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The Role of Biological Collections in Undergraduate Teaching

A. V. L. Pike

Natural history collections provide a wealth of material for teaching biology to undergraduates. Why is it then that the use of these marvellous resources for educational purposes at a tertiary level has declined dramatically in the last two decades? With a steady decline in the number of whole-organism biologists being employed by universities and the ever-increasing demands on space and funding, the very existence of university teaching collections has been threatened, with many institutions suffering the loss of their valuable and irreplaceable collections. It seems that with the present trend towards a more molecular and cellular approach to biology, the role that collections play in undergraduate teaching is no longer valued. This may, in part, be explained by the apparent lack of understanding of what that role is. The aim of this article is to present some of the key benefits to be gained using natural history collections as a teaching resource for undergraduates in the biological sciences.

The main reason that natural history collections are marvellous resources for undergraduate teaching is that when used in a thoughtful way they allow a structured learning experience, especially when used in a practical or tutorial context. Within this strategic framework, the use of collections allows a process of 'active learning'. Active learning can be defined as learning through instructional activities that involve students in doing things and thinking about what they are doing. This should be contrasted with 'passive learning' in which students may be listening or note taking but are not actively thinking and evaluating what they are doing at the time of the exercise. Teaching methods promoting active learning have been shown to be comparable to traditional lectures in promoting the understanding of facts but superior to lectures when it comes to promoting the development of cognitive and writing skills.

In a biological context the outcomes of the active learning process can be broadly divided into two areas: promoting understanding of biological concepts and developing good scientific methods and practical skills. The roles that collections play within these two areas are considered below.

Biological concepts

The precise biological knowledge and concepts that a student will be expected to gain when using a collection will ultimately depend on the subject being considered at any one time. However, it is worth mentioning here some of the more fundamental biological concepts, relevant to the education of any biology student, which can be demonstrated using a natural history collection.

Effective use of natural history collections can give students a sense of reality. Actual specimens can act as a focus for concepts and ideas and allow visual comprehension of size, form and structure in a way that illustrations or slides cannot. Similarly, an appreciation of the diversity of life can be gained from collections, as by their very nature they have been amassed to maximise diversity. This sense of reality can be extended into many other areas of biology. For instance, studying a real skeleton of an extinct animal will have a far greater impact on a student's understanding of extinction and its finality than looking at any textbook diagram.

Another fundamental biological concept is one of variation. As well as providing an insight into the diversity of species, museums can also provide an environment in which students can appreciate variation within a species. Biological variation is the subject of much scientific study whether it is structural, genetic or behavioural variation. Effective use of collections, especially specimen-rich collections, can allow students to appreciate morphological variation of individuals. Furthermore, an understanding of variation leads students to think directly about adaptation of organisms to environments and natural selection. Inevitably, natural selection is the basic principle around which biological courses are organised, and a thorough understanding of evolution has to be one of the ultimate learning objectives of any

biological degree.

Scientific methods and practical skills

Effective use of collections can play an important role in allowing students to expand their scientific methodology and practical skills within a biological context. Any structured active learning experience will allow students time to evaluate knowledge and put that knowledge into context. By applying them to specimens, the understanding of concepts can be tested. With the right direction and support specimens can be used to promote discussion and arouse curiosity, and help students develop skills in asking so-called 'why, what and how' questions; the development of an enquiring mind is a fundamental part of science education. In addition transferable, practical skills can be acquired and promoted. Skills such as observation, data acquisition, accuracy and communication are useful not just within a scientific context but for life in general.

An underlying factor in the role of collections for undergraduate teaching is their 'effective' use. Whilst discussing the uses of particular specimens is beyond the scope of this article, it is worth noting a few important requirements that need to be in place for effective teaching to take place. Firstly, suitable facilities must be available. Obviously access to a collection is necessary, but in addition, that collection needs to be accessible not just in the manner in which the general public views collections, but specimens need to be taken out from behind glass and placed into the immediate environment of the student. It follows that space in which this can take place needs to be provided. Secondly, teaching staff need to be willing to put in the time required to use collections. Preparation time for the structured and effective use of collections can be extensive. Questions and activities need to be carefully formulated for students to benefit from the experience; appropriate lines of tutorial support need to be in place. In addition, the circumnavigation of constraints imposed by space, class size and class time may require much ingenuity on behalf of the museum and teaching staff. Thirdly, a collection needs someone to manage and maintain it. Ideally, this would be

a dedicated museum curator. However, members of academic staff can take on this role given suitable training and with a realistic amount of time designated for the purpose.

Whatever the needs, however, it is hoped that the above paragraphs illustrate some of the important parts that biological collections play in tertiary-level education. Understanding this role is the first step towards reinstating the value of collections as a teaching resource within universities. When used in the right way collections provide a structured learning experience, promoting effective, active learning as well as enjoyable learning. They also produce enthusiastic, enquiring, communicative minds, which at the end of the day is what a university education is all about.

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Book Review



The Aurelian Legacy, by Michael A. Salmon (2000). Harley Books, Colchester. 432pp, 162 figs, 41 col. pls. Price: £30.00. ISBN 0-946589-40-2.

Butterfly collecting has been one of the most popular pursuits of naturalists for generations and few natural history collections lack at least a few specimens, albeit often in poor condition or with little data. This indispensable book provides a fascinating insight into the lives of the collectors, their methods of collecting and the places where they collected, thereby providing curators with an essential background to the collections that they care for.

The first chapter 'A short history of butterfly collecting in Britain', provides a useful overview of collectors and their collections and describes the origins of the Aurelian Societies in the coffee houses of London. In some ways this is almost a social history of entomology, describing changing attitudes towards the study of insects as natural history societies