The Centre for Digital Heritage was established in 2012 to provide a focus for researchers from across the University of York with an interest in all fields of Digital Heritage, including data management, analysis, and visualisation.

It brings together staff from the Departments of Archaeology, Computer Science, Electronics, History, Sociology, and Theatre, Film and Television, as well as the Humanities Research Centre and the Borthwick Institute for Archives.

The Centre undertakes ground-breaking research and knowledge exchange in:

- mobile applications for cultural heritage recording and presentation
- data mining and information extraction, including natural language processing, to analyse, index and interpret cultural heritage texts
- augmented reality and virtual reality modelling, including both acoustic and 3D modelling, of cultural heritage resources
- the impact of digital media on the public interaction with cultural heritage, both tangible and intangible
- the use of digital media (including Internet and computer games technologies, and video and sound) for the dissemination and publication of cultural heritage
- data and information management and preservation of digital data

Since its inception the Centre has become a national leader in Digital Heritage with current projects including research into natural language processing, data mining, image recognition, 3D modelling of archaeological excavation data, photogrammetric recording, acoustic modelling, social media, mobile apps, archive digitization and interactive heritage games.

To find out more about CDH research at the University of York I invite you to turn to pages 6–11.

Professor Julian Richards
Director, Centre for Digital Heritage
An International Partnership

In 2013 the Centre received funding to extend its reach and by developing a collaborative international research centre with partners in Aarhus (Denmark), Leiden (Netherlands) and Uppsala (Sweden). Since then the Centre has moved from strength to strength and we have recently welcomed Lund University (Sweden) and Zhejiang University (China) to our network. The strength of our international network further strengthens our ability to undertake collaborative international research in the field of Digital Heritage, including the application of Information and Communication Technologies to the understanding and presentation of heritage.

Our international network provides a unique range of opportunities to researchers, students and partners. Collaboration in research, consultancy, and the supervision of students means that we are able to draw upon an exceptional breadth of expertise and experience. While the majority of this brochure is dedicated to research based at the University of York we want to take this opportunity to introduce you to our partners.

Aarhus University

Our connections with Aarhus University are based upon a long history of research collaboration between Centre for Digital Heritage partners. As a leading institution in the field of digital archaeology our partners in Aarhus bring an expertise in the management, analysis and representation of archaeological data. We work particularly closely with the Section for Prehistoric Archaeology and Archaeological IT both of which are situated within the Department of Culture and Society.

We have recently welcomed Peter Jensen and Tara Copplestone our first co-supervised Aarhus/York PhD students to the Centre for Digital Heritage community. Our annual international conference was held in Aarhus in 2015. These activities are just some examples of our dynamic and fruitful collaborative relationship which will continue to grow during the coming years.

Researchers at Aarhus are conducting a range of leading Digital Heritage research and have a particular focus on digital site recording and 3D documentation.

As part of his joint CDH PhD with the University of York Peter Jensen is developing data models to assist in the management and representation of complex data from archaeological fieldwork. His work will allow archaeologists to straightforwardly incorporate 3D and other complex spatial data into their analyses.

His work is built upon a significant history of involvement in 3D site recording at Aarhus University. Current research involves the documentation of archaeological sites using structure from motion technology. Having completed successful pilot studies at Jelling and Alken Enge the technology will now be rolled out further in conjunction with researchers at the Moesgaard Museum.

Uppsala University

Uppsala University have been a key partner in the Centre for Digital Heritage since
its inception. Centre for Digital Heritage members Daniel Löwenborg from the Department of Archaeology and Isto Huvila from the Department of Archival, Library, Information & Museum Studies at Uppsala have an expertise in heritage data management, digital spatial analysis, 3D computer graphics and data visualisation. We are also collaborating with Marike Hedin from the University’s Museum Gustavianum and Per Cullhed from the University Library to develop a wide programme of digital humanities research relating to digital collections.

We are working closely with Uppsala University Innovation on developing techniques for measuring the economic and social impact of Digital Heritage research.

One of Uppsala’s major Digital Heritage projects is investigating the use of augmented reality and locative media at Gamla Uppsala. The archaeological site of Gamla Uppsala has seen a considerable amount of research over the past centuries. Although there are still many uncertainties, the increasing amount of archaeological activity in the last few years has provided a more detailed understanding of the site. Together with experts in computer graphics, the department of Archaeology and Ancient History are now developing an mobile app that uses GPS position and compass to provide the user with a “window to the history”, where reconstructions can be presented in the actual location in the landscape. With further development, it will hopefully be possible to interact with the virtual environment, and use it as a platform for telling the story of the site and its history.

**Leiden University**

Leiden University has a history of innovation in the application of interdisciplinary and digital approaches to the study of the past. The Centre for Digital Heritage team in Leiden is led by Hans Kamermans and Milco Wansleeben. They have an expertise in digital research methods in archaeology and heritage management, including GIS and text mining.

**Lund University**

Lund is the latest addition to the Centre for Digital Heritage and bring with them an expertise in archaeological computer graphics and visualisation. Our collaboration with researchers at the Department of Archaeology and Ancient History is led by Nicolo Dell’Unto and centres on data visualisation and the use of augmented/virtual reality.

The Lund group are currently embarking on two major new research projects; *Pompeii – a 3D Revival* aims to investigate, document and visualize Pompeian architecture by means of different types of 3D-models while *3D GIS: a Research Platform for the Development of New Research Methodologies for the Documentation and Analysis of Archaeological Sites* aims to develop of new methodologies for the systematic generation of 3D models in support of archaeological practice.

**Zhejiang University**

Zhejiang, just 30 minutes by high-speed train from Shanghai, is a leading Chinese university with a strong emphasis on science and technology. The Cultural Heritage Institute undertakes research and consultancy in digital imaging and visualisation and develops new technologies for heritage recording. It has recently completed a major project to create a high resolution digital record of Buddhist cave art in China, including the production of a full scale replica of one cave.
Fieldwork and Documentation

Fieldwork and documentation form an integral part of Digital Heritage research. From recently excavated prehistoric urban landscapes to medieval coins which have travelled across Europe, the CDH specialise in the recording and analysis of a wide range of historic material. We work with specialists from across the world to develop new recording technologies and approaches to documentation.

The ADS 3D Viewer: a 3D web-based dynamic working environment for the analysis of archaeological data – Fabrizio Galeazzi

Archaeologists increasingly use 3D technologies to record on site, but there have been very few tools available to help visualise, present and archive their work. We are working with the ISTI – CNR Visual Computing Laboratory in Pisa, Italy to adapt a 3D Viewer to provide a 3D web-based working environment for the management and analysis of archaeological data. Our viewer is being designed and tested with the Archaeology Data Service and allows users to browse 3D geometry directly in the webpage and see all the information related to the digital model.

Timing Things Right: stratigraphy and the modelling of intra-site spatiotemporality using GIS at Çatalhöyük – James Taylor

As well as using new tools we are also developing new digital methods for the interpretation and representation of complex cultural heritage data. Our research at Çatalhöyük in Turkey is one example of how we can benefit from innovative approaches to the use of existing technology. Recent fieldwork at Çatalhöyük has seen comprehensive efforts to digitise all the single context excavation data, with a focus upon full integration of all aspects of the digital archive into an intra-site GIS as an aid to analysis and interpretation. The aim of our research has been to visualize the complex stratigraphic sequence in a more dynamic and intuitive way which moves beyond conventional methods of phasing and periodization. The research uses deep analysis of conventional archaeological diagrams to extract a dynamic model of the stratigraphy of the site allowing researchers to examine the way the site changes in space and through time.
Visualisation

Digital visualisation is an essential tool in the study of the past. At the Centre for Digital Heritage we have wide-ranging expertise in this area with researchers from across the University undertaking innovative work. We are also championing the use of visualisation as a means of ensuring the social impact of research and are involved in a number of research projects which seek to push the boundaries of visualisation as a form of research publication.

The Centre for the Study of Christianity and Culture – Dee Dyas & Pat Gibbs

The Centre for the Study of Christianity and Culture (CCC) is based in the University of York’s Department of History and is a key member of the Centre for Digital Heritage. We have been creating interactive digital teaching resources and interpretation media for over 13 years.

We have produced four very successful interactive digital resources, combining expert but accessible, well-illustrated articles from hundreds of scholars with intuitive Adobe Flash-based interfaces. These resources – which provide essential cultural tools for the study of areas such as history, literature, archaeology, architecture, art and music – are used worldwide. The success of these resources has led to increasing involvement in multimedia site-based heritage interpretation. Working with cathedrals and parish churches across the country, the CCC is now a leading specialist in combining high quality academic research with cutting-edge 3D visualisation, interface design and mobile device technologies. Alongside these external ‘commercial’ partnerships, the centre is also involved in two major AHRC-funded projects, exploring the use of digital reconstruction as a research tool in the cases of St. Stephen’s Chapel, Westminster and pilgrimage to Canterbury Cathedral in the Middle Ages.

The CCC’s technical expertise is wide-ranging, focusing on 3D visualisation (3DS Max and Cinema 4D), touchscreen interface design (Adobe Flash/Actionscript), mobile device app design for iOS and Android and web technologies. The research and development of new interpretive media, including the utilisation of game engines and other interactive forms of presentation, is also key to the CCC’s ongoing commitments.

Digital Imaging for All – Gareth Beale

The advent of inexpensive digital imaging technologies has profound implications for the way in which we document and manage cultural heritage. At the Centre for Digital Heritage we are playing a leading role in advancing the use of these techniques and are helping to ensure that the widest possible community can benefit from their use. Research projects in the UK and Canada have worked with local communities to document and manage their cultural heritage.

The Re-Reading the British Memorial project works with local history societies and church groups to produce records of burial spaces which reflect the social history and interests of the communities within which they are situated. As well as producing a valuable record of ‘at-risk’ memorials the project also enables church groups to interpret and present the history of their community in their own way. Research in Canada seeks to apply a similar model by working with First Nations communities to document, interpret and manage rock art sites.
Sound and Heritage

Sound often takes second place to our more dominant visual sense yet has a significant role in conveying complex information for rapid assimilation by a listener. Speech and music are obvious examples of this, but in general sound can be used to create highly evocative, engaging and immersive audio or multimedia experiences, leading to new areas of research, and considerations in acoustic design.

Audio Lab – Damian Murphy

In the Department of Electronics Audio Lab we aim to develop a better understanding and preservation of our heritage by considering the sounds associated with specific sites and landscapes. The acoustic preservation of our heritage is just as important as any other more tangible property, as all such aspects are subject to, and will be affected by, the inherent nature of change in the lifetime of a site or place.

Our digital heritage virtual acoustics and auralisation research encompasses four main areas:

Measurement – where we acoustically survey an existing site, considering how it may have been used for a particular event or period. This process captures the characteristic sonic fingerprint – or impulse response – of a given site for preservation and analysis.

Computer modelling – allows us to imagine, build and interact with these sites in the digital domain.

Auralisation – alongside visualization, enables acoustic measurements or computer models to form the basis of an audio reconstruction and presentation so that we might place and manipulate any sound within a given space, and listen again to the echoes and resonances that are produced.

Experience – what can we learn about a site and the people who used it from how we perceive and interact with this virtual representation? More generally, what role do sound, sound-art and archival recordings have as a means to access, enhance understanding, or experience the diversity of our heritage?

Much of our virtual acoustics work has been made available online via the AHRC-sponsored Open Acoustic Impulse Response Library (OpenAIR: www.openairlib.net) and these results are now featured in diverse application areas, including music software, compositions, sound-art, heritage interpretations and computer games.

Considering sound in this way, through the use of acoustic measurement, computer modelling and auralisation, better enables us to develop a more complete understanding of the past – for one thing we can be sure of is that the past was not a silent place.
Digital Creativity

From gaming to digital publication; encounters with the past have become increasingly digital. At the Centre for Digital Heritage we are working to make these digital experiences more accessible and rewarding. Collaborations with the Department of Computer Science and the Department of Theatre, Film and Television have allowed us to explore the role which digital creativity can play in engagements with heritage, from games and film-making to citizen science.

Playing the Past: Digital Heritage & Video-Games – Tara Copplestone

The influence of video games on the perception of heritage is increasingly significant. At the Centre for Digital Heritage we are investigating the portrayal of heritage subjects in games but we are also working with researchers and industry to develop entirely new approaches to heritage gaming.

CDH PhD researcher Tara Copplestone is investigating opportunities for video-game and heritage sectors to cooperate in the production of ‘heritage video-games’, with the aim being to create documentation, standards and toolkits which underpin the use of ‘heritage video-games’ as a medium for academic research, dissemination, entertainment, engagement and education.

Strong connections between research and industrial partners in gaming and digital media underpin research at the CDH and help to ensure that our research in this area is insightful but that it also achieves unrivalled levels of social and economic impact.

DADAISM – Helen Petrie

The DADAISM project brings together researchers from the diverse fields of archaeology, human computer interaction, image processing, image search and retrieval, and text mining to create a rich interactive system to address the problems of researchers finding images relevant to their research.

DADAISM will transform the way in which archaeologists interact with online image collections. It will deploy user-centred design methodologies to create an interactive system that goes well beyond current systems for working with images, and will support archaeologists’ tasks of finding, organising, relating and labelling images as well as other relevant sources of information such as grey literature documents.
Publication and Dissemination

Communication is central to high quality research. At the Centre for Digital Heritage we believe that all research should have a profound social impact and that in order to achieve this it is necessary to think creatively about how we communicate with different audiences. Whether we are developing new ways of thinking about academic publication or writing blogs which show the personal stories behind research; we understand how important it is to keep people informed.

Internet Archaeology – Judith Winters

Internet Archaeology (http://intarch.ac.uk/) is an independent, open access, peer-reviewed journal for archaeology based at the University of York. We are at the forefront of experimental publishing in digital heritage, continually devising creative solutions and approaches to archaeological publication. The journal has been pushing at the boundaries of scholarly publication since 1996. Working in collaboration with authors, the journal incorporates elements such as VR models, mapping, searchable data and reader comments into articles and, with the ADS, has developed the ‘integrated publication’ model where multi-layered e-publications link to associated digital archive data.

This synergy is exemplified through the publication of a detailed archaeological survey and archive research of the Guild Chapel, Stratford-upon-Avon (Warwickshire), one of Europe’s most important surviving late-medieval Guild Chapels. Kate Giles and colleagues not only describe the creation of a digital model and textual paradata of the chapel, but include the model itself (created in the popular Unity game engine) in the article. The VR model becomes a research tool through which users can explore and validate the evidence for themselves, and the publication demonstrates the ways in which digital heritage technologies can be harnessed both within archaeology and beyond it.


Blogging and Heritage – Colleen Morgan

At the CDH we are committed to communication. Sometimes this will be through specialist channels such as academic conferences or technical publications but sometimes we want to tell people about the personal side of our work. For some time now we have been experimenting with the use of blogs as a form of publication. They are a great way to reach out to our colleagues and the public but they also provide a venue for personal expression. Once a relatively rare and unusual practice, blogging is becoming a normal part of research and teaching.

Blogs provide a unique insight into the activities of the CDH and are the best way to find out about what we are doing. As well as the main Centre for Digital Heritage Blog (http://centredigitalheritage.wordpress.com) there are also excellent research blogs maintained by CDH partners including the Archaeology Data Service (http://archaeologydatascience.ac.uk/blog/) and the Borthwick Institute for Archives (http://borthwickinstitute.blogspot.co.uk/).
Data Management and Curation

Behind all good digital research is good data. Several of the key partners in the Centre for Digital Heritage are groups with a proven track record of innovation in data management and curation. They include the Archaeology Data Service (the UK’s national repository for archaeological data) and the Borthwick Institute for Archives (centre for archival research).

The Archaeology Data Service – Julian Richards

The Archaeology Data Service (ADS) is the national digital data archive for the UK and the world-leading data management centre for the archaeology and heritage sector. We were established in 1996 and now comprise some 15 staff. We support research, learning and teaching with free online high quality and dependable digital resources and preserve them in the long term. We preserve over 1.3m metadata records, over 30,000 unpublished fieldwork reports, and over 700 data comprehensive project digital archives. The ADS/ Digital Antiquity Guides to Good Practice are widely regarded as setting the international standard for file formats and metadata standards. In 2012 we were awarded the Digital Preservation Coalition’s Decennial Award for the most outstanding contribution to digital preservation of the last decade. ADS staff have provided support and guidance to several other countries setting up parallel initiatives, most recently the United States, Germany and Sweden. We can provide data management training and technical advice and costings for digital preservation needs, whatever the size of project. Our online costing calculator is available at [http://archaeologydataservice.ac.uk/easy/costing](http://archaeologydataservice.ac.uk/easy/costing). For more information contact us at help@archaeologydataservice.ac.uk.

Borthwick Institute for Archives – Jen Mitcham

The Borthwick Institute for Archives contributes further expertise in data management to the Centre for Digital Heritage. As well as managing a large and diverse range of digital and analogue collections we are also leaders in research and innovative archival practice. Examples of ongoing research projects include the York’s Archbishops’ Registers Revealed Digitisation Project. The Registers record the formal acts of the Archbishop of York, the earliest dating from 1225, fifty years before the survival of the first Canterbury register.

They are the earliest systematic records of the archbishops’ office, and document the government of the Church, the management and staffing of parishes; and the Church’s oversight and regulation of the moral and spiritual conduct of the mass of the population across Yorkshire, Northern England and beyond.

The York’s Archbishops’ Registers Revealed project has been generously funded by the Andrew W. Mellon Foundation and aims to capture and make freely available on the web, high-quality digital images of the 10,000 folios (equal to 20,000 pages) of the York Registers 1225–1646. The aim of capturing and disseminating thousands of high-quality digital images is inextricably linked to the condition of the original Registers and their suitability for digitisation. The project therefore includes professional conservation work in order to prepare the York Registers for imaging. This will be the very first time that each of the registers will have received in-depth conservation work, and will secure their survival in the best possible conditions for the future. In addition, bespoke tools are being created to enable the display and dissemination of the images and the enable future indexing work to be undertaken.
Heritage Jam

The 2014 Heritage Jam brought together a wide community of researchers and practitioners to design and create forward-thinking pieces of heritage visualisation. As an open event the Heritage Jam attracted a diverse community of participants with an interest in the way heritage is visualised. Artists, animators, designers, programmers, archaeologists, historians, conservators, museum professionals and heritage practitioners all joined forces to produce an innovative range of apps, games and art based upon cultural heritage data.

If you missed the Heritage Jam 2014 but want to get involved then you still can. Our active events programme means that there will be something for you. Visit the CDH website and register for an event today.

Digital Recording Days

The Centre for Digital Heritage run regular digital recording workshops for groups wishing to use digital approaches in their work. We specialise in the use of low cost and freely available digital imaging techniques and have worked with a wide range of groups ranging from large companies to small local societies.

Digital Recording days can be run for a groups of different sizes and varying levels of experience. We have conducted events at York very successfully but are also happy to arrange workshops elsewhere. We aim to leave groups with the skills that they need to produce high quality sustainable digital outputs which will enable improved interpretation and communication of cultural heritage.

Events

The Centre for Digital Heritage has a constantly updated programme of events. Our annual international conference is highly interdisciplinary and brings together the latest Digital Heritage research from across the world.

We also organise and sponsor a range of more focussed events including cultural heritage hack-a-thons, games jams and Digital Heritage summer schools.

To find out more about upcoming events please consult the Centre for Digital Heritage website.
Consultancy

The CDH bridges the latest research with professional practice, working with clients around the world to build and extend their capacity to conduct exemplary digital heritage work. Drawing on our cross-disciplinary expertise, the CDH offers a range of consultancy and training services to support all of your digital needs. Our offerings span the entire information pipeline – from recording and data analysis to archiving, public interpretation and community engagement.

Our professional staff comprises internationally-recognised digital heritage specialists experienced with visual, oral, sound, smell and touch-based multimedia technologies. We work both locally and abroad, from remote archaeological contexts to urban city centres. Our projects range from small, community-driven data recording, to large-scale heritage development at UNESCO World Heritage Sites.

Services ...

We offer a 5-tier system of services to meet the full spectrum of heritage demands:

1. Access to digital technologies to test their functionality and potential for application within your heritage organisation.
2. Skills training sessions to develop your capacities in using specific media to maximise impact.
3. Making sessions (including intensive, short-term development events, hack-a-thons and games jams) to experiment with the development of specific co-designed outputs, from apps to films, digital repositories and individually-tailored products.
4. Collaborative contracts where our staff work one-on-one – in ongoing, iterative fashion – with you to define, plan, develop and implement a fully co-created heritage recording, management, interpretation or engagement project.
5. Full consultancy where our staff work to your needs, producing research and interpretative outputs that marry best digital heritage practice with your individual or institutional goals.

... and Space

We offer a space where you can experiment with new technologies, analytical techniques and interpretation styles in a supportive, creative, sustainability-focused environment guided by world-leading specialists.

For more information about our services, training events and experience, please visit http://www.york.ac.uk/digital-heritage/consultancy.
Taught Masters degree programmes in Digital Heritage

The Centre for Digital Heritage run two MSc courses within the Department of Archaeology; Digital Heritage and Archaeological Information Systems. The courses both provide training in a wide variety of practical and academic skills and will prepare you for a career in academia or industry.

The MSc in Digital Heritage was introduced 2010 in response to the growth in digital heritage practice. The course provides training for professionals who wish to work in digital archiving, visualisation, and museums and heritage sector interpretation, curation and education.

The MSc in Archaeological Information Systems provides students with applied practical experience and critical theoretical engagement with a full range of computing systems and technology used for publishing, archiving, analysing, visualising and presenting archaeological information today.

Both courses are taught by leading specialists who incorporate latest research and best practice into the taught content.

PhD programmes in Digital Heritage

The Centre for Digital Heritage is uniquely positioned to support PhD students wishing to undertake interdisciplinary research in the field of Digital Heritage. We are also keen to support international collaborations and run a joint PhD programme in Digital Heritage with Aarhus University in Denmark. Researchers on this programme generally spend their first and third year in their primary university and the middle year in the other university, benefitting from the international experience and the specific expertise on offer in the overseas institution.

PhD students at the Centre for Digital Heritage will find themselves at the heart of a diverse and highly active research community. As well as having access to the programme of academic events organised at departmental level students are also able to take advantage of activities across the range of partners. Researchers at the Centre for Digital Heritage are engaged in a wide range of research areas including games development, data management, visualisation, human computer interaction, interactive media and acoustics so no matter where your interests lay we can support them.

Whether you wish to pursue a career in academia or in industry the Centre for Digital Heritage is perfectly situated to ensure that you have the skills and experience you need.

Conducting research through the CDH is an incredibly rewarding experience. The resources and contact networks have enabled my research to span multiple disciplines as well as enabling my collaborations with international partners. My research has benefited greatly from this rich international and interdisciplinary knowledge exchange.

Tara Copplestone
(Current CDH PhD Student)
CDH People

Research Fellows

Gareth Beale is a research fellow at the CDH. He is co-director of the Basing House Project (investigating the post-English Civil War demolition of an Early Modern Manor) and the Re-Reading the British Memorial Project (Community driven research looking at the development of contemporary burial spaces). His research interests focus on digital imaging in archaeology, digital narratives and the archaeology of the Modern and contemporary past. Recently Gareth has embarked on a research project investigating the archaeology of historic computing.

Colleen Morgan received her PhD from the University of California, Berkeley in 2012, then subsequently completed a Marie Curie Research Postdoctoral Fellowship at the University of York. She is currently a teaching and postdoctoral fellow associated with the Centre for Digital Heritage and conducts research on archaeological avatars, virtual and augmented reality, and critical making with digital media.

Steering Committee

The Centre for Digital Heritage steering committee is an interdisciplinary panel of specialists from across the University of York. The purpose of the steering committee is to guide the activities of the CDH and to oversee the long term strategic development of the Centre.

Judith Buchanan is Professor in the Department of English and also Director of the Humanities Research Centre.

Dee Dyas is Director of the Centre for the Study of Christianity and Culture.

Philip Morris is Research Development Manager for the Arts and Humanities.

Damian Murphy is Reader in Audio and Music Technology, and Deputy Head of the AudioLab in the department of Electronics.

Helen Petrie is Professor of Human Computer Interaction in the Department of Computer Science.

Sarah Rees Jones is Senior Lecturer in Medieval History and Director of the Institute for the Public Understanding of the Past.

Julian Richards is Director of the Centre for Digital Heritage and the Archaeology Data Service, and Professor in the Department of Archaeology.

Marian Ursu is Professor of Interactive Media at the Department of Theatre, Film and Television.

Chris Webb is Keeper of Archives at the Borthwick Institute for Archives.

The CDH offer a wide range of consultancy services from basic advice through to bespoke project design. Creative approaches to public engagement and interpretation are central to all CDH research.
Contact Us

If you have any questions about the Centre for Digital Heritage at York or any of our international partners then please don’t hesitate to get in touch.

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