The Biology Curator

Title: The Educational Value of Natural Science Collections

Author(s): Tunnicliffe, S. D.

Source: Tunnicliffe, S. D. (1995). The Educational Value of Natural Science Collections. *The Biology Curator*, *Issue 3*, 25 - 32.

URL: http://www.natsca.org/article/565

---

b) when lending or borrowing specimens insist on all discussions on valuations or other agreements and security and other relevant working practices being put in writing.

c) do not take risks - always insure

These are simplistic and it is assumed that few curators would not follow such procedures in the case of obviously valuable objects such as those made of precious metals. However, natural history items have long been undervalued both for their monetary value and curators find the intrinsic worth of such material difficult to quantify in terms of hard currency. This is changing, linked with the increasing difficulty in obtaining some specimens and a burgeoning market for certain kinds of material such as fossils (Rolfe, et al. 1988). Also, the development of Registrar sections in at least the larger museums in recent years has helped to standardise procedures and involve a number of different viewpoints in what was previously a dialogue between curators.

Repair of damage

The fragments of the shell were sent to a ceramic conservator for repair, a proportion of the shell being restored because of the crushing of the shell fragments. The purchase of a live-collected shell in an unfaded condition and without the filed lip, is useful for comparison.

Incidental discoveries made as a result of the damage.

Inside the apex of the shell was a small amount of sediment which indicated that it was not a live caught specimen. This has been analysed and the combination of planktonic and benthonic foraminifera is reported as typical of the outer shelf of low to moderate latitudes and the aspect is described as Indo-Pacific. These tangible though dubious advantages ot the accident are worth reporting and the full list of identified organisms is on file (in litt. R.W. Jones, 23 June 1987).

It is hoped that the rather painful process of setting down these details will be of interest to others. If the morals from it help to prevent similar accidents then it will have been worthwhile.

Acknowledgments

Professor Frank Willett and Margaret Reilly (Hunterian Museum, Glasgow University); Fred Woodward (fomerly of Glasgow Museums); S Peter Dance (Carlisle).

Notes

1. Thomas Gray (1820-1910), a founder member of the Glasgow Natural History Society, was an enthusiastic conchologist and artist whose own shell collection is now in Glasgow Museum and Art Gallery. A biography and account of his collection and artistic achievements is given in Dance & Woodward (1986).
2. Martin Lister (1639-1712), eminent physician and author of numerous publications about natural history and especially about molluscs. For bibliographical details of Historia Conchyliorum, Lister's magnum opus, see Keynes (1981)

References

Bourne, W.R.P. (1993). The story of the great auk (*Pinguinis impennis*). *Archives of Natural History*, **20**: 257 - 278

Dance, S.P. (1966). *Shell collecting: an illustrated history*, Faber & Faber, London, pp344.

Dance, S.P. (1986). *A history of shell collecting*. E.J. Brill, Leiden, pp265.

Dance, S.P. & Woodward, F.R. (1986). *Thomas Gray, Glasgow's shell artist*. Glasgow Museum & Art Gallery, pp 4.

Gray, T (1852) On a species of *Strombus* in the Hunterian Museum at Glasgow. *Ann.Mag.Nat.Hist.* (Series 2) **10**: 430.

Keynes, G. (1981). *Dr Martin Lister, a bibliography*. Godalming.

Rolfe, W.D.I., Milner, A.C. & Hay, F.G. 1988. The price of fossils. *Special Papers in Palaeontology* **40**: 139 - 171

THE EDUCATIONAL VALUE OF NATURAL HISTORY COLLECTIONS

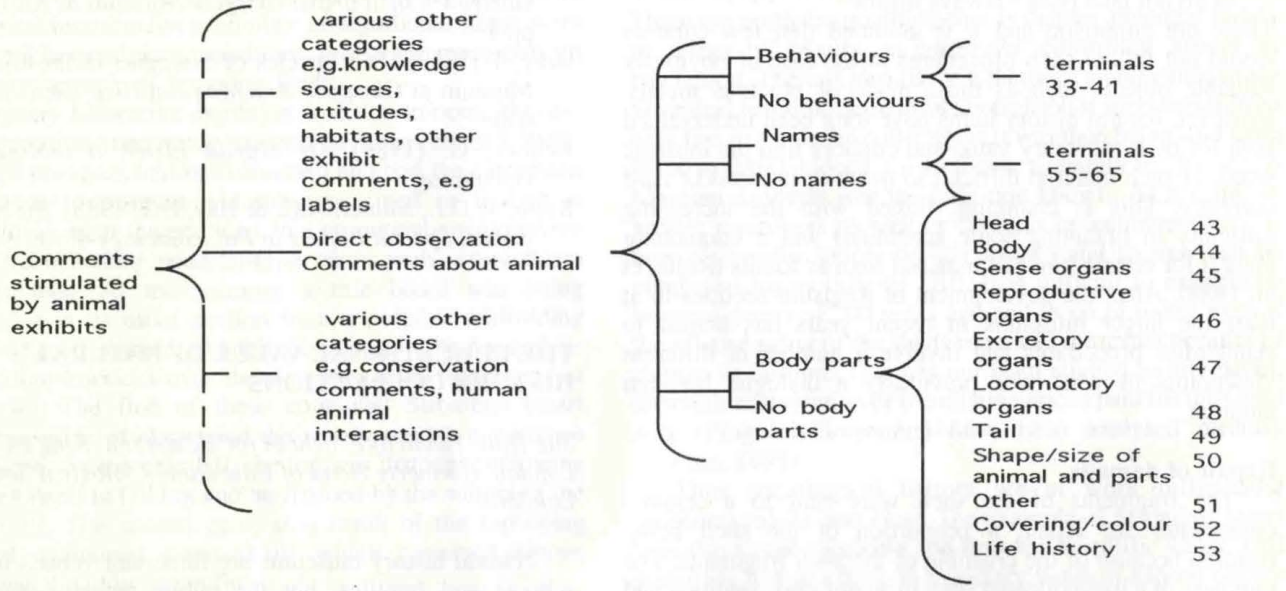
Sue Dale Tunnicliffe, School for Education, King's College, London. (formerly Head of Education Zoological Society of London)

Natural history museums are important venues for both schools and families, but the public perceive museums, rather than zoos, as places of learning. Zoos are regarded as a more appropriate place to take young children (Rosenfeld, 1980; Linton & Young, 1992). In the period April 1990 - March 1991 the Natural History Museum, London, had over one and a quarter million visitors, of whom thirteen per cent were school parties (pers comm. Department of Public Services). In contrast, London Zoo had over one and two third hundred thousand visitors, of whom five per cent were school parties (Zoological Society of London, 1991). Museums, and indeed zoos, have a role in the education of school children far beyond that of zoology or, in more general terms, science (Goodhew, 1989; Goodhew, 1994; Tunnicliffe, 1992a; Tunnicliffe, 1992b), yet the primary education function of natural history museums is seen as 'stimulating interest in the natural world' (Stansfield, 1994a:2). Collections, although usually 'a poor substitute for living organisms in their natural habitat', do 'provide opportunities for close examination in a way that is seldom possible in the wild' (Stansfield 1994b: 235).

This paper focuses on the observations and related comments, focused on animal specimens, of primary school children and their accompanying adults in school and family groups. The content of the comments are indicators of the innate interest in animals of this group of visitors and also, therefore, of potential learning/teaching opportunities, that occur in the museum. Whilst the museum data are of inherent interest, they are even more relevant if compared with data for similar groups visiting London Zoo to look at live animals, and may indicate which site has the greatest present, or potential, educational value in terms of learning about taxonomic zoology, which is the fundamental element in biodiversity and conservation education.

Human beings have an inherent need to categorise objects to make senses of their world and such taxonomies render referring to the items less time consuming (Bruner, Goodnow, & Austin, 1956). Berlin (1973;1978) observed the use of a basic term of family/order level for living organisms, psychologists observed that the basic level term is in the middle of the hierarchy and furthermore, is this term that is taught first to children. (Cameron, 1994; Moore, 1973).

Fig. 1: Part of the Systemic network used in coding the conversations



Whilst it is popularly supposed that there is a definite difference in the topics attended to and learnt in a zoo, compared with those done at preserved specimens exhibited in a natural history collection, little work has been done in this area. Birney (1986) compared responses from sixth grade children (10-11 year) after a visit to either a museum or zoo visit to look at the same species exhibited in a different state. At the museum specimen, but not in the zoo, the children spontaneously observed both structural adaptations of the specimens and aspects of the habitats presented through the exhibit, without having a talk that drew their attention to these phenomena. Disconcertingly, 40% of all the purpils surveyed, both museum and zoo visitors, thought that wild animals lived in a similar type of environment to the one in which specimens were exhibited.

Whilst this paper considers the factual observations made, it must be remembered that there exists an emotional or affective side to viewing animals, (Tunnicliffe in press), and there are drawbacks to exhibiting taxidermically preserved specimens. Falk and Dierking (1992:122) discuss the fascination of a child with 'stuffed' animals, perhaps because of disappointment at their not being 'alive'. Furthermore, children interpret other animals in anthropomorphic terms (Carey, 1985). The students whom Birney studied used more affective terms in their responses about the live animals, reinforcing the popular assumption that museums are for learning and zoos are for creating an emotional bond between visitors and animals (Krakauer, 1994; Tunnicliffe in press).

The attributes of animals about which children spontaneously comment are unknown, but classroom based work shows that children cite the possession of a head and legs and particular body coverings as defining attributtes (Braund, 1991; Mintzes, 1984; Mintzes, 1989; Mintzes, Trowbridge & Arnaudin, 1991; Natadze, 1963; Ryman, 1974a; Trowbridge & Mintzes, 1985; Trowbridge & Mintzes, 1988). If this pattern represents the concept of 'animal' held by children, it is likely that similar attributes would be mentioned by children when they look at live and preserved specimens. However, the content of the conversations of primary aged children, in family or school groups at preserved animal exhibits, has not been documented. It is known, however, from work in zoos, that families categorise the animals, talk about behaviours and body parts, try to instigate interactions with them and occasionally are involved in reflective thought (Rosenfeld 1980: 60).

Thus, before any meaningful discussion of the educational value of natural history collections per se, and a comparison with live collections, could be drawn, the conent of the conversations had to be established. The results presented in this paper are part of a larger study which sought to investigate the attributes about which primary school children and their accompanying adults, on school or leisure visits, notice and comment, and the naming categories that are employed, when looking at animal specimens of various kinds, within England and the USA.

Method

I identified school parties that had booked with the museum, and which contained children of appropriate age, and met the group in the reception area of the Education Department, requesting permission from the teacher-in-charge of each group to accompany groups and record the conversations. Demographic data which included the age of the group and the name of the school was recorded. Not all the family groups were approached, but a sample selection were asked, there were no refusals, but accordingly no demographic data was collected. Conversations from families were collected mostly at the weekends whilst those of the school groups were recorded during weeks days in term time. The two locations have a wide variety of animal specimens on show, covering all the major phyla, but themost favoured locations for observations by the groups were mammals and reptiles.

The study is ethnographic in nature, and details of the

methodology used for analysis of the transcripts of conversations has been discussed in detail elsewhere (Tunnicliffe, 1994 d). Essentially, the study is descriptive, setting out to describe and explain *'what is'*, he researcher accounting for what has occurred (Cohen & Manion, 1989), and is concerned with providing descriptions of people in their contexts (Hensel, 1987). A systemic network (Bliss, Monk, & Ogborn, 1983) was devised after pilot study transcripts had been studied (Fig. 1).

Spontaneous conversations at animal exhibits were tape recorded, transcribed and coded according to the network in the following manner.

Location: Mammal Gallery Group of 6 year olds and their teacher

	22	/	40 /		56
Teacher:	The one	/ over there/ is a cheetah			
	56				
Boy:	Cheetah!				
	22	/	15	/	53
Boy 2:	All these animals/ are real,/ well they were,				
		3/			70
Teacher:...	and yes, some of them/ were very dangerous				
	12				
Boy:	They're not now!				

The results were entered into category columns, one for each terminal of the network, plus some additional demographic columns. The Minitab statistics package was used. Columns were amalgamated into superordinate groups that had been established from reviewing literature e.g. Rosenfeld (1980) and Hensel (1987), and were related to 'accessing the exhibit', comments about 'exhibit furniture' (Tunnicliffe 1994) and four categories for each of the main areas of observations. Hence, the body part categories were comments about the front end, head and sense organs, dimensions, size shape and coverings of the body, disrupter, parts that projected, e.g. legs, and unfamiliar parts such as exretory or reproductive organs. The behavioural categories were position in the enclosure, locomotory behaviours, food related and attention attractors such as noises or play. Naming comments were divided into those that named, or 'labelled', the naimsl with the everyday popular or common names, those that categorised the specimens, e.g. a bird, those which compared the specimens with something else, such as a human or other animals, and lastly naming comments which allocated an incorrect name or category to the specimen, categories were not mutually exclusive. Whilst the study was not specifically interested in management, e.g. 'Stop that!, 'Come on' or social comments, the category was recorded. Social comments were either an acknowledgement or use of someone's name, e.g., 'Yes!', 'Sarah!', or a comment unrelated to the exhibit with the total conversational exchange which was about it.

Results

A total of 407 conversations were collected from school groups in the Natural History Museum during 1991-92 and 184 units from families, mostly in May 1994. A small number collected in July 1992. The results of both the conversations of school groups and family groups were obtained. A two by two contingency table was used to assess the significance of the results between the groups and to establish if there were any significances in the data. An example of a contingency table is shown in Table 1 which presents the information for comments about the front end of the animal and which is part of Table 2.

A comparison between the content of the conversations of the primary school and family groups looking at preserved animals is shown in Table 2.

It is surprising that both groups discussed behaviours in approximately one third of all conversations and that more of the school conversations contain reference to the animal being 'real', or alive, than in the family groups. Almost nine tenths of conversations provide some type of naming comment. The similarity on other exhibit comments and the far higher management and social component of conversations in family groups is striking.

School groups, whilst following the same pattern of observational comments as that shown by families, are focusing on particular aspects of the animals whilst in the museum, but name and categorise less than do the families. Both groups appear to depend on their personal knowledge in interpreting the exhibits. In summary, the two groups in the museum:

- looked at similar features of the preserved animals, including potential behaviours;

but:

- schools groups commented more about the attributes, in particular all the body parts and the position of the animal in the exhibit, than did the families;
- families named animals significantly more, labelling and categorising the specimens, but made more mistakes, yet there was no difference in label reference in the conversations. This suggests that the visitors were using their own knowledge in naming and not the interpretation provided by the museum.
- schools compared animals more and discussed the authenticity and alive/dead state more;
- school groups commented about other aspects of the exhibits significantly more, but not labels;
- family groups had more conversational exchanges with management or social comments.

Thus school groups appear to be using the exhibits for discussing the location of the animals and the physical attributes of the specimens and comparing these with other forms whilst family members made comments about the animal specimens but were experiencing a social occasion which they organised through verbal social acknowledgements and management comments.

Discussion

Whilst the data suggest that school groups use the specimens for discussion more than do the family groups, the data is relatively meaningless unless it is compared with similar data obtained from the conversations of similar children in the zoo.

Such data had been collected in London Zoo in the first study in this series, and the results are shown in Table 3.

It is striking that there is such similarity in the proportion of the comments from both groups about the animals during zoo visits. In the zoo:

- the content of conversations contains more references to animals and less about accessing the exhibit;

Table 1. Example of Contingency table used in the analysis

Category	School groups n= 407	Family groups n= 184	Totals
With 'front end' comments	67	17	84
Without 'front end' comments	340	167	507
Total	407	184	591

Value = 5.42 which is significant, at 1 degree of freedom, at the 0.025 level.

Table 2: A Comparison of the number of comments made by primary school and family groups at preserved animals in the Natural History Museum London

Category of topic in conversation	Number School Groups n=407	% of all conversations	% of total of comments in next highest category	Number Family Groups n = 184	%	% of total of comments in next highest category	Chi Square	Significance
Management or social conversation	219	54	54	142	77	77	29.10	p <. 005
Exhibit access	248	63	63	108	58	58	0.26	
All Exhibit focused	407	100	100	184	100	100	N/A	
Other exhibit*	220	54	55	52	28	28	33.3	p< 0.005
Reference to labels	60	15	27	18	10	35	2.72	
Animal focused	405**	100	100	181	100	100	1.95	
All body parts*	248	61	61	80	40	44	15.63	p< 0.005
Front end	67	17	27	17	12	21	5.42	p <.025
Dimensions	198	49	74	62	43	76	11.14	p <.005
Unfamiliar	67	17	27	7	5	9	18.54	p <.005
Disrupters	39	4	16	15	8	19	0.312	
All behaviours*	152	38	37	56	30	31	2.65	
Position	69	17	45	19	10	34	4.39	p <.001
Locomotory	40	4	26	12	7	21	1.72	
Food related	28	7	18	13	7	23	0.04	
Attention attractor	63	16	42	26	14	46	0.18	
All naming comments*	344	85	73	167	91	92	4.21	p < .05
Label	297	74	86	154	84	92	8.05	p <.005
Category of animal	232	57	67	126	69	76	6.98	p <.01
Compare	166	41	48	46	25	28	13.72	p <.005
Mistake	23	6	7	22	12	13	7.61	p <.01
Real/not real	65	16	-	18	10	-	4.01	p < .05

* next highest categories;** 2 conversations were entirely about the telephones at the elephant exhibits and did not refer to the animal exhibit at all.

Table 3: A Comparison of the number of comments made by primary school and family groups at live animals viewed at London Zoo

Category of topic in conversation	Number School Groups n=459	% of all convers ations	% of total of comments in next highest category	Number Family Groups n = 143	%	% of total of comments in next highest category	Chi Square 1DF	Signifi-cance
Management or social comment	354	77	77	125	85	85	7.08	p< 0.005
Exhibit access	289	63	63	123	86	86	26.8	p< 0.005
All Exhibit focused	458	100		140	99	99	0.76	
Other exhibits*	227	60	61	62	43	44	11.21	p< 0.005
Reference to label	53	21	19	14	10	23	0.34	
Animal focused	459	100	100	143	99	99	3.07	
All body parts*	280	61	61	75	53	44	8.016	p< 0.005
front end	77	17	27	17	12	23	1.97	
dimensions	237	52	85	62	43	83	2.94	
unfamiliar	32	6	11	7	5	9	0.77	
disrupters	57	12	20	15	11	20	0.38	
All behaviours*	301	66	66	95	66	67	0.03	
position	177	24	59	49	34	65	0.85	
locomotory	130	28	42	35	25	37	0.81	
food related	54	12	18	12	8	13	1.27	
attention attractor	115	25	38	30	21	32	0.99	
All naming* comments	401	88	88	126	88	89	0.005	
Label	318	69	73	91	64	72	1.59	
Category of animal	220	48	55	57	40	45	5.8	p< 0.025
compare	87	19	22	62	43	49	34.8	p< 0.005
mistake	17	4	4	6	4	4	0.01	
real/not real	41	6	-	6	4	-	3.39	

- school groups notice other aspects of the exhibit more and comment about the label more often;
- school groups refer to body parts more, particularly the dimensions of the animals, which are often the focus of the activity or task that the children are doing;
- school groups compare the animals with other things, animals, self and inanimate e.g., 'That iguana looks like it's covered with tights!'.
- there are statistically significant differences between the two groups in comments about behaviours.

However, both groups:

- name animals in over three quarters of conversational exchanges.

Thus, both groups of zoo visitors are concerned with naming the animals to their own satisfaction but school groups do pay more attention to other aspects of the exhibit and body parts. Body parts are likely to be part of the topic of study whilst reference to the exhibit furniture is made when trying to explain the location of an animal within the exhibit.

Does the content of the school conversations vary with the location? The results are compared in Table 4.

The proportions of the topic mentioned in conversations of school groups varies. Conservations within the museum contain fewer management and social comments than those in the zoo, suggesting that the museum presents an environment more conducive to looking and discussing the specimens without additional distractions or need for control. Whilst the groups presumably notice and then discuss similar attributes, the museum groups comment on unfamiliar aspects significantly more as well as noting the authenticity of the animals.

School groups observe and then comment about a similar range of attributes, but, in the natural history collection:

- there are significantly fewer management/social comments in conversations;
- fewer 'other exhibit' comments, including significantly fewer references to labels;
- significantly more discussion about unfamiliar attributes;
- significantly less discussion about behaviours, but over

Table 4: Comparison between the number of conversations of school groups containing comments at preserved and live animals

category	Pre-served n= 407	per cent	'Live' n=459		Chi Square (1DF) value total conversation	significance	Chi Square (1DF) value of category total	significance
man/ Social	219	54	354	77	52.58	p<0.005		
Exhibit access	248	63	289	63	0.32			
Other exhibit comments	220	54	227	60	30.77	p<.005		
Reference to label	65	17	53	21	1.94		4.62	p < .05
All body parts	248	61	280	61	.0004			
Front end	67	17	77	17	0.15		0.15	
Dimensions	198	49	237	52	0.79		2.09	
Unfamiliar	67	17	72	6	19.18	p <.005	20.97	p <.005
Disrupters	39	4	57	12	1.76		1.89	
All behaviours	152	38	301	66	68.91	p <.005		
Position	69	17	177	24	49.52	p <.005	7.13	p <0.01
Locomotory	40	4	130	28	46.78	p <.005	12.26	p <.005
Food	28	7	54	12	6.00	p <.025	0.15	
Attention attractors	63	16	115	25	12.11	p <.005	94	p <.005
All naming comments	344	85	401	88	1.45			
Label	297	74	318	69	1.42		6.36	p <.025
Category	232	57	220	48	7.12	p <0.01	12.27	p <.005
Compare	166	41	87	19	49.7	p <.005	58.24	p <.005
Mistake	23	6	17	4	1.8		2.18	
Real/alive	65	16	41	6	9.94	p < .005		

Table 5: Comparison between the number of conversations of family groups containing comments at preserved and live animals

Category	Preserved n= 184	per cent	Live n=143	per cent	Chi Square (1DF) value of total	significance	Chi Square (1DF) value of category*	significance
Man/ Social	142	77	125	85	5.6	p<. 025		
Exhibit access	108	58	123	86	28.95	p< .005		
Other exhibit comments	52	28	62	43	8.07	p<. 01		
Reference to label	18	10	14	10	5.97	p < .025		
All body parts	80	40	75	53	2.59			
Front end	15	12	17	12	1.27		0.36	
Dimensions	69	43	62	43	2.49		0.37	
Unfamiliar	13	5	7	5	0.65		1.64	
Disrupters	12	8	15	11	1.67		0.67	
All behaviours	56	30	95	66	41.95	p <.005		
Position	19	10	49	34	27.99	p <.005	4.43	p <.05
Locomotory	12	7	35	25	21.07	p <.005	3.9	p <.05
Food	13	7	12	8	0.20		2.85	
Attention attractors	26	14	30	21	2.69		3.32	
All naming comments	167	91	126	88	0.001			
Label	154	84	91	64	17.2	p <.005	20.9	p <.005
Category	126	69	57	40	26.74	p <.005	27.95	p <.005
Compare	46	25	62	43	12.25	p <.005	14.7	p <.005
Mistake	22	12	6	4	6.18	p < .025	5.8	p < .025
Real/alive	18	10	6	4	3.6	3.69		

1/3rd of conversations contain such a comment. This is interesting, because the animals are static;
- the overall naming pattern of specimens is similar but significantly more animals are labelled, categorised and comapred by the visitors to the natural history collection;
- not unsurprisingly, the authenticity of the animals is discussed to a significant extent.

In a similar manner the data can be compared between the family groups in the two locations (Table 5).

The data from Table 5 shows that, compared with the zoo groups, the family groups in the museum:

- find the animal in the exhibit more easily than in the zoo, with less comment, but pass less 'other exhibit' comments, including use of the label;
- comment on the body parts in similar proportion of their conversations as do zoo visitors;
- comment about behaviours but significantly less than the zoo families;
- name and categorise the animals significantly more but:
- make more mistakes in their naming;
- compare the specimens less.

It is apparent from this study that the natural history collection of preserved animals presents an opportunity for school groups to focus on the specimens. The ambience and physical characteristics of the museum provide an environment in which the management of the group is significantly less, judged from conversational content, permitting groups to focus their attention on the animal specimens. The museum exhibits, as Birney (1986) found, are the focus of significantly more comments about other aspects of the exhibit, including labels,. The visit to a natural history collection presents an opportunity to discuss unfamiliar parts of the animals and, whilst it is not unexpected that the zoo visitors discuss behaviours to a significant extent, it is interesting that museum groups do so to the extent that has been identified.

The comparison of data suggests that museum interpretation could develop further the opportunities for conversation about the features which constitute the content of spontaneous comment, and develop further involvement of children in 'talking science' (Lemke, 1990). The data also reinforce Falk and Dierking's observation that children at preserved specimens are concerned about the authenticity of the specimens. Furthermore, it is of interest to note that the school visitors to the natural history collection both assign animals to everyday taxonomic groups and compare the specimens, often referring to the human form (Carey 1985).

The natural history collection experience for families has a particular emphasis, derived from the analysis of the content of the conversations of the groups at the exhibits. The families who visit natural history collections to view animals:
- say more management comments than do school groups;
- make significantly fewer comments about other parts of the exhibit;
- 'find' the specimens in exhibits with significantly more ease than do zoo family visitors;
- refer less to 'other exhibit' comments, including referring to labels, than the zoo families looking at live specimens;
- natural history collection visitors comment about the attributes of the animals significantly more than do the zoo visitors, except in the category of body parts where there is no significant difference;
- Families in museums comment less about behaviours than the zoo families but name and categories animals significantly more in museums, comparing them less but make more mistkaes in categorising and labelling the specimens.

In terms of educational 'value', the natural history collection offers school and families:
- the opportunity to view animals with ease. The specimens are 'framed' within the exhibit and are thus more easily observed;
- the relative ease of making observations on the exhibited specimens facilitates the learning of the criterial attributes, thus establishing a sound foundation for further learning of taxonomy and for encouraging children to 'talk science' and use the science process through their own observations.

This study shows that there is a definite and inherent pattern in the way which visitors look at animals. However, this agenda could be built on by teachers and institutions to develop a student's understanding of the animal specimens. The data from this study suggest that the preserved animal collections afford a more opportune collection for developing such education initiatives and that those that they have are more effective than those of the zoo. Furthermore, the behaviours of the school groups in the museum reflects a greater concentration on the task, looking at animals, than appears to be the case in the zoo.

Visitors already use a functional naming system, in both the natural history collection and zoo, through which they refer to the animals using basic terminology, the everyday system of society. Hence monkeys, cats, snakes, birds and fish, are the everyday terms employed. However, there is no spontaneous development of, or use of known, superordinate categories such as reptile or mammal, and whilst on a few occasions a subordinate term is used, .e.g. Blue Whale, it is relatively rare and often associated with label use. Effective interpretation, at the level of the understanding of the visitor and employing their familiar terminology, could assist in their learning the scientific terms and further relevant background information, starting at the topics about which they are interested, not the institution.

Whilst collections may be, as Stansfield said, 'poor substitutes for the natural habitat', they appear to be of prime importance in teaching children taxonomic zoology, relationships and adaptations of structures, behaviours and adaptations to habitat. Natural history collections should be regarded as the essential primary source of zoological education for both future scientists and for the public understanding of this particular science, leading into the areas of biodiversity and conservation. Museums have the distinct advantage that their specimens are clearly visible and predictable hence teaching points can be planned with certainty. Moreover, whilst both institutions provide a 'frame' for the specimens through which they are viewed, that of the natural history collection is more defined, helping the visitors to allocate and observe the specimens more easily.

The museum collection, unlike that of most zoos, provides examples of the range of biodiversity so students can learn an overview, not, as in many zoos, focus on birds and mammals or one group, such as butterfly houses or hawk sanctuaries. Whilst this study did not focus on botanical specimens, it is likely that the pattern of observations would be similar. The value of natural history collections, in terms

of education, is high, and superior to that of zoos, but the potential has not been fully exploited.

Acknowledgements:
I wish to thank: Dr Carole Boulter of the Department of Science and Technology Education, University of Reading for her constructive comments; Professor Arthur Lucas, Principal, and Professor of Curriculum Studies, King's College, London, for his advice and support during the project.

References

Berlin, B. (1973). Folk Systematics in Relation to Biological Classification and Nomenclature. In R.F. Johnstone, P.W. Frank, & D.M. Michoner (Eds.), Annual Review of Ecology and Systematics, 259-271.

Berlin, B. (1978). Ethnobiological Classification. In E. Rosch & B.B. Lloyd (Eds.), Cognition and Categorisation, Hillsdale, New Jersey: Lawrence Erlbaum Associates Inc., 9-24.

Birney, B. (1986) A Comparative Study of Children's Perceptions and Knowledge of Wildlife. PhD, California.

Bliss, J., Monk, M., & Ogborn, J. (1983). Exploratory Qualitative Analysis for Educational Research. London: Croom Helm.

Braund, M. (1991). Children's ideas in classifying animals. Journal of Biological Education, **25** (2), 103-109.

Bruner, J.S., Goodnow, J.J., & Austin, G.A. (1956). A Study of Thinking (First Science Editions 1962 ed.). New York: John Wiley, Science Editions, Inc.

Cameron, L. (1994). Organising the World: children's concepts and categories, and implications for the teaching of English. ELT Journal, **48** (1),28-39.

Carey, S. (1985). Conceptual Change in Childhood. Cambridge, Mass., MIT Press/Bradford Books.

Cohen, L., & Manion, L. (1989). Research methods in Education (3rd ed.). London: Routledge.

Goodhew, E. (1989). Museums and Primary Science. London: Area Museum Service for Southern England.

Goodhew, E. (1994). Schools and Natural History Museums. In J.M.G. Stansfield G. Reid (Eds.), Manual of Natural History Curatorship. London: HMSO:255-263.

Hensel, K. (1987) Families in Museums: Interactions and conversations at displays. Unpublished PhD, Columbia University Teachers College.

Krakauer, T. (1994). The interactive zoo. Paper presented at Annual Meeting of Association of American Zoos and Aquaria, Atlanta. GA., AZA.

CONTACTS

BCG Chairman: Mike Graham, Towneley Hall Museum, Towneley Park, Burnley, Lancs BB11 3RQ. (tel 0282 24213)

BCG Secretary: Steve Thompson, Scunthorpe Museum, Oswald Road, Scunthorpe DN15 7BD (tel 0724 843533)

Coordinating Editor and general news: Michael Taylor, Perth Museum and Art Gallery, George Street, Perth, Scotland PH1 5LB (tel 0738 632488)

News items: Jane Mee, Ludlow Museum, Old Street, Ludlow, Shropshire SY8 1NW (tel 0584 873857)

Articles and specialist papers: Charles Pettitt, Manchester Museum, Oxford Road, Manchester (tel 061 275 2634) 2665

Monitoring collections at risk: Mike Palmer, Liverpool Museum, William Brown Street, Liverpool L3 8EN.

Membership details etc: The Treasurer, Ms Kathie Way, The Mollusca Section, The Natural History Museum, Cromwell Road, London SW7 5BD. (tel 071 938 8892)

Copy date for the next issue is 1 July.

ISSN 1355-8331

Published and printed at Northern Whig Ltd., Limestone Road, Belfast, BT15 3AH.