hubrecht Laboratory, in which the collection was housed. Until 1973 the Hubrecht Laboratory was the seat of l'Institut International d'Embryologie, now the International Society of Developmental Biology. This society was established in 1911 on the initiative of Professor Hubrecht as an organization of leading European comparative embryologists. Since 1987 the Hubrecht Laboratory has been the administrative seat of the European Developmental Biology Organisation. Presently, the Institute's main activity is research on fundamental problems of animal development, in particular the early development of vertebrates.

## Further Development of the Collection

Hubrecht's collection was gradually extended by acquisition of embryological material, mainly by purchase or exchange. Other collections were also added, such as those of L. Glaesner (*Triturus*), A. Dohrn (fishes), and E. Selenka (primates). A listing of these donations is available. J.P. Hill (1873–1954) (Fig. 2) was Demonstrator

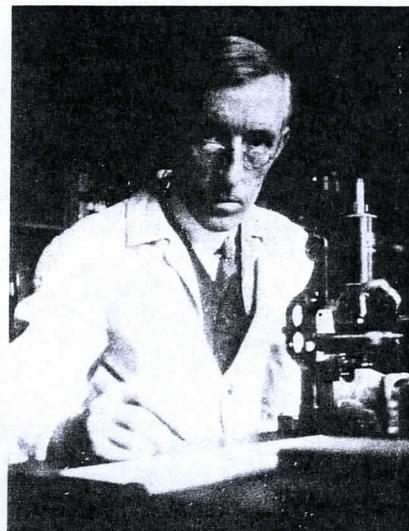


Figure 2 – James Peter Hill (1873–1954).

of Biology in the University of Sydney (Australia) from 1892 onwards and collected embryological material of the Australian endemic mammalian fauna; viz. Monotremata and Marsupialia. In 1906 he was appointed Professor of Zoology and Comparative Anatomy in the University of London, and from 1921–1938 he held the chair of Embryology and Histology. During this period his collection was enlarged, mainly by purchase, both with marsupial species from South America and many other mammalian species from Africa and Madagascar. His bibliography lists 50 papers on development and placentation.

In 1967 Hill's collection was transferred to the Hubrecht Laboratory on permanent loan from the University of London, which doubled the embryological collection of the Hubrecht Laboratory. Many of the embryos in the collection are from species that are relatively rare, difficult to obtain, or at present endangered. In addition to material pertaining to normal development, some classical "experimental" collections, and a collection of mouse mutants were incorporated because of their uniqueness and continuing scientific value. Among these are the collections of H. Spemann, O. Mangold, C.P. Raven and H. Grüneberg.

At present the Hubrecht Laboratory Embryological Collection consists of about 80,000 microscopical slides (Fig. 3) and 2,000 jars with specimens preserved in alcohol (Fig. 4) pertaining to more than 600 vertebrate species. Thirty-five species are represented by extensive series of microscopical slides covering a complete range of developmental stages. The collection is accessible through a concise catalogue, edited by the previous Curator Dr. E.C. Boterenbrood, and through two extensive card indexes. An alphabetical register of the more than 1,200 taxonomic names and synonyms used is also present. All specimens are described in 100 original catalogue books. Of great scientific value are the many original notes, drawings, photographs etc., relating to the material in the collection. Furthermore, ca. 200 publications based on collection material are present.

It should be emphasized that the Hubrecht Laboratory Embryological Collection is available for research on

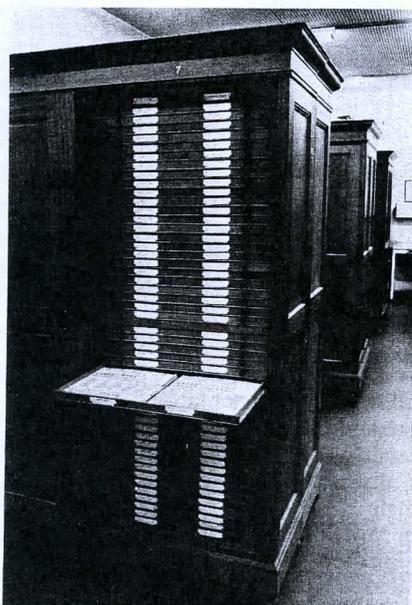


Figure 3 - Slide-cabinets of the Embryological Collection dating from the time of Hubrecht.



Figure 4 - Jars with specimens preserved in alcohol.

the development and placentation of vertebrates. The collection may be consulted at the Hubrecht Laboratory, where adequate research facilities are available. Under certain conditions it is possible to borrow material from the collection. A copy of the catalogue is available on application. In special cases financial support in the form of a short term grant can be supplied.

*Mrs. Dr. G.C. Bangma is Curator of the Hubrecht Laboratory Embryological Collection at the Netherlands Institute for Developmental Biology in Utrecht. Additional information and visits can be arranged by writing to Dr. Bangma at Uppsalaalaa 8, 3584 CT Utrecht, The Netherlands.*

# Systematic Collection Curators as Historic Preservationists: Case Studies from the MCZ Mammal and Bird Departments

By M.R. Massaro

Founded in 1859 by Louis Agassiz, the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts, is an example of the unprecedented growth of natural history museums during the second half of the nineteenth century — not only on this continent but throughout the world. Thus the collections of the Museum of Comparative Zoology house some of the oldest zoological specimens extant in the New World. Like other natural history collections which date to the mid-nineteenth century, the inventories of the Bird and Mammal Departments owe much to the heyday of expeditionary biology and exploratory government surveys.

## Henry A. Ward's Contributions

In their formative years, few museums had enough staff or resources to handle large numbers of specimens for exhibit. For these purposes, they often turned to the services of Ward's Natural Science Establishment in Rochester, New York. Specimens were either sent to Ward's for state-of-the-art mounting or they were purchased directly from the firm's catalogue which was amply stocked by the collecting activities of its founder, Henry Augustus Ward, merchant-naturalist *par excellence*. Ward's collecting trips took him to the far corners of the globe to seek and then sell his specimens (Kohlstedt 1980; Sheets-Pyenson 1985).

Accession catalogues for the period 1870 through the 1890's document a brisk business with the Rochester firm. Ward's mounts still dominate the MCZ exhibits today, their localities fully reflecting Ward's itinerary. Ward's mounts, now averaging 100 years old, are still in good condition with the exception of cracking and splitting of some of the tougher hides of large mammals. Among the more curious of Ward's preparations are two mounted dolphins dating back to the 1880's. These specimens are covered with an outer coat of paint, beneath which is a layer of plaster, followed by wax, and finally, skin. X-rays are planned to determine what material lies beneath these layers.

## Mammal Collections of the Museum of Comparative Zoology

Many mammalian specimens are of special interest due to their extreme antiquity. Included among them, a series of red squirrels collected in 1847 by Louis Agassiz before he founded the museum; skulls of the first-described male and female gorillas, also collected in 1847; a Townsend's chipmunk collected in 1836; and a white-tailed deer collected in 1832 (the oldest skin and skull respectively discovered to date in this collection). In addition, there are many specimens of rare, endangered, and extinct forms, among them the Tasmanian wolf or thylacine, the aye-aye, Florida panther, eastern mountain lion, and the paratype skin of the Newfoundland wolf, *Canis lupus beothucus*, (one of only two known skins of this extinct subspecies).

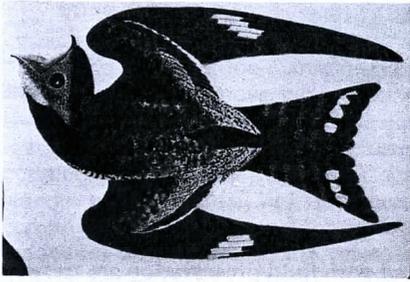
Possibly other collections as old as those of the MCZ have a "skeleton or two in their closets", so to speak or a curatorial *faux pas* they would just as soon forget. Our *faux pas* was a case of the unwitting destruction of historically valuable material. When a mounted pair of unwieldy, untagged, and badly deteriorated northern elephant seals was taken off exhibit a number of years ago, and attempts to place them in other museums proved unsuccessful, a decision was made to discard them rather than store them. A photographic record of their disassembly was made revealing their method of construction, and their severed heads were saved. It was only later that the specimens were recognized in photographic plates in the Museum's Annual Report for 1908–09 and their true significance realized. Purchased in 1908 from Rowland Ward, a London natural history dealer, these specimens had belonged to the last remaining herd of this species on Guadelupe Island off the coast of Baja California. By 1890 the population had dwindled to a single herd of between 20 and 100 seals (King 1983) and the species was believed doomed to certain extinction. Samuel Henshaw, then Curator, states in his Annual Report for 1908–09 that this species "if not extinct, is at least on the verge of exter-

mination, and while its fate is regrettable, the Museum is fortunate in securing such admirable specimens of a distinctly American mammal. The male . . . is so far as known the only one in America." But somehow the Guadelupe herd not only survived but expanded, its descendants re-colonizing most of the species' former range. Thus all subsequent generations of northern elephant seals can trace their ancestry to this bottleneck herd from which the MCZ specimens were collected.

Several conservation measures are being implemented as part of a renovation currently in process, including transfer of specimens from wooden storage cases into metal ones, removal of chemical fumigants from the collection, and use of unbuffered, neutral pH trays and tissue paper to line cabinet drawers. New specimen labels are being printed on archival-quality paper and Mylar-encapsulation of old labels is taking place, following the method proposed by Hawks and Williams (1986).

## Bird Collections of the Museum of Comparative Zoology

A pair of Chinese golden pheasants, known as "Washington's pheasants", the oldest known specimens within the Bird and Mammal Departments, celebrated their 200th anniversary on February 27, 1987. A gift from General Lafayette to George Washington sent from the Royal Aviary in Paris, these birds graced the lawns of Mt. Vernon until their demise in 1787. Charles Willson Peale, who is often called the father of natural history museums in America, requested that the dead birds be sent to his Museum in Philadelphia. Washington obliged and these birds represent one of Peale's earliest efforts to mount specimens in a naturalistic attitude. So pleased was Peale with his own handiwork that he wrote Washington that he would be pleased to accept more birds from Mt. Vernon for the museum. . . but that next time he (Washington) should remove the bowels and pepper the body cavities before sending them on the two-day stage ride to Philadelphia. He added, but not salt, please, as this would ruin their feathers

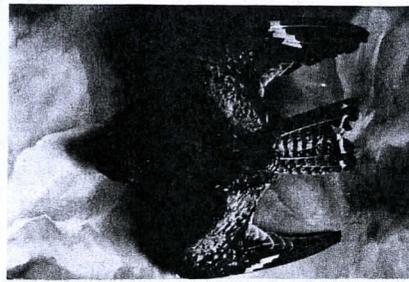


Wilson's figure of *Caprimulgus americanus*, (= *Chordeiles minor*) the common nighthawk, from his *American Ornithology*, volume 5, (1812), p. 65, plate 40, figure 1. Photo by A.H. Coleman.

(Sellers 1980, p. 25). The Museum of Comparative Zoology has plans to upgrade this exhibit, changing its lighting and location from immediately over a functional radiator, thus eliminating a literal "pheasant under glass" situation.

The Bird collection is remarkable for the longevity of its earliest holdings. The Lafresnaye Collection consisting of several thousand specimens from the Americas dating back to the late 18th and early 19th century, and specimens from the old Peale Museum spanning the same period are surely among the oldest preserved higher vertebrates in North America. Specimens from the Peale Museum came from many sources. For example, C.W. Peale's self-portrait of 1822, which was located in the entrance to one of his exhibit halls shows an unprepared turkey specimen recently brought back by his son Titian from the Long Expedition to the American West. This turkey shown in the portrait's foreground was mounted and later served as the model for Titian Peale's plate in Charles Lucien Bonaparte's continuation of Wilson's *American Ornithology* (Sellers 1980). The mounting is still on reposit in the MCZ collection today. The Long Expedition to the American West was the second federally funded exploration of the West following that of Lewis and Clark earlier in the nineteenth century. Former Peale Museum specimens also include those which Titian Peale collected on the Wilke's Expedition to South America and the South Pacific in 1838-42.

Peale's specimens came to the MCZ by an interesting path. When the Peale Museum closed its doors in 1849, its holdings were sold. One half of the collection was purchased by P.T. Barnum, only to be lost in two subsequent museum fires (1851 and 1865); the other half was sold to Moses Kimball for his Boston Museum. When the latter museum closed in the 1890's, its collections were donated to the Boston Society of Natural History. Finally in 1914 almost seventy-five years after the



MCZ #67855, without doubt, Wilson's figured type, male, of *Caprimulgus americanus*, preserved in the attitude of 'booming' as in the figure. Skin has been de-mounted. Photo by Rosamond Wolff Purcell.

Peale Museum closed, the Boston Society of Natural History relinquished its non-New England holdings to the Museum of Comparative Zoology.

Probably the most historically valuable Peale Museum specimens still in the MCZ are those which served as subjects for Alexander Wilson who wrote his descriptions and composed his color plates for his *American Ornithology* between 1808 and 1814. This classic nine-volume work includes citations to Peale Museum-numbered specimens. Many of these birds were described for the first time by Wilson or presented under a new name; some are also type specimens. Despite the fact they are nearly two hundred years old, the de-mounted Peale/Wilson specimens are in very good condition, due, in part, to Peale's liberal use of arsenic in his taxonomic preparations (Sellers 1980). Among the oldest known specimen in the Museum is the type specimen of Lewis' woodpecker, *Picus torquatus*, collected by the Lewis and Clark Expedition of 1805-06. Because the original Peale Museum labels were lost, many of these specimens can only be identified by their mounted pose, plumage peculiarities, or other distinguishing characteristics as shown in the plates of Wilson's classic volume (Faxon 1915). Among species for which the similarity between mounted specimen and plate is most dramatically illustrated are: American bald eagle, nighthawk, barn owl, roseate spoonbill, bluebird, red-breasted grosbeak, and the extinct Carolina parakeet. Also of interest to both ornithology and the history of art are two important type specimens in the MCZ collection: Parkman's house wren, *Troglodytes parkmanii*, and a subspecies of hermit thrush, *Turdus nanus*,

both originally described by John James Audubon in 1839.

There are many long-term preservation problems among the skin collections which are beginning to be recognized. One is the migration of organic resins and oils from the specimens onto their labels, sometimes totally obscuring valuable data (such as measurements and precise localities) which for many older specimens can be found nowhere else. In turn, labels degrade specimens; the close complementary relationship between specimens and their labels and the significance of original labels as historically valuable documents created by early naturalists has been noted elsewhere (Hawks and Williams 1986).

The mammal and bird collections of the Museum of Comparative Zoology, because of their antiquity relative to that of most other non-European collections, serve as a laboratory for analyzing aging natural history specimens and associated material and for researching new techniques towards conserving them. And for those with curatorial responsibilities for these collections, the work has just begun . . .

#### REFERENCES

- Annual Report of the Curator of the Museum of Comparative Zoology at Harvard College for 1908-1909, pp. 6-7 and plates 1 & 2.
- Faxon, W. 1915. Relics of Peale's Museum. *Bulletin of the MCZ*, LIX (3): 119-148.
- Hawks, C.A. and S.L. Williams. 1986. Care of Specimen Labels in Vertebrate Research Collection. *In*: Proceedings of the 1985 Workshop on Care and Maintenance of Natural History Collections, pp. 105-108. Edited by J. Waddington and D. M. Rudkin. Life Sciences Miscellaneous Publications, Royal Ontario Museum, 1986.
- King, J.E. 1983. *Seals of the World*. 2nd ed. British Museum (Natural History) and Cornell University Press, Ithaca, New York. pp. 124-125.
- Kohlstedt, S.G. 1980. Henry A. Ward: the merchant naturalist and American museum development. *Journal of the Society for the Bibliography of Natural History*, 9(4): 647-661.
- Sellers, C.C. 1980. Mr. Peale's Museum. A Barra Foundation Book, p. 34, 242, W.W. Norton & Co., Inc., New York.
- Sheets-Pyenson, S. 1985. Henry Augustus Ward and Museum Development in the Hinterland. *The University of Rochester Library Bulletin*, Vol. XXXVIII. Rochester, New York. pp. 38-59.

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## Reviews

*Guidelines for managing bird collections* by Paisley Cato. *Museology*, No. 7, 1986. Texas Tech University, Lubbock, Texas. 78 pp. \$16.00 US.

The outstanding contributions of Texas Tech University to museum science continue with this much-needed common sense guide to the management of ornithological collections. Paisley Cato has broken little new ground with this volume, but has succinctly and thoroughly set forth collection management guidelines which have too long been skirted or ignored by those entrusted with the care of bird collections. In generating this treatise, Cato solicited information from thirty-three major bird collections, and received completed questionnaires from twenty-nine.

Following a plea for the establishment of collection management policy and procedure manuals and a five-page discussion of ethical and legal issues related to collections, the author presents a very straight forward primer on acquisitions, specimen preparation, documentation, storage and maintenance, information, retrieval, and collection use. Again, Cato concentrates on presenting rational, common-sense approaches to collection managements. This guide is clearly not intended as a forum for new, untested techniques, materials and treatments; while many advances in what to do (and, perhaps more importantly, what NOT to do) with bird collections are in the works, Cato's conservative approach based on existing practices brings us a welcome infusion of practical information and heightened awareness.

Following are some thoughts and criticisms that have come to mind as I have used "Guidelines for Managing Bird Collections". The key word here is "used" — I have used it continually and completely in reassessing and/or reaffirming my techniques at the Natural History Museum of Los Angeles County, and always with admiration for the author and the timeliness of her endeavor. It should be noted that many of the criticisms below are leveled not in any sense at the author, but all of us, collectively, for a belated entry into the realm of a "preservation awareness" for natural science collections.

I believe that greater emphasis on the complete documentation of preservation methodologies is in order. Only hinted at the bottom of p. 19, the recording techniques, treatments, and materials used in specimen preparation is vital, as subsequent analytical use of these specimens require a known history of preparation, preservation, and storage environment. How helpful it would be today, for example, if the use of arsenical compounds in study skin preparation had been routinely, honestly, and retrievably recorded over the last century and a half. Where such preparation procedures are standard, they may be described in a Policy and Procedures Manual, with variations recorded in the specimen preparation catalog.

Perhaps biased by our primary technique at LACM, I would have preferred a more substantial discussion flat skin/complete skeleton preparations, over and above the oft-cited but rather awkward technique of Norris. In fairness I point out that Cato's work was not intended to be a thorough, critical evaluation of preparation techniques; I eagerly await, as does Ms. Cato I am sure, the publication of the survey of avian specimen preparation techniques by Steve Rogers and his co-workers at the Carnegie Museum of Natural History.

Problems associated with fluid preservation are treated rather simplistically, though Cato was perhaps wise in avoiding this rather messy can of (pickled) worms. Storage in 70% ethanol seems to be the technique of choice (91% of the collections surveyed). It seems that considerable displeasure regarding the use of phenoxetol has arisen since "Guidelines" went to press. Ornithologists have traditionally been guilty of reversing fluid-preparation for damaged specimens, or those left over after a long day of skinning efforts. The vast research use potential of properly prepared and stored spirit specimens in fluid, not just the "dregs" of a collection. The work of Peter Cannell (in MS) at the National Museum of Natural History (Smithsonian Institution) will expand greatly on this theme.

Surprisingly, the discussion of skeleton preparation makes no mention of maceration, a bacterium-mediated method that is preferred by many researchers and a great many technicians who are allergic to dermestids and their frass.

The section of Storage and Maintenance contains a brief but important discussion of conservation, treating storage facilities, temperature, relative humidity, light, dust and pollutants, insect pests and fumigation, and emergencies and disasters. The discussion of insect pests is heavily slanted toward fumigation procedures, echoing existing practices in bird collections. Those entrusted with the care of bird collections would do well to emphasize general house-keeping, careful monitoring, and, where possible, non-chemical methods of pest eradication (Such as freezing); these aspects of an integrated pest management program are not emphasized in Cato's "Guidelines". Twice (p. 48 and p. 66) Cato recommends fumigation of incoming local specimens; loan recipients should consider, however, that lending institutions may not permit such treatment of their specimens. Isolation and monitoring is always a preferred first alternative to preventive fumigation.

In recommending regular monitoring and topping off of jars in fluid-preserved specimen collections, Cato should have pointed out that mere topping off will, over time, result in undesirably low preservative concentrations since alcohols evaporate more readily than water.

While the guide is well-produced and generally error-free, I note, for the record, that the captions on p. 54 have been reversed.

In reviewing "Guidelines for Managing Bird Collections", my only nagging concern is that this work might not reach those who most need enlightenment. This booklet is an indispensable basis for collection management decisions in any institution housing bird specimens. Its availability is now well known to those in major institutions, but I wonder how many curators of small collections, particularly those in colleges and universities, need to made aware of the existence of this guide. I would go so far as to say that "Guidelines for Managing Bird Collections" should be required reading for students in ornithology classes; instructors of such classes would do well to purchase and thoroughly review this work, for it is well-curated collections of birds that form the basis for the science of ornithology. We must all strive to spread the message contained in "Guidelines", as well as that in similar collection preservation literature currently being generated.

"Guidelines for Managing Bird Collections" achieves and exceeds its modest goal as a status report and primer on ornithological collection management. An unstated goal, also fulfilled, is to get those who manage bird collections to thoroughly and critically examine their practices with an eye toward long-term specimen preservation. Cato's work, coupled with ongoing research on specimen deterioration, storage environments, and documentation practices, will certainly give rise to more thorough collection management guidelines down through the years.

Kimball L. Garret  
Natural History Museum of Los Angeles County  
Los Angeles, California

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*The Insect and Spider Collections of the World* by Ross H. Arnett and G. Allan Samuelson. E.J. Brill/Flora & Fauna Publications, Gainesville, Florida, 1986. One volume, paper, spiral bound, bibliography, indices. 220 pages. \$19.95 US.

The goal of this publication is to provide a complete reference to all the insect and spider collections of the World, in both the public and private domain, and to the personnel who administer and maintain them. The authors intend it to be a generally useful reference for location of specimens deposited in collections and to provide for establishment of a series of codons which will allow uniform citation of the location of specimens in research publications. For each collection, the authors have attempted to provide information about the overall size of the collection (in terms of numbers of specimens, drawers, boxes, vials, slides, etc.), the geographic coverage or areas of specialization of the collection, notable units or special taxonomic or geographic strengths of the collection, historically important or other significant collections which have been incorporated as subunits of a larger collection, and the names and addresses of curators in charge of the collections.

The book is primarily divided into two sections: Part I, which treats collections associated with public institutions; and part II, which deals with private collections. The organization of these two sections is somewhat different.

Part I is a list of public domain collections arranged alphabetically by country. Provinces, states or other pertinent political or geographic subunits are arranged alphabetically within countries. A particularly useful characteristic of this arrangement is that the authors have provided cross references for many islands, smaller geopolitical areas, or regions with alternative names when these have been included within other, more inclusive, geopolitical units. This arrangement of information works very well, and I had surprisingly little trouble locating information about the collections available in most geographic regions. However, I was not able to discern any logical or consistent order to the listings of collections within the smallest geopolitical unit cited. However, this seldom created problems in locating information about a collection. Those geopolitical regions within which there are no known collections are also listed, and the lack of collections clearly stated.

Part II of the book treats collections held privately. The information provided is similar, but the arrangement is alphabetical by individual. The authors required that each collection listed be "registered" at a recognized public institution which maintains a collection. The goal of this was to insure that the location of specimens housed in a private collection could be tracked in the future by contacting the institution with which the collection was registered. In the long run this may prevent loss of some private collections,

but it probably also resulted in lack of response from many individuals holding private collections of insect or spiders.

The goal of the authors was to provide the same types of information for all collections. In this respect the book is clearly incomplete and the treatments of individual collections very uneven. This problem, which is recognized by the authors, is a direct result of the way that information about collections was gathered for this book. Information was accumulated by sending a series of questionnaires and letters to all institutions and individuals which were known or suspected to maintain collections. Even with repeated requests for information and with notices placed in professional journals and newsletters, the questionnaires often failed to reach the appropriate individuals in some institutions. Thus, information about many collections, often large and well-known collections, is missing. Also the authors were able to include only that information which was supplied by the respective curators, resulting in very uneven treatment of most collections. These problems are largely unavoidable in a book of this nature, and the authors decided, correctly in my opinion, to go to press without a full return on their questionnaires. In spite of this lack, the amount of information about insect and spider collections is considerable, and the world perspective is an especially valuable contribution. Additionally, the authors have stated their intention of publishing a revised edition or supplement as soon as sufficient information is available.

Two indices provide access to the information included in the collection descriptions. An "Index of taxa" allows the user to search for those collections which have stated strengths in a particular taxonomic group. This should be a very significant aid to systematists and other researchers who are seeking information about, or research material in, specific groups. An "Index of curators and collections" provides access to information in the collection descriptions about the curators associated with collections, and, perhaps of even more value, access to information about historically important or other significant collections which have been incorporated into larger collections, at least in so far as this information has been included in the collection descriptions. In this latter index, collection entries are distinguished from curator entries by the addition of "coll" after collection entries. This works reasonably well, but access to this information may have been more efficient if the authors had separated the curator and collection entries into two independent indices.

An additional important section of the book is a list of all known public and private collections and a proposed 4-letter codon which signifies each collection for literature citations. The authors have also listed known 2- and 3-letter codons which have been used previously in the literature and provide cross references to the appropriate 4-letter codon that they prefer. If researchers would apply the codons suggested here consistently, it would provide a stability and uniformity of such citations which is sorely needed in the literature. The authors admit that this section is incomplete and solicit information about other previously cited codons or collections.

The authors include two short sections which outline the protocol for borrowing and using borrowed specimens, and for submitting specimens for identification. The "rules" listed are actually guidelines and are not binding. However, they provide a reasonable discussion of those aspects of professional usage that are so important for keeping the international system of collection accessibility working. The guidelines discussed probably represent a reasonable approximation to the policies of most lending institutions and individuals, but the authors state explicitly that policies vary, and individual arrangements must be made in each instance.

In summary, this book is a valuable resource to that part of the scientific community which uses insect and spider col-

lections. In spite of the fact that this first edition is very incomplete, it provides a substantial amount of information about such collections that was previously unavailable. As information about other collections is supplied and the authors bring out revised editions, this book will become more and more valuable. This first edition should help alert curators and other researchers to the need of this type of catalog, and hopefully, will encourage them to make the necessary information about insect and spider collections available to the authors. The authors have included the appropriate questionnaires for submitting information as a separate section in the book.

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Field Museum of Natural History  
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*A World List of Mammalian Species*,<sup>1</sup> 2nd ed. G.B. Corbet and J.E. Hill, Facts on File, 254 pp., 1986. \$29.95 US.

A purpose of taxonomy should be to provide a directory of life forms. A plethora of books of lists has appeared in recent years despite the fact that field biologists estimate the number of undescribed species at about ten times the number which now have names. Most are small, but as Corbet and Hill point out for mammals, "several new species . . . are discovered every year." Any world list of species in any group is premature today.

Nevertheless, attempts such as this one could be enormously useful to persons in other branches of science and management of natural resources if they at least clearly state the standards and principles of the authors. Unfortunately,

this list does not. There is no definition of "species," and the introductory remarks reflect muddled thinking. Forms that "interbreed freely" to the extent of supporting significant commerce, such as domestic cattle and bison, are placed in separate genera; whereas forms that display character divergence and that apparently cannot readily cross (rock wallabies *Petrogale penicillata* and *P. inornata*; voles *Microtus pennsylvanicus* and *M. breweri*) are synonymized. The result does an abiding disservice to the diversity of life: the purely artificial higher taxa in genera and families are irrationally split; many real species — distinct evolutionary lineages — are lumped together.

This book is a collection of unsubstantiated and undefended opinions. This situation will not be alleviated until taxonomists agree on some set of principles or standards. The most elementary principle would be all forms so closely related that they can cross and produce viable offspring are as closely related as species can be and still — even arguably — be called species. They are certainly congeneric.

The treatment of names of domestic forms and some wild ones ("*Odocoileus*" for the American deer genus *Dama*) flies in the face of the rules of nomenclature. A second principle should be: stability of nomenclature will be most rapidly achieved by obeying the rules, not abrogating them.

James D. Lazell, Jr.  
Peabody Museum  
New Haven, Connecticut  
and  
The Conservation Agency  
Jamestown, Rhode Island

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1. Review of *A World of Mammalian Species* was reprinted from *American Scientist* 76(2):193, Published by Sigma Xi: The Scientific Research Society, New Haven, CT.

## Correspondence

Dear Editor,

I am writing in regard to the article "Teaching with Natural History Specimens" by Mary Anne Dancey and Joanne G. Faber (*Collection Forum* vol. 3, no. 1 & 2).

One cannot help but agree with the sentiments expressed by the authors in the opening paragraph. There is no denying the fact that handling natural history specimens offers students a valuable learning experience, and it is difficult to procure suitable specimens for hands-on teaching. However, in defence of curatorial types who refuse to relinquish catalogued specimens for hands-on teaching, it is an unfortunate fact that seemingly redundant specimens are often the least suitable for this purpose, because they are probably contaminated with such toxic substances as arsenic, lead, mercury, and strychnine. Fenn (1987) ably outlines the many potential hazards in handling preserved natural history specimens and offers some interesting suggestions for providing an interactive experience without allowing students to touch the material.

Even more disturbing is the suggestion that road kills and other natural casualties be used to fill gaps in teaching collections. "Goulsh" aspects notwithstanding, in so doing the authors run the risk of exposing themselves and their students to a number of potentially dangerous pathogens (Rossol 1983; Irwin, Cooper, and Hedges 1972). They do take care to suggest boiling and bleaching turkey bones, but no such precautions are recommended for handling the probably parasite ridden bodies of animals that have died of unknown causes and may be infected by any number of serious diseases.

Dancey's and Faber's intentions are laudable; unfortunately their practices are not. It is the responsibility of educators, while seeking innovative techniques, to be aware of potential health and safety hazards and not to advocate practices that may threaten the well-being of their students or themselves.

#### REFERENCES

- Fenn, J. 1987. Danger in the Discovery Room. *Museum Quarterly* 16(2):8-11.
- Irvin, A.D., J.E. Cooper, and S.R. Hedges. 1972. Possible health hazards associated with the collection and handling of post-mortem zoological material. *Mammal Review* 2(2):43-54.
- Rossol, M. 1983. The young at art: This "Yuk" can kill. *Art Hazards News* 6(3).

Janet Waddington  
Royal Ontario Museum  
Toronto, Ontario

Dear Editor,

This letter is a reply to Ms. Waddington's concerns for health and safety in obtaining teaching collections.

The main intent of our article was meant to point out our difficulties in acquiring, maintaining, replacing and storing teaching collections, but not "at any cost". Ms. Waddington is concerned about a subject that is not even included in our paper.

We did not believe it was necessary in our brief article to point out health and safety problems in obtaining specimens for teaching; perhaps if the audience were the general public, we would have taken the time to point out — beware of being foolish while being "ghoulsh". The same obligations to take precautions apply to museum educators as they do to curatorial staff. It's nice to know that there are individuals, such as you Ms. Waddington, who are concerned about the health and safety of students and teachers of natural history.

One does not need to be particularly well informed to realize that one does not freely handle the carcass of a red fox in areas like Ontario where the high incidence of rabies is well publicized. However, we believe that a pheasant meeting its demise on the grill of a speeding car is less of a threat, as are hummingbirds which break their necks attempting to get at a bouquet of lilacs on an inside window sill.

All our "gifts" are first shown to our capable staff taxidermists for their opinions on whether or not they should be prepared for teaching purposes. Skins and pelts are treated and tanned by modern techniques, hopefully our taxidermists are knowledgeable enough so as to avoid danger; so in taking care of themselves, they inadvertently take care of our teachers, students and visitors.

We agree with Ms. Waddington that very old specimens, such as those tanned with arsenic and other toxic substances can pose problems. However, when mounted and sealed in plexiglass cases, students are able to see the animals up close and observe details of their adaptations in complete safety.

One of the most difficult problems for natural history educators is obtaining enough specimens owing to limited budgets. If they can not be obtained from taxonomic collections nor from the misfortunes of nature, then our only hope is to use farm-raised specimens. Does anyone know where a good blue jay farm is located?

Mary Anne Dancey  
Joanne Faber  
National Museum of Natural Sciences  
Ottawa, Ontario

## Miscellany

### **Natural History Collections Care — A Symposium**

2–4 November 1988 at The Transvaal Museum, Pretoria, South Africa. To discuss recent changes in the concept of collections management; to present results of collections management research; to discuss specimens preparation; documentation; data management; specimen conservation; fumigation; storage; environment; loan management; funding.

Elizabeth M. Jones,  
Transvaal Museum,  
Box 413,  
Pretoria 0001,  
South Africa.

### **Natural History Collection Seminars — France**

France is having meetings and seminars at various sites on the management of natural history collections.

On 24–27 November, 1987, at OCIM, Montpellier, a seminar was held entitled: "The Conservation of Zoological Collections." As a result of that seminar, a publication was released entitled, *Collections de Zoologie, remarques sur leur conservation*, Note Technique, pp. 1–21, OCIM, 17, rue Abbe de l'Epee-3400 Montpellier. Authors were Louis Demay, Natural History Museum of Nice; Michelle Dunand, Natural History Museum of Grenoble; and Robert Jullien, Office de Cooperation et d'Information Museographiques, Montpellier. The main titles in the publication (in French) include: 1. Causes of deterioration, 2. Recommended treatments, 3. Cleaning and Reconditioning specimens, 4. New techniques of preparation.

The next seminar will be held 26–28 April, 1988, at OCIM, Montpellier. It is entitled "Administrative Documentation of Natural History Collections, the system MDA and its computer program "MODES".

The following seminar will be held 12–14 October, 1988, at École du Louvre, École du Patrimoine, Paris. It is entitled, "Museums and Natural History Conservation, What? Why? and How?"

### **Message from the Editor**

Since *Collection Forum* is a new publication, it would be useful to describe how authors get their manuscripts published.

It is a good idea for authors to send their completed manuscripts to a friend, colleague or another member of SPNHC who is working in a closely related field. Looking through our membership directory will help to identify such a member. This help will allow the author to identify paragraphs or ideas that are not written clearly. Authors may know what they are trying to say but others do not.

When authors feel their manuscripts are ready for publication in *Collection Forum*, they should read and follow "INSTRUCTIONS TO AUTHORS OF COLLECTION FORUM", found in a recent issue. Authors should type their manuscripts in the format of a paper previously published. They should follow, in particular, the format for references.

Authors must send three copies, one original copy and two duplicates. When manuscripts are received by the Editor, the two duplicate copies are sent for peer review to two individuals knowledgeable about the subject. Authors may suggest reviewers, but the Editor reserves the right to select the final reviewers. If two reviewers disagree, then a third one is selected to determine whether or not the manuscript should be accepted. The peer review system is believed to provide the best method of imposing a uniform scientific standard on manuscripts. The main problem, however, is that it offers little reward to those who service it. *Collection Forum* puts the names of reviewers on the Editorial Board in issues which they helped. Depending upon the collective comments of the reviewers, manuscripts are either sent back to the author for revisions or they go for proofreading, copy editing, layout, and printing.

**Daniel J. Faber**

### ***Cover of Collection Forum***

The cover of this issue of *Collection Forum* is a reproduction of a "Bear Clan Blanket Design" by Simon Brascoupé. The original blanket design was executed in a unique inlay and appliqué technique in wool duffle. The fine stitchwork was done by his wife, Carol Leslie-Brascoupé. It was originally designed as a blanket for children, but collectors are buying them as wallhangings.

The bear image is both ancient and universal to most cultures around the world. Simon said, "You can find the bear image in cosmology in Western Europe, East India, and in many North American Indian cultures." Researchers have found that the bear goes back to very early Man. In France large numbers of skulls of the great cave bear were found in the same caves as ancient cave art. These long tailed, cave bears were found in medieval prints of the Big Bear constellation (also called the Big Dipper), although already extinct by that time. Iroquois Indians told stories about the Big Bear which are related to the annual cycles of nature and the winter hunt. The bear is one of the most ancient symbols of natural history and is found in many cultures of the world.

Simon Brascoupé (a Mohawk/Algonquin) is a member of the Bear Clan. Clans are an ancient matrilineal system whose membership is through the mother. Simon's artwork is in international collections, such as the Smithsonian Institution in Washington DC and the National Museum of Civilization in Ottawa, and in private collections around the world. Write for more information to: Simon Brascoupé, 154 Aylmer Avenue, Ottawa, Ontario K1S 2Y4.

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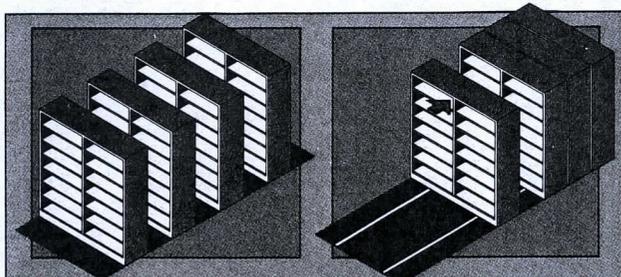
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