
DIGITAL IMAGE ARCHIVE OF MEDIEVAL MUSIC (DIAMM)
FIRST WORKSHOP EXPLORING THE DIAMM ONLINE RESOURCE

27-28 November 2003
St Cross College, Oxford, UK

Participants

Margaret Bent (All Souls, Oxford, director DIAMM)
Andrew Wathey (Royal Holloway, London, director DIAMM)
Marilyn Deegan (Director, Forced Migration Online, DIAMM Senior technical advisor)
Harold Short (Head of Centre for Computing in the Humanities (CCH), King's College, London, and head of DIAMM technical development team)
Hafed Walda (database/web developer, CCH)
John Bradley (database/website developer, CCH)
Paul Vetch (website development, CCH)
Tim Crawford (music technology specialist, City University)
Simon Tanner (digitization advisor, for digitization of catalogue metadata, CCH)
Prof Charles Oppenheim (Prof of Law and copyright expert/advisor to DIAMM)
Sarah Wickham (formerly archivist at Lambeth Palace, now Royal Northern College of Music)
John Rink (Prof of Music, Royal Holloway, London, director of the Online Chopin Variorum Project)
Ichiro Fujinaga (McGill University, specialist in music software and music technology)
Jose Luis Esteban (Coordinador de Informática, Biblioteca Nacional, Madrid)
Richard Gartner (Research Libraries Group Cultural Materials Initiative)
Peter Scott (Researcher in Medieval MS Materials, University of Newcastle)
Julia Craig-McFeely (DIAMM Project Manager)
Meg Twycross (Lancaster University)
Matthew Dovey (Oxford Digital Library)

PROGRAMME

The DIAMM workshop has been convened to bring together a group of advisors and experts in particular fields to discuss the particular needs, aims and problems of presenting DIAMM materials on the internet. The timing of these sessions is flexible so that if any particular area raises more issues than anticipated it will not be necessary to impose an arbitrary time-limit on the discussion. A written report will be produced following the workshop as a study document for the Project team.

THURSDAY 27 NOVEMBER

- 11:00 am Coffee and introductions
- Presentation:** Julia Craig-McFeely (DIAMM Project Manager), Marilyn Deegan (DIAMM Technical Advisor) et al—The DIAMM Project and what we hope to gain from discussion with Workshop participants
- 12:30 **Discussion:** a first opportunity for participants to comment on the Project and present their own ideas of what they would like to see in the way of development
- 13:00 LUNCH (light 'working' lunch in St Cross College)
- 14:00 Four short informal presentations (10-15 mins) by workshop participants, describing particular issues that have arisen with their own online projects, matters that they have discovered are important or annoying when using an online resource and their own perspectives on making material available online.
Sarah Wickham
Meg Twycross
José Luis Esteban
John Rink (may be moved to a different time)

- 15:00 **Breakout sessions:** The workshop will split into two groups (technical, chaired by Harold Short, and 'academic' chaired by Julia CMcF) to consider more specific questions and ideas on the online presentation of DIAMM materials.
- 16:00 **Reports** on the breakout sessions and discussion between the two groups
- 17:00 End of the first day's session.
- 19:00 **Dinner** at 'Baby', Walton Street (a short walk from St Cross and Rewley House)

FRIDAY 28 NOVEMBER

- 10:00 Coffee and commencement of sessions
Short presentation on key issues regarding copyright materials relation to the DIAMM Project
- 10:15 **Presentation/discussion:** Charles Oppenheim & Simon Tanner—dealing with copyright issues when presenting materials online; right protection and image protection; catalogue metadata
- 11:00 **Presentation/discussion:** Ichiro Fujinaga (& Tim Crawford)—what is possible in online music transcription and other music tools (followed by time for questions and contributions from other participants)
- 11:45 **Presentation:** John Bradley & Hafeed Walda—Pilot ideas for the DIAMM website and web resource
- 12:30 **Round Table discussion:** continuation and conclusion of any discussions arising from other sessions, a summary of the needs of DIAMM, the requirements of users, a 'wish-list' from and for the development team
- 13:00 LUNCH (light 'working' lunch in St Cross College) and END

Introduction

The meeting held at St Cross College, Oxford, on 27-28 November 2003 by DIAMM was funded as part of the Andrew W Mellon Foundation pilot project to scope new methods for the delivery of images of medieval music currently held in the Archive, and to scope new tools for access and exploitation of those images by scholars, students, and anyone else who wishes to use them.

Brief description of DIAMM

The DIAMM project was originally conceived as an archive only, hence its name. Phase One was established in 1998 to gather a specific corpus of 15th-century British polyphonic fragments intended for a facsimile publication, but early studies showed that there was much to be gained from obtaining high-resolution digital images in preference to slides or glossy prints. This was not only because of the evidence for growing exploitation of digital resources at that time, but also because many of these fragments were badly damaged and digital restoration offered opportunities not possible with conventional photography. Fragments of medieval polyphony are scattered throughout the world, in libraries, archives, churches and other institutions large and small. These fragments were sometimes palimpsest or had been otherwise reused during their long history, and had almost always suffered damage. They represent a valuable corpus of evidence for musical culture of the 11th to 16th centuries, as well as a rich resource for historiographers and literary paleographers.

The primary aim of Phase One was to capture the manuscript images at the best quality possible using high-end digital imaging equipment, set up according to the most rigorous professional standards; to archive the images in an uncompressed "raw" form; to employ image-processing software to enhance copies of the archived images in order to extract every possible piece of information from them and improve legibility; to preserve all these images—archive and derivative—for the long term; and to publish the results and report on our findings to the wider scholarly community. Internet dissemination of the images themselves was not envisaged (very few scholarly projects at this time even had a website, and scholars were not seriously considering the internet as a research medium): where they were to be used for publication, this was to be in facsimile volumes such as the Early English Church Music (EECM) series, Published by the British Academy.

Images are scanned (or captured) directly from the original manuscripts rather than from photographic surrogates, since this ensures colour control and sharpness of the image without interim stages introducing inaccuracy or extraneous colour information. Although some libraries were willing to scan their items on a flatbed scanner this in some cases the constraints of travel (e.g. for one leaf in Estonia) or because of library policy that prevented DIAMM working in the library, some images were scanned from large-format transparencies. Capture is done either by the project's research officer or, in the case of larger institutions, by their own digitization service, to the project's specifications. Working images accessible via the website are currently made available by the Performing Arts Data Service (PADS) of the UK Arts and Humanities Data Service (AHDS), and Long-term archiving facilities are provided

at present using a Hierarchical fileserver system maintained by Oxford University, with the expectation (at present) that they will ultimately be stored by the AHDS.

Phases Two (1999) grew out of the discoveries made in Phase One: part of the Phase One remit had been to explore possibilities and develop techniques for digital restoration or enhancement of digital images of the most damaged sources. The quality of the results far exceeded expectations, both in the increased legibility of text previously only partially visible, and in the discovery of new material that had hitherto been completely obscured, even under ultra-violet light. At the same time, the aspects of 'rescue' and preservation that the archive offered had become manifestly more important. The emergence of the the internet as a research resource during the life of the Project necessitated changes in policy and purpose so that, thanks to the support of the contributing institutions, all the images captured in Phases 1 and 2 (English fragments) were made accessible via the Project's website, a system not originally intended for the delivery of items in this quantity and size.

Having achieved and exceeded the aims of Phases One and Two, with the collection of English fragments, the Project was extended into a third phase to begin the collection of fragments in mainland Europe and the capture of complete MSS in the UK. Thus Phases Two and Three had initially the same broad aims as the Archive aspect of Phase One, but embraced a wider range of material derived from sources throughout Europe, the USA, and elsewhere. In some libraries where fragments exist the project has been allowed access to complete manuscripts and these have been captured alongside the fragments.

Data management

The project database, set up during Phase One, was conceived as an internal tool for the management of the images and information about them. It was designed and developed by the project officer. The website was developed as an information service about the project, not a delivery system, but demand from scholars who knew of the work of DIAMM and wished to have access to the images even before the completion of the archive led to the inclusion of low-resolution copies of the large TIF files in the web area, but protected behind a password portal. The images were large enough to allow quite detailed study, and presented in .pdf format. This had two advantages: first, users could zoom and rotate the images and second Acrobat allowed low-level encryption that prevented users from printing or cutting and pasting. The combination of this security measure and the password portal provided a level of reassurance to libraries that their images were not going to be misused or that their copyright status would not be abused. As a result many archives who would not normally have done so allowed the delivery of their images on the internet. This move was particularly notable since for most of the libraries there was no precedent for this decision, and at the time many did not have access to the internet either for staff or for users, Images made available for delivery in this way are currently mounted by the Performing Arts Data Service (PADS, which is part of the UK's Arts and Humanities Data Service (ADHS), and linked to from the project web site (<http://www.diamm.ac.uk>). With the growth in this resource the amount of web server space designated for DIAMM images has far outstripped the resources that PADS or DIAMM had anticipated being devoted to this aspect of its work, as well as straining the resources of what is essentially a non-delivery service. Because of the age of the PADS servers and the need for firewall security DIAMM personnel could not have direct access to the password encryption files, nor could they update image files, so maintenance of the website was extremely unwieldy and has fast become impractical.

Progress of the project

Progress on all three phases of the project has been excellent, with all the aims achieved as promised to the AHRB. Indeed, the project has exceeded these aims in that it has been able to also capture significant complete manuscripts in some archives, as well as the fragments. Archives in the UK have been generally more amenable to the project putting images on the web than institutions in other countries, though as the internet became more widespread as the project progressed libraries were increasingly able to put the images on their own websites (though few have in fact done so in practice) which made them less interested in the secure web delivery resource offered by DIAMM. The project has found that seeking non-exclusive rights has been a very important factor in gaining access to the sources in libraries and archives. One problem that the project has found has been the assertion of rights to acknowledgement—DIAMM images are now being used quite widely by scholars, but it is the libraries that are acknowledged alone, and the expertise of DIAMM in photographing the images and supplying them to the library for their free use is often forgotten. Acknowledgement of the work of the project is essential to future funding applications, but is also a necessary part of acknowledgement and appreciation of current funding.

Main aims of the scoping study

The main aims of the present Mellon-funded project are:

- 1) to re-engineer the project database and web site, in order to produce a better means of delivering current images and metadata;
- 2) to investigate in more detail than so far the rights management issues of making images more widely available, taking into account the far wider use of the internet now prevalent and the prospect for this becoming a major research tool;
- 3) to scope a range of tools and techniques for the exploitation of DIAMM images and as far as is practical to generalize these to other repertories or corpora, both within and outside the discipline.

- 4) To explore the needs of the scholarly community regarding research tools for the exploitation of this type of resource, and specifically the DIAMM collection.

Julia Craig-McFeely

DIAMM

This presentation outlined the aims of the DIAMM project from its inception, and the aims of the current pilot project, as outlined above. There was then a good deal of background discussion of key issues, a particular concern was how to bound both the current pilot and any development project that grows out of it. On the whole, participants felt that the addition of sound to the Archive or the delivery system was probably cosmetic for scholarly work though possibly useful for teaching purposes. OCR was rejected too as out of the question with the kinds of materials that DIAMM deals with though it was noted that software exists that would clearly be able to handle transcription of the more legible of the sources (see Ichiro Fujinaga below); it was pointed out that painstaking transcription was a more likely need for the fragments since they are nearly all damaged and almost all have 'unreadable' areas, and areas of dirt or damage that would confuse OCR software. It would not be the task of a project such as that being scoped here to provide transcriptions, but to provide a) better access to the sources (both enhanced by DIAMM and untouched); b) tools for increasing the legibility of those sources to facilitate their study and/or transcription by scholars; c) other tools and a rich and diversified working environment that would enhance the process of study and enable a wider appreciation and understanding of the sources within a single web resource, i.e. by providing complementary data (e.g. catalogue descriptions) and online study and transcription tools that might otherwise have to be found elsewhere or would be unavailable to scholars.

The general view of the meeting was that the pilot project should be as broad in scope as possible and that nothing should be ruled out of bounds initially. The Mellon Foundation has a significant interest in this area, and it is perhaps for them to rule things in or out of scope—certainly in terms of their funding intentions. In particular, it is important to scope tools that can be generalized to other repertoires or corpora, so the audiences should be considered not only in the context of the DIAMM project itself but also in the possibilities for broader applications. Input from scholars in complementary fields was very much appreciated in this context, as was the expertise of the team from CCH whose involvement in such a variety of digital or digital-delivery projects gives them a uniquely broad perspective.

There was some discussion about what libraries should provide to users of digital images, and what projects like DIAMM should provide. It is the libraries' job to provide sources but not necessarily to provide tools for scholars to exploit those sources. Nor is it necessarily the remit of resource-limited libraries to provide users with access to their images online, particularly where this would require considerably more maintenance and server space than they would otherwise require. We need to remember that libraries are still 'real space' resources and most of them provide a web service only to guide the public to their premises and give some idea of the materials and collections available. The service that DIAMM can provide in making materials available online is one that is unique, since it is not dealing with a single collection, but rather a series of very diverse collections and owners from the private owner to major national institutions, from the single treasured possession of an almonry or tiny regional record office, to a minor holding in a large research institution. The complexities that this diversity causes in terms of agreements will be dealt with in a different workshop, but should always be borne in mind, since every contributor to the archive has a slightly different agenda and understanding of the issues that need to be raised.

One of the issues that a cross-disciplinary project like DIAMM will need to grapple with is how to display sources that does not come from its own archive. As the web matures and smaller libraries begin to make high quality images available themselves, tools which can interoperate between a variety of different sources will be necessary. This is discussed in more detail below.

At the moment, DIAMM is providing the images, and so needs to present librarians with mechanisms that will make them feel safe about their rights and their control over their images, such as passwords, watermarking, etc. It is also important that the integrity of the primary source is preserved; it should always be made visible in a faithful rendition of the original, however compromised that original may be. Enhancements can be provided alongside that faithful original, but it must always be remembered that any enhancements are subjective. DIAMM should always be presented as a serious scholarly endeavour that respects the integrity of originals. That will increase its visibility and help ensure that we get maximum participation from libraries, archives, scholars and others. There was also some discussion about sustainability. This is very difficult to achieve when funding is project-based rather than institution-based

Work on the scoping study so far

A prototype of the new database is now available on a test website, and some experimentation with viewing tools has been done. Zoomify, a viewing tool that allows users to zoom in on much larger images than have hitherto been practical, delivers larger images by only bringing down the pixels being viewed, rather than having to load the whole image before it can be manipulated. Zoomify allows a reasonable level of encryption, and it is not possible to download the whole image, since the display is constructed by breaking the large image into multiple tiny portions and then reconstructing them as needed in the viewer. The process of 'Zoomifying' images (i.e. breaking them into manageable segments) also involves compression. In theory any size of image could be accessed via the web portal, with no significant waiting time for the image to download, including the largest 240 MB images. However this

resolution is not necessary for 99% of online work, and we have decided on a maximum size of 100 MB for images, which when 'zoomified' yields file sizes of approx. 20 MB per image.

Zoomify uses *Flash* viewer, which is installed as a default in many mainstream browsers and operating systems. This means that most users will not need to download special software to gain immediate full use of the website, and any software needed will be free. The Project has maintained since its inception the necessity for using mainstream software applications that have strong application support and a strong commercial base. Our reasoning is that continual development of the software will ensure that it remains up-to-date with changes in operating systems, and also that it will be widely available for the DIAMM user-base. Since *Flash* is fast becoming (?has become) a 'standard' application, this aspect of Zoomify makes it extremely attractive to the Project.¹

The Zoomify viewing window is fixed in size and contains a thumbnail that indicates which portion of the whole image is showing in the display window. Although designed as a navigation feature, this effectively makes screen-capture prints less useful. Testing has so far been undertaken using a freeware 'lite' version of the application. The 'Pro' version of Zoomify offers several annotation tools, and having established that the speed, efficiency and type of delivery are appropriate to our needs, our next stage of investigation will be to buy the full version and explore the extent to which the annotation tools may be adapted to meet the needs of DIAMM users and the requirements of the project team. This is still under testing. The database takes its content from the DIAMM database (which currently exists in FileMaker Pro) and the XML export 'engine' designed by CCH constructs the HTML, generating thumbnails, workable images with copyright statement attached and metadata on the fly.

Sarah Wickham **CHURCH PLANS ONLINE**

www.churchplansonline.org

Sarah Wickham then gave a presentation on the Church Plans Online project, funded by the New Opportunities Fund (the main focus of which has been to increase access to a wide range of British materials through digitization) and based at Lambeth Palace. Church Plans Online was a project aimed at digitizing the archive of the ICBS, an Anglican society responsible for the restoration of churches since the early 19th century (1818), and which had plans and drawings created for the restorations. The archive consists of 16,000 files, 20,000 applications from churches and totals 21 cubic metres of archive space. The cataloguing took 10 years, and provides a unique record of 19th and 20th century architects and architecture. The cataloguing was done with external funding provided by the Leverhulme Trust, which meant that the existing index cards could be transferred to a database.

The archive is a rich source of information for historians, family historians, and architectural historians, so the NOF seemed an appropriate body to approach for funds. The project could not have been done without public funding, but this can bring in other agendas, such as packaging materials appropriately for user access, and in this case obtaining specific funding for the transfer of the card catalogue into the electronic medium.

The project started in July 2001 and finished in 2003. The main reason for the rapid completion is that the archive already had the catalogue and metadata available: this project pioneered the use of computerized catalogues at Lambeth Palace.

Issues

1) Copyright

There are 12,300 drawings in the archive and most of the 20th century ones are in copyright. 600 people were written to to seek permission to scan, after considerable research into who owns the copyright. Nearly 300 copyright holders were found. They were all very pleased to be asked, and all but one agreed to the request for scanning.

2) Preparation

Extensive tests were carried out on handling and locating materials in preparation for digitization: this took twice as long as taking the pictures, as it included calculating the variations in time to access sources depending on the person

¹ The Project was approached in March 2004 by a company that wished to form a partnership with DIAMM to promote their software: the software purported to be a compression protocol that allowed much larger images than usual to be delivered via a website, and offered a high level of security encryption. Unfortunately it did not meet any of our requirements, nor did the developers appear to understand that an image must be decompressed in order to view it. Rather than reject the product out of hand, it was investigated far enough to ensure that it was not appropriate to our requirements. Technical problems aside, the images compressed with this software could not be viewed without the user purchasing the product. Longevity of the software seemed extremely doubtful since it was not able to deliver what it was aiming for, and the developers seemed to have been unable to sell it to any user whose demand for it would ensure its survival and future development. See report undertaken by Alan Lock.

collecting them, as some would have to climb on ladders, where others would have been tall enough to obtain the materials by reaching. Although apparently a minor item, those attending the meeting felt that this level of time-and-motion study was extremely unusual in a digitization project and showed a much broader appreciation of the cost and effort involved in digitization than is usual. The result of this level of detail meant that the project was completed exactly on time and to budget.

3) Collaborations

NOF felt that it was highly advantageous to have funded projects collaborating, and so the project was teamed with the SINE project who did much of the technical work. However, it was not always easy to co-ordinate and communicate within the collaboration, and problems arose such as plugins not working properly. It was also a problem not able to have local control over systems, a difficult that has also been encountered by DIAMM with its web delivery currently split between Royal Holloway, London (the 'front end of the website') and the performing Arts Data Service in Glasgow, from where the images are delivered. Archiving and all other work takes place in Oxford.

Other collaborations were more fruitful, such as that with the Society of Antiquaries, who allowed some of their holdings of plans to be incorporated in the project, which meant a virtual reuniting of some of the archive materials that had been separated for over a century.

4. Scanning

Testing showed that it would be impossible to use a scan back camera because of vibration caused by the wooden flooring. A single shot Power Phase camera was chosen. This was partly established during the visit of the DIAMM team to photograph an important music MS in the Palace Collection. The equipment was set up five times in different locations, but in each it was found that the proximity of heavy traffic on the road outside meant that all the old buildings vibrated each time a bus or lorry passed. The only parts of the buildings where this was not the case were public access areas, and therefore unsuitable for the establishment of a semi-permanent photography facility.

Problems

1. User expectations of digital projects can be huge, with a call for completeness and a desire to have everything at their fingertips. This is also a key issue for DIAMM as for all projects: how do we either meet expectations or scale them down.?
2. Users will not read introductory text and want to be able to access everything without any investment of time in learning about the system. This makes the delivery of complex materials difficult, problems that would be exacerbated by the addition of the sophisticated and probably relatively complex scholarly tools envisioned by the DIAMM project;
3. The funding had to be supplemented with considerable internal resources from Lambeth palace;
4. It is difficult to prioritize collections and target them to specific users; what has been digitized for this project is a very small proportion of the total holdings of Lambeth;
5. Sustainability: once grant funding has run out, it is difficult to sustain long-term access to the materials developed—especially as hardware and software becomes obsolete. It is also difficult to budget for sustainability as technology and the cost of this aspect changes far too fast to enable project managers to make a reasonable projection budget.

As a librarian and archivist Sarah was able to provide the meeting with the perspective of the contributor to the collection, and she suggested that the issues of concern were, in some cases, not those that we might have expected. For example, her perspective was that rights issues were less important than we realized to the archives, since a) the amount of investment needed to seriously exploit an image (e.g. make place-mats out of it) made that an unlikely problem and, quite apart from that, the materials in the DIAMM collection were far from suitable for any sort of commercial exploitation. She agreed that acknowledgement of the owner of the source was important, but she brought up an issue that we had not considered before: the primary concern of a library is that their sources are not *misrepresented*. This includes not only collage-like rearrangement of the matter but also the sort of restoration procedures that DIAMM might envisage as necessary for reading the document. If a scholar sees only the 'clean', restored image s/he develops an expectation of what the original document looks like. If s/he then visits the document s/he may feel that the reality of its condition was due to mismanagement on the part of the archive. Thus if any 'restored' version of the image were to be offered for study it should be secondary to the representation of the true state of the document. Likewise, a problem already identified by DIAMM is that in the digital medium the delivering agent (in this case DIAMM) has almost no control over the way in which the end-users (scholars and other archivists etc) see the items. In a facsimile the colour and image quality is all controlled by the delivering agent, the publisher. They ensure that the most colour-accurate and clear image reaches the end-user. When delivering via the web this control is lost, since most monitors are sold mis-calibrated, and some operating systems default to 256 colours rather than the smooth and more subtle 'millions' of colours in the high-resolution setting. Poor colour calibration and monitor resolution not only misrepresents the source, but also misrepresents the quality of the images being delivered. This aspect of the rights of the library would need to be considered carefully in any redrafting of the DIAMM Licences.

Professor Twycross explained that her use of digital images was largely for personal research and teaching, especially the teaching of palaeography and codicology. Digital resources are excellent for uses where the source material is visual: a picture really does save many words. For palaeography, it is possible to build entire alphabets of letters, abbreviations, and to discuss the layout of pages and the makeup of a book. Large, high quality images are needed as it is necessary get down to the level of the individual letter.

Professor Twycross then discussed a telling example of why facsimiles are better than transcriptions: the York Ordo Paginarum, a fifteenth century manuscript that has been added to and annotated many times. A transcription of a source as complex as this is heavily interpretive as there is no one 'right' transcription. It is therefore always going to be better to provide good quality page images and let scholars and students work from originals. These can be supplemented by transcriptions, but transcriptions cannot stand in for the originals. Professor Twycross is making a great deal of use of digital facsimiles in her work, and would like to make more.

Most useful was her demonstration of the types of annotations that we wanted to make on her documents to indicate items of interest or problem corners to her students: in particular it was clearly useful to have a variety of colours available for drawing boxes around material, to indicate different types of problems or different types of annotation. It would not have been sufficient simply to provide a 'point marker' for the item, as the specific dimensions of the area under discussion were highly relevant. It was also useful to be able to use different shapes for the same purpose of differentiation, but also because flexibility in the area selected was necessary.

In some cases the comment required merely a text annotation, but in others it was necessary to paste a character or cropped area from another image, or another part of the same image. Similarly it would be useful to be able to insert a URL or tag that would take the viewer not just to another image, but to a specific point on the page of that image, where a corresponding annotation had been made, or to an enlargement of that area of the page.

There was some discussion of possible tools that Professor Twycross might find useful, though most of her work is done using Photoshop. The effect on developments in this area of the advent of the web was also discussed, and opinions expressed that the web has actually cost us 10 years of functionality in pursuit of interconnectedness. Some of the things that we are trying to pursue now were possible in the early 1990s using tools such as Guide, Hypercard and ToolBook. Also discussed was the use of automated techniques for text and symbol capture. Research on handwriting recognition is now fairly advanced with the advent of Tablet PC technology, but for earlier manuscript hands this is unlikely to yield much fruitful progress for some time yet.

Charles Oppenheim and Simon Tanner

COPYRIGHT AND OTHER IPR ISSUES

A key question discussed here was how to make images available online and also protect libraries. Professor Oppenheim outlined some changes in the law in a recent EU Directive that gives explicit protection for copyright management and technical protection methods. It is now an offence to delete or amend copyright management signs or to subvert or evade technical systems, and perpetrators of this can be sued.

There was some complex discussion of what materials of interest to DIAMM and similar projects are likely to be in the public domain, and therefore not subject to copyright. Professor Oppenheim explained that if material is unpublished, whether the creator is known or not, it remains in copyright, though it can be impossible in practice to know who the rights owner might be. What, in these cases, is the definition of 'published'? There is a need to make copies to fulfil demand in order for an item to be considered published.

What rights do libraries own?

Property right is different from *copyright*. Even if a person or institution owns the item, they need explicit release from the copyright owner to transfer rights. The owner of the physical object, if they also own the copyright, can do whatever they want with that object. If it is private property they can stop copies being made or they can make copies themselves. A new copyright arises here in the UK for digital images, but not in other countries, where there must be proof of some creativity in the process of copying for a new copyright to exist. If they make a copy, a library can do what it wants with the new copyright. However, if the scanning is done by a freelance, the library must make sure it obtains a release in order to own the rights. The issue of acknowledgement for DIAMM was discussed, and Professor Oppenheim recommended that there should be a clause in the license for libraries that DIAMM be acknowledged by both library and users. It is also important to be clear (and to state clearly) what uses can be made of images, and what charges can be made for those uses. One possibility is that libraries could impose a technology or ask DIAMM to impose a technology to track provenance of images.

General rights issues

Professor Oppenheim discussed some recent marginal infringements, such as the case of a photographer who took a photograph of the Guggenheim Museum in Bilbao and put it on his web site. It was a questionable issue of what rights were being infringed, but he agreed to take the image down.

There was also some discussion of third parties and what they can do with images. If for instance someone purchases a microfilm, passes it to a friend, then this is digitized by the friend, the friend is infringing and can be sued. Also, the person who supplied the film can be deemed to have authorized the infringement and can also be sued.

One issue for libraries is that of patrons infringing copyrights. It is the individual who copies something and makes it public by, say, putting it on the web who is infringing. The library is not liable, but must warn all patrons that they must abide by copyright laws and that infringement will be punished. US law DOES permit copying for educational purposes, so if something is put on the web by a US library that may not be infringement, but if it is READ in the UK, that is infringement, but this is very hard to enforce.

Given that people will (and do) infringe, how can the trust of libraries be retained while allowing accessibility for reasonable use? It is important to be fairly specific about what uses are acceptable, for instance, what is 'personal use'? what is research? In the scholarly environment, infringement is often unwitting and may not overly concern the rights owner. Copyright protection doesn't really work here, but there is a necessity to educate users.

Protection issues can be put in place preventing people from wholesale copying, for instance of all images in an institution or of a whole database. If the copying is made difficult to do, very few people are going to spend a lot of time getting around the protection. Watermarking is a possibility: visible marks make it clear where the rights lie, but for images such as produced by DIAMM this would compromise the image.

Is it likely that DIAMM or libraries would chase people? Invisible watermarking provides a means, but is it worth doing? The security on most invisible watermarking can be breached if the breacher is not bothered about true fidelity to the original. It may be better to make a transactional paper trail. The reality is that infringement happens all the time and is costly to chase. In the scholarly and library world, the legal costs will far exceed any loss. It is important to decide what is an acceptable level of abuse.

DIAMM issues

Should we be moving towards institutional licenses rather than personal? This reduces transactions and can be easier to manage. What kind of offence are we concerned with? Is clicking an 'I agree' button legally binding? Professor Oppenheim explained that this is ambiguous as there is no signature. The Act of 2000 permitted electronic contracts to be legally binding only with high level encryption.

There needs to be a balance about how many barriers to put in place. Libraries are very concerned about being sued. DIAMM needs to plan a workshop with libraries in order to work on these issues.

Ichiro Fujinaga

GAMERA, AN OPEN-SOURCE XML APPLICATION FOR NOTE-RECOGNITION

Ichiro's development of an open-source XML application, GAMERA, shows how much can be done in providing scholars with transcription and other manuscript study tools. In particular the application of shape recognition to individual sources. GAMERA is a trainable application, and can be used to recognise ANY shapes, from lute tablature to Greek manuscript texts, and embraces one-off handwritten plainchant neume notations. Apart from explaining the uses and programming of GAMERA, he also surveyed searchable databases related to sheet music collections, examining search parameters and discussing searchable items that users may wish to access. Its first task involves the transformation of the source to bitmap so that grey or halftone elements in the image caused by show-through are removed. This has to be done at a definable cutoff point to ensure only unwanted material is removed, leaving the relevant material behind, so the user has to define at what point in the grays pixels below that value should become white and those above should become black.

Having created a 'clean' image with which to work, Gamera is then programmed to remove the staff lines, as these are irrelevant to the note shapes and can confuse the recognition of shapes. Once this is done the software is given sample shapes to define, and it then searches the text for similar shapes. Where those shapes are very close to the original they appear in one colour, but if the software is unable to make a definite identification it places the new shape in the category closest to the shape it is attempting to define, and the user then corrects or confirms the definition, thus 'teaching' the software. Since there is no pre-defined set of shapes or notes, this recognition activity can be extended to any more-or-less regular text, either printed or handwritten.

The application of Ichiro's software development to the DIAMM images would mainly be in the area of searching the documents. Most of the music in the DIAMM archive has not been transcribed, partly because of the quality of the sources, and there is no suggestion that automated transcription would or should be a practical offering on a website. However there is a potential for the shape-recognition aspects of Gamera to be applied in constructing a searchable database of note-shapes drawn from the DIAMM resource. Although not particularly useful in many repertories, the specifics of note-shapes in the early fragment repertory have formed the basis for many crucial studies in filiation and in reassembling dismembered manuscripts from very disparate surviving elements.

Clearly GAMERA is under development, but it seems to have reached a considerable level of maturity, particularly as it is now cross-platform, and functioned equally under the PC or Mac umbrella.

SUMMARY: DIAMM technical issues and general questions

These issues covered in the workshop were subject to a great deal of discussion, and what is reported here is a superset of what we may be aiming to do over the next 2-3 years. Many of the tools and techniques discussed are fairly generic and so would be applicable for other projects or source materials. Exploration over the next few months hopes to answer some of the issues raised by the workshop. Some of the questions asked (while looking at the current DIAMM web site) were:

- 1) What items would people want to search on?
- 2) How should the mss be presented?
- 3) How should the relationship between image and text be handled?
- 4) Should we show thumbnails straight away?
- 5) What about marking images at thumbnail level with check boxes just to look at some of the items?
- 6) Should the colour patch be in a different place?
- 7) A click on captions should bring up detailed metadata—this is coming soon.
- 8) Can images be laid out in columns?
- 9) Is it possible to type ms shelf mark into a box in order to retrieve that item?
- 10) Should supplementary images be linked from the metadata page?
- 11) We need a signal that there are UV and restored images available.
- 12) People searching generally want free text
- 13) Church Plans Online used as many pick lists as possible.
- 14) How do you help people who have not got any results from searches?
- 15) Should there be different levels of usage provided? Beginner, intermediate, expert? Transparent, translucent, opaque?
- 16) Do we offer descriptions or transcriptions of textual materials? RISM doesn't provide descriptions of the text.
- 17) Need to provide bibliographic data.
- 18) Should we make all image metadata available?
- 19) What about technical metadata? Is this just for people who want to know about the methodology?
- 20) Need a facility for users to download metadata and print off as a PDF.
- 21) Should scholarly/manipulation tools be web based or in a local work area? Or both?
- 22) Do scholars want info here or will they go to other paper or online resources?
- 23) What tools are needed for annotation? Look at the work done by the BNF on annotation tools in the library. But this is not web-based ...
- 24) What are the issues around annotation of in-copyright materials? Become joint copyright owners. Producer of annotation needs to give permission for annotations to be made available.
- 25) How will we manage the annotations when we have them? What will people do with them?
- 26) Searching of annotations: how will the machine help to sort/select them?

- 27) Will annotations be made public? What is the value of annotations for the users?
- 28) Will we provide a collaborative work space which might be restricted to certain individuals or groups?
- 29) We need to provide a facility to display different interpretations. Not just annotations but also transcriptions.
- 30) Will there be a facility to put up different restorations? Can the users work on these and upload them?
- 31) Scholars work in communities which may be international. Would there be a small circle which would have access to the latest transcriptions?
- 32) Would it be possible to have user-groups defined so that defined groups of scholars could access each others' online work without making it public?
- 33) A transcription tool might be built which could take existing transcriptions.
- 34) Sources of funding: Mellon, JISC, AHRB—note the new programme on ICT in the Arts and Humanities headed by David Robey. Also note a new EPSRC initiative on culture and creativity. A number of participants offered suggestions of funding sources.
- 35) Technical environment: MET'S would be the ideal environment to use for annotations system. Note also MusicXML.
- 36) What do we want users to do? Access catalogue data; search; find an image; zoom; blow up parts of the image without losing the main image; return to a list of mss without viewing an image; bring up a related ms; go to look at RISM catalogue entry; add a sticky note—perhaps have an URL link within a note that can take you off to somewhere else; use enhancement tools for images so for example contrast could be changed; a pixel selected to make it darker or lighter.
- 37) Do we want at some point to provide a bulletin board as part of DIAMM?
- 38) Teaching: virtual classrooms?
- 39) How do we preserve the materials? What are the issues of sustainability?
- 40) Make sure durable standards are used.
- 41) Establish a dialogue with major archives and libraries to formulate an agreement that allows a) wider access for users that does not require a password and b) a certain level of discretion for DIAMM to give permission of use of images without reference back to the library. This would need both an exploration of what the libraries want, AND what DIAMM and its users want, together with what is practical and taking account of the realities of copyright protection and levels of infringement.