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Thoughts on the exploitation of geoscience collections

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Introduction

This article is related to a conference that I attended back in May called 'Exploiting Geoscience Collections'. The conference was organised as a joint effort between the Geoscience Information Group (GIG) and the Geological Curators Group (GCG) – of which I am a member – and was held in the Geological Society of London's (GSL) apartments. The conference lasted for two days and was well attended, with delegates travelling from all over the UK and as far a field as Canada and Russia.

When I first heard the title of this conference, I found the notion of 'exploitation' quite uncomfortable; words like exploitation are rarely heard in the museum sector. Why don't we exploit our collections? Why do we prefer to think of the collections being used? Should we exploit our collections? Like 'exploitation', the use of the term 'geoscience' also seemed somewhat puzzling; whatever happened to geology? Geoscience is also a word that is rarely used in the museum sector (at least in the UK), and seems more appropriately suited to an academic department than a museum storeroom. I will return to these issues later in the discussion section, but before I continue, it may be useful to clarify what is meant by 'geoscience collection'.

The Geological Society defines geoscience as: "…all the sciences (geology, geophysics, geochemistry) that study the structure, evolution and dynamics of the planet Earth and its natural mineral and energy resources" (The Geological Society 1999a). Geoscience collections are therefore all of the records, samples and digital data that are generated by these sciences. As the overwhelming scope of this definition would suggest, the papers presented at the conference covered a vast range of themes, of which I will only be mentioning a few. This is therefore not a comprehensive conference review, rather, my thoughts on themes arising from the conference. If, however, you would like more information about the rest of the conference, I strongly recommend either the conference website, the book of abstracts or reviews of the conference for the Geological Curators Group (Haycock, 2008) and The Palaeontological Association (McGowan, 2008).

The papers that I will be discussing are: How do we value geological collections? (Professor Richard Fortey - Keynote); The contribution of serendipity to the exploitation of geoscience collections (Dr Mike Howe); Managing collections for exploitation (Jeremy Giles); Old samples – New questions (Angela Ehling); and Collections management at the geological survey of Canada (Jean Dougherty). The first three papers address some of the more general issues arising from the exploitation of geoscience collections, whereas the final two papers focus on the practicalities. I will finish by mentioning some of the issues arising from the discussion that was held at the end of the first day, and this will also allow me to return to some of the issues raised by these papers.

Values

Richard Fortey – president of the Geological Society of London - opened the conference with a candid description of the GSL's own collections (or lack thereof); despite being "the UK national society for geoscience, and the oldest geological society in the world" (The Geological Society 1999b), only 'odd bits' of the society's geological collections remain in Burlington House. Considering the fact that the society was transferring its collections to the BM(NH) as early as 1911, it would seem that - as far as 'deaccessioning' is concerned - the GSL was somewhat ahead of its time.

According to Fortey, the GSL's remaining collections have suffered from loss and neglect, and therefore, it would seem that for the GSL, the decision to transfer its collections was a smart one. Fortey went on to explain that the GSL is now concentrating on collections of a different kind with the Lyell Collection; an online collection of earth science literature containing the vast majority of the book and journal content published by the society over the last 200 years (The Geological Society 1999c). I will discuss this shift in focus, from specimens to data, in more detail in the discussion section, however, for now I will return to the matter of value – the theme of Fortey's paper.

Having spent over three decades working in London's Natural History Museum, Richard Fortey is well qualified to address the question of how we value geological collections. Placing particular emphasis on palaeontological material, Fortey highlighted some of the more 'special' features of geological collections, citing - amongst other things – a robustness that makes much material relatively immune to degradation (both natural and human-induced) over time. While geological material may have a head start in this sense, it is precisely because of this persistence that geological collections can be seen as a nuisance, thus the notion of permanence is the very feature that makes them vulnerable.

Often situated on prime real estate and taking up valuable storage space, these collections – sometimes remaining untouched since being accessioned – may contain hidden gems, unknown type specimens, historically important material, and who knows what else. Fortey's point is that the value of many geological collections is largely unknown and that in order to rectify this problem, specialist expertise are essential. As he noted, however, the subject specialist is a dying breed, and unless fundamental changes are made to the ways in which research is funded, their extinction seems immanent. For Fortey, this lack of expertise is at the heart of the problem; without the subject specialist, the value of our collections will remain unknown, and as he went on to explain, this lack of knowledge can seriously threaten survival of collections for future generations.

Fortey made his opposition to disposal (i.e. deaccessioning, downsizing, rationalising, streamlining or basically discarding of geological collections) quite clear, suggesting that the only real grounds for disposal were cases where: material is unlocalised, unlabelled, poorly preserved or commonly duplicated; disposal has been sanctioned by the original collector – i.e. due to the existence of duplicates or material of better quality; or material can be returned to those with a legitimate claim of title and where certain standards of curation can be guaranteed.

According to Fortey; "Disposal implies that the disposer is a scholar with a depth of knowledge (a) to recognise what is important from old collections (b) to anticipate the way science may move in the future" (Fortey, 2008). Fortey's concern for the lack of subject specialists is a genuine issue when it comes to the matter of disposal; the untrained eye may fail to recognise the distinction between material with unknown value and material with no value. Furthermore, it is doubtful whether even a specialist scholar can be expected to predict future directions of science, especially if - as Fortey suggests - the value of a collection is ultimately culturally justified.

So how do we overcome these very pressing issues? For Fortey, "the adage 'never throw anything away' is still a wise precaution" (Fortey, 2008). Fortey concluded his paper by reminding us that collections are more important than the scientists in charge of them. I believe that this little piece of wisdom is worth bearing in mind as we tackle these difficult questions of value and disposal.

Serendipity

Mike Howe of the British Geological Survey (BGS) began his paper with a classic cautionary tale; the story of specimen number GSE13821 - otherwise known as the conodont animal. Despite the importance of conodonts to fields such as biostratigraphy and petroleum exploration, the origin of these tooth-like microfossils has perplexed palaeontologists ever since their initial description (Pander 1856) over 150 years ago. Thus the elusive creature became the source of endless debate and speculation amongst palaeontologists, retaining its status as an enigma for over a century. The mystery of the conodont animal was finally solved in 1982 by a palaeontologist named Clarkson who spotted the elongated-worm-shaped smudge (Briggs et al. 1983: p3) on a specimen belonging to the Institute of Geological Sciences (IGS) in Edinburgh (now the BGS).

The discovery of the illusive Conodont animal in a specimen that had been sat in a drawer for over half a century is often told as a classic tale of serendipity, and as Howe explained; "many key discoveries in the geosciences have depended on serendipity. There are numerous examples in palaeontology, many of these relating to the chance recognition of the true importance of historical specimens in collections" (Howe 2008: p10). This idea of recognising the 'true importance' of historical specimens is an interesting one, and one that requires further thought.

In the case of the conodont animal, the specimen is believed to have been collected during the 1920s by Mr David Tait (Briggs et al. 1983: p2) - "one of the [geological] survey's skilled fossil collectors" (Stubblefield 1965: p4) - from a site along the Granton-Muirhouse shore (near Edinburgh). Today, the site is no longer

accessible due to much of the site having been paved over, and the removal of "…the most fossiliferous sections of the Granton 'shrimp bed' …to protect fossils of the conodont animal after the theft of several square metres of the bed in 1984 by a commercial collector" (Gordon et al. 2002: p218). The IGS retained the specimen because it had a particular value prior to Clarkson's visit in 1982 and prior to the loss of much of the remaining material from the site in 1984; this value relates to the original context in which it was collected.

To suggest that Clarkson recognised the 'true importance' of the specimen implies that importance is a fixed quality, and therefore, that specimen number GSE13821 is now simply the 'specimen that contains the first evidence of the conodont animal'. This is to ignore the other qualities that the specimen has had and may have in the future: the specimen still retains its historical association with Tait; its geographical association with Granton shore; its stratigraphic association with the 'shrimp band'; its faunal association with the shrimp Waterstonella (Briggs and Clarkson, 1987: p104); the list could go on and on. So for the conodont animal, it wasn't so much the 'chance recognition of the true importance' of the specimen, rather, the chance discovery of an additional value.

As Howe pointed out, the last 25 years have seen collections based research operating in an increasingly strategic, managed and standardized world, suggesting that the best way to increase the odds of serendipity (and therefore the potential value of material) is to increase access to both the samples and the data contained in our geoscience collections, and this is particularly important for our historical collections; "Numerous similar discoveries have been made, including early tetrapods and birds. All of these relate to material from localities that are now inaccessible or specimens that are extremely rare, so that geoscience collections provide the only realistic access" (Howe, 2008: p11).

While this discovery relied on the existence of an historical specimen and clearly demonstrates the potential value of existing collections, this serendipitous tale should not be mistaken for a reason never to throw anything away 'just in case': "Serendipity is a bonus to the perceptive, prepared scientist, not a substitute for hard work" (Abelson, 1963).

Exploitation

The paper presented by Jeremy Giles (also of the BGS) titled 'Managing collections for exploitation', provided an insightful introduction to a more commercial approach to geoscience collections. The paper opened by asking what we mean when we talk about collections, a very basic question but one which is useful to revisit, offering the following definition of geoscience collections: "A group of geoscience objects, analogue and/or digital, that are assembled together, along with appropriate contextual data, for a specific purpose" (Giles, 2008a: p1). Of particular interest here is the notion of purpose; at a time when the cost of maintaining and managing collections is high, the purpose of our collections is increasingly called into question.

For Giles, the resources required for the ongoing care and management of our geoscience collections can no longer be explained simply in terms of their scholarly value; "Geoscience collections need to justify their societal value by contributing to the development of products and services that do at least one of the following; create wealth; reduce risk; improve quality of life; or improve quality of the environment" (Giles, 2008b: p5). Many of our geoscience collections serve no contemporary purpose, and this is closely linked to their treatment as a liability.

Giles explained that in order for collections to demonstrate their value they need a purpose, and this will often require reappraisal. Such reappraisal cannot be achieved if geoscience collections are seen and treated as a burden; clearly, a different mentality is required. As Giles explained, it is only through the treatment of geoscience collections as assets that it will be possible to exploit them: "Collections need to be recognised as an organisational asset which can potentially be exploited in the development of products and services" (Giles, 2008a: p17). Giles went on to clarify that; "Once collections are linked to specific income generating products and services, their strong scientific justification is also supported by a robust business case" (Giles, 2008a: p17).

Using the BGS's Borehole Records Collection as an example, Giles outlined the approach taken by the BGS to the management of collections for exploitation. Over 170 years, the BGS has amassed a collection of over 1.2 million paper borehole logs which were originally used to support geological mapping. These paper records were scanned and converted into TIFF format – a task that took 2 years to complete. By digi-

tising the records, BGS has transformed this collection into not only a well-used and valuable resource, but also a source of income.

I must admit that initially, I found much of this talk of exploitation, assets and business cases quite unsettling and rather overwhelming; the BGS collections are different from those contained in most museums in terms of content, volume, purpose and resources; much of what Giles was saying seemed quite irrelevant at first. However, as Giles continued, it became increasingly apparent that there is much to learn from the BGS's approach to collections management – even if the end product is not the same. A particularly relevant aspect of this approach to collections management is the need to "understand the individual collections, why they were collected and how they can be used, re-used and repurposed" (Giles, 2008a: p17); an obvious part of the process but one which is vital in order to understand any limitations arising from the use of existing collections for new purposes. Linking back to the previous papers, this reinforces the point that keeping material because it may be useful one day does not constitute a purpose or sufficient justification for the ongoing costs of maintaining a collection.

Against all odds

So far, the papers that I have mentioned originate from the BGS and the Natural History Museum; institutions that clearly operate on a scale that is beyond that of the vast majority of non-national museums. The last two papers that I want to mention demonstrate that both the exploitation and effective management of geoscience collections can be achieved in less than ideal circumstances, offering a glimmer of hope and a source of inspiration.

Firstly, take Angela Ehling, the sole curator of Germany's Federal Institute for Geosciences and Resources which comprises over 1.5 million specimens. Building on Giles' point about the importance of purpose, Ehling's paper – Old samples New questions – provided a refreshingly positive description of the contemporary relevance and use of historical material (Fig 1 and Fig 2).

The Federal Institute's collections originate from the Royal Mining Academy's collections which date back to the 1770s, and also incorporate material from other historical institutions including the Prussian Geological Survey. Like many geoscience collections contained in the Federal Institute of Geoscience and Resources, the vast holdings include many old samples from sites that are no longer accessible or that no longer exist. Faced with questions of the value of keeping such historical material, some of which dates back 150 years, Ehling explained that "New questions appear and some of them can be answered with the help of the old specimens" (Ehling, 2008: p4).

Fig 1. A view of the inside of the Federal Institutes Collections. Reproduced with permission from Angela Ehling.

Fig 2. A view of the inside of the Federal Institute. Reproduced with permission from Angela Ehling.

Ehling described a number of ways in which historical material is being actively used in ways that bear no relation to their original purpose, including the use of the institute's sandstone collections as a reference for the analysis and matching of building stones. (For example sandstone samples at the Federal Institute of Geoscience and Resources comprises of less than 0.1% of the institutes collections, but generates 25% of the users). Of particular interest were the examples of unexpected and creative uses of the institute's collections in fields outside of the geological sciences, and these included: the analysis of 35 cinnabar samples by art historians in order to demonstrate the possibility of provenance analysis on red pigment in paintings (University of Potsdam); the use of 50 copper samples to identify the deposit from which copper contained in the bronze age 'Sky disc of Nebra' , a bronze age artefact from the University of Halle (Fig 3); and finally, the contribution of specimens to the removal of war waste through the analysis of 600 laterite samples to allow for differentiation between land mines with low metal content and the naturally lateritic ground.

Ehling clearly demonstrated that historical specimens can still prove valuable sources of data in contemporary research across a variety of disciplines, and that even with just one full time member of staff, it is possible to create a purpose for otherwise redundant specimens.

Fig 3. Image of the 'Sky of Nebra.' Reproduced with permission from Angela Ehling.

My second example comes from Canada where Jean Dougherty introduced the Geological Survey of Canada's (GSC) Collections Project. The project aims to protect collections whilst making them more accessible – a task that may seem fairly unremarkable until you discover the scale of the project. Geographically speaking - with a land area of about 37 times that of the UK - Canada is huge, and as you would expect from such a large country, the range and volume of earth materials in the nation's collections is vast.

Until 2005, the management of the GSC's collections lacked coordination and resources; the immense distances separating the regional offices had resulted in them becoming increasingly independent, each with various facilities, staffing levels, systems and methods, all working in isolation. 2005 saw the approval of the Collections Project by the GSC, and work started on devising a standardized and accessible system for the management of the GSC's samples and data.

The very fact that the GSC approved this project was, for Dougherty, a great achievement, as it showed that the GSC recognised that collections are an information asset requiring ongoing funding and support. Dougherty, however, has faced a mammoth task; the GSC's immense national collections are contained in just six facilities across the country, each with one member of staff, and with collections containing over fifty types of material; to describe this as a logistical nightmare is perhaps an understatement.

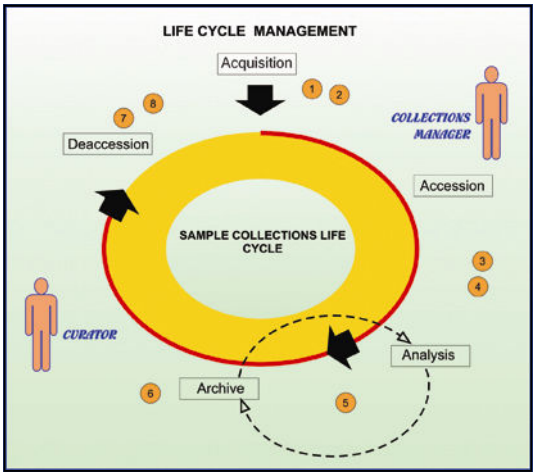

Fig 4. Image of the Life cycle management of collections. Reproduced with permission from Jean Dougherty

The project has generated a number of 'tools' which are based around the concept of collections 'lifecycles' (Fig 4). The lifecycle is initially managed using a collections policy which provides principles for handling the samples and data on entering the collection, and subsequent stages of the lifecycle are then managed by guidelines and standard operating procedures. Perhaps the most important tool for the implementation of this national collections management strategy has been a national database - the 'Sample Management System' (SMS) - which allows the integration of data from various regionally developed tools into one single system. The SMS has two functions; firstly it enables sample information and data to be tracked, and secondly, it tracks the movement of samples through their lifecycles.

Launched in spring 2007, the first version of SMS has proven a valuable tool for the GSC. As Dougherty explained; "With the launch of the new system, researchers will have efficient access to results, collections managers will have the necessary tools and information to manage their collections, and project managers will have access to timely information to efficiently manage the progress of their projects" (Dougherty 2008: p12). SMS has effectively provided a tool for the creation and maintenance of networks and links for people, samples and data across huge areas, saving both time and money.

Discussion

The first day of the conference concluded with an interesting discussion about the importance of specimen collections and the treatment of digital collections. The majority of the papers presented at the conference focused on digital collections; this led to the question of whether the emphasis on digital collections meant that analogue collections were becoming redundant. It would appear not; Jeremy Giles summarised the discussion by explaining that "records are abstractions of information from real specimens and any record is just a personal abstraction". A record may overlook or totally ignore some aspect of a specimen because of the context in which it is generated: Keeping 'the real thing' is a safeguard against this.

As described above, geoscience collections embrace both the 'analogue' and the 'digital' material. Returning to Fortey's introduction to the GSL, it seems that the movement of the society's collecting activities away from specimen collections and towards digital data, reflects a wider trend whereby the science of geology is becoming increasingly disconnected from its specimens. The shift from tangible specimen collections to intangible data collections reflects the transformation of the 'old geology' to the 'new geosciences'.

The recognition that data falls within the scope of geoscience collections implies that digital collections are subject to the same treatment and standards as the tangible rocky material. This is apparently not the case; it came as quite a surprise to discover that for the BGS to reach its aspirational level of digitisation, it would take 600 years (if 'business as usual' activities are put on hold). This is clearly a problem: digital collections are growing at a rate that is far greater than their physical counterparts. Have we not learned from our mistakes?

The ongoing struggle we face with our geological collections is the result of years of poor management and a lack of standardization. Is it not obvious that even if we can't touch the stuff, that digital data collections need the same levels of management that we now understand to be essential for physical material? This should come as no surprise to us; we are in the 'digital age', after all. On a more positive note; if anyone is in the position to sort this out, surely it is the curators who have had to learn to manage the mess that was left behind after years of mismanaged physical collecting.

Notes:

For a list of geoscience disciplines, see: The Australian Museum, 'Geoscience: Branches of geoscience', <http://www.amonline.net.au/geoscience/about/branches.htm>, accessed 12 June 2008

Conference Home Page, 'Exploiting Geoscience Collections', <http://www.exploitinggeosciencecollections.com/>, accessed 1 March 2008. Slides from many of the papers can also be found at: http://www.exploitinggeosciencecollections.com/pageID_5581386.html

The abstract book is available online: 'Abstract Book', *Exploiting Geoscience Collections: 12th and 13th May 2008, Burlington House, Piccadilly, London* <http://www.exploitinggeosciencecollections.com/pageID_5893123.html>, accessed 20 April 2008

The Lyell Collection website is: http://www.lyellcollection.org/

A document containing Fortey's presentation is available on the conference website: http://www.exploitinggeosciencecollections.com/mediapool/63/637143/data/0101_Richard_Forty_-_How_do_we_value_geological_collections.pdf

A document containing Howe's presentation is available on the conference website: http://www.exploitinggeosciencecollections.com/mediapool/63/637143/data/0111_Mike_Howe_-_Serendipity.pdf

A document containing Giles' presentation is available on the conference website: http://www.exploitinggeosciencecollections.com/mediapool/63/637143/data/0106_Jeremy_Giles_-_Managing_Collections_for_Exploitation_20080512.pdf

A document containing Ehling's presentation is available on the conference website: http://www.exploitinggeosciencecollections.com/mediapool/63/637143/data/0104_Angela_Ehling_-_Old_samples_new_questions.pdf

A document containing Dougherty's presentation is available on the conference website: http://www.exploitinggeosciencecollections.com/mediapool/63/637143/data/0112_Jean_Dougherty_-_Collections_Management_at_GeolSurvey_Canada.pdf

The GSC uses the term ‘earth materials’ as it provides the most accurate description of the different types of material contained in their collections – ranging from rock, ice, sediment and soil to water.

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