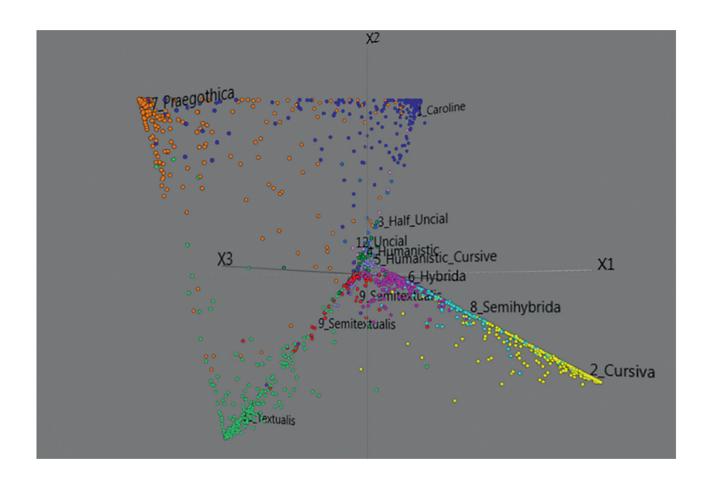
mc N° 15 2020

manuscript cultures

Hamburg | Centre for the Study of Manuscript Cultures

ISSN 1867-9617









Publishing Information

Natural Sciences, Technology and Informatics in Manuscript Analysis

Edited by Oliver Hahn, Volker Märgner, Ira Rabin, and H. Siegfried Stiehl

Proceedings of the third *International Conference on Natural Sciences and Technology in Manuscript Analysis* and the workshop *OpenX for Interdisciplinary Computational Manuscript Research* that took place at the University of Hamburg, Centre for the Study of Manuscript Cultures, on 12–14 June 2018.

Editors

Prof. Dr Michael Friedrich Universität Hamburg Asien-Afrika-Institut

Edmund-Siemers-Allee 1/ Flügel Ost

D-20146 Hamburg

Tel. No.: +49 (0)40 42838 7127 Fax No.: +49 (0)40 42838 4899 michael.friedrich@uni-hamburg.de

Prof Dr Jörg Quenzer

Universität Hamburg Asien-Afrika-Institut

Edmund-Siemers-Allee 1/ Flügel Ost

D-20146 Hamburg

Tell. No.: +49 40 42838 - 7203 Fax No.: +49 40 42838 - 6200 joerg.quenzer@uni-hamburg.de **Editorial Office**

Dr Irina Wandrey Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstraße 26 D-20354 Hamburg

Tel. No.: +49 (0)40 42838 9420 Fax No.: +49 (0)40 42838 4899 irina.wandrey@uni-hamburg.de

Layout

Miriam Gerdes

Cover

Image of ICDAR2017 Tensmeyer's distance matrix (axes 2 and (1 and 3)), see article by Dominique Stutzmann, Christopher Tensmeyer and Vincent Christlein in this volume.

Translation and Copy-editing

Amper Translation Service, Carl Carter, Fürstenfeldbrück

Print

AZ Druck und Datentechnik GmbH, Kempten

Printed in Germany

www.csmc.uni-hamburg.de ISSN 1867–9617

© 2020

Centre for the Study of Manuscript Cultures

Universität Hamburg Warburgstraße 26 D-20354 Hamburg

manuscript cultures mc N° 15

CONTENTS

3 | Editorial

by Oliver Hahn, Volker Märgner, Ira Rabin, and H. Siegfried Stiehl

ARTICLES

5 | On Avoiding Segmentation in Handwritten Keyword Spotting: Overview and Perspectives Marçal Rusiñol*

- 11 Writer Identification and Script Classification: Two Tasks for a Common Understanding of Cultural Heritage

 Dominique Stutzmann, Christopher Tensmeyer, and Vincent Christlein*
- 25 | Z-Profile: Holistic Preprocessing Applied to Hebrew Manuscripts for HTR with Ocropy and Kraken

 Daniel Stökl Ben Ezra and Hayim Lapin*
- 37 | On Digital and Computational Approaches to Palaeography: Where Have we Been, Where Are we Going?

 Peter A. Stokes*
- 47 | Creating Workflows with a Human in the Loop for Document Image Analysis

Marcel Gygli (Würsch), Mathias Seuret, Lukas Imstepf, Andreas Fischer, Rolf Ingold*

53 | Building an Evaluation Framework Researchers Will (Want to) Use
Joseph Chazalon*

61 | Turning Black into White through Visual Programming: Peeking into the Black Box of Computational Manuscript
Analysis

Vinodh Rajan Sampath and H. Siegfried Stiehl*

73 | Legally Open: Copyright, Licensing, and Data Privacy Issues

Vanessa Hannesschläger*

77 | A Comparison of Arabic Handwriting-Style Analysis Using Conventional and Computational Methods

Hussein Mohammed, Volker Märgner, and Tilman Seidensticker

87 | Illuminating Techniques from the Sinai Desert

Damianos Kasotakis, Michael Phelps, and Ken Boydston

91 | Image Quality in Cultural Heritage

Tyler R. Peery, Roger L. Easton Jr., Rolando Raqueno, Michael Gartley, and David Messinger

105 When Erased Iron Gall Characters Misbehave

Keith T. Knox

115 | 'Dürer's Young Hare' in Weimar – A Pilot Study

Oliver Hahn, Uwe Golle, Carsten Wintermann, and Ira Rabin

mc N° 15 manuscript cultures

123 | Material-Technical Details on Papyrus as Writing Support

Myriam Krutzsch

133 | The Techniques and Materials Used in Making Lao and Tai Paper Manuscripts

Agnieszka Helman-Ważny, Volker Grabowsky, Direk Injan and Khamvone Boulyaphonh

163 | Inks Used to Write the Divine Name in a Thirteenth-Century Ashkenazic Torah Scroll: Erfurt 7 (Staatsbibliothek zu Berlin, Or. fol. 1216)

Nehemia Gordon, Olivier Bonnerot, and Ira Rabin

185 | Contributors

manuscript cultures mCN° 15

Contributors

Olivier Bonnerot

BAM Federal Institute for Material Research and Testing

Division 4.5

Unter den Eichen 44-46

12203 Berlin, Germany

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: olivier.bonnerot@bam.de

Khamvone Boulyaphonh

Buddhist Archives of Luang Prabang

Sala Thammavihan, Vat Suvannakhili

06000 Luang Prabang, Lao PDR

eMail: khamvone.boulyaphonh@gmail.com

Ken Boydston

MegaVision Inc.

P.O. Box 60158

Santa Barbara, CA 93160, USA

eMail: ken@mega-vision.com

Joseph Chazalon

EPITA Research and Development Laboratory (LRDE)

14-16 rue Voltaire

94270 Le Kremlin-Bicêtre, France

eMail: joseph.chazalon@lrde.epita.fr

Vincent Christlein

Friedrich-Alexander-Universität Erlangen-Nürnberg

Department of Computer Science

Martensstraße 3

91058 Erlangen, Germany

eMail: vincent.christlein@fau.de

Vincent Christlein

Friedrich-Alexander-Universität Erlangen-Nürnberg

Department of Computer Science

Martensstraße 3

91058 Erlangen, Germany

eMail: vincent.christlein@fau.de

Roger L. Easton Jr.

Chester F. Carlson Center for Imaging Science

Rochester Institute of Technology

54 Lomb Memorial Drive

Rochester, NY 14623-5604, USA

eMail: rlepci@cis.rit.edu

Andreas Fischer

University of Fribourg

Department of Informatics

PER 21 bu. B429

Boulevard de Pérolles 90

1700 Fribourg, Switzerland

eMail: andreas.fischer@unifr.ch

Michael Gartley

Chester F. Carlson Center for Imaging Science

Rochester Institute of Technology

54 Lomb Memorial Drive

Rochester, NY 14623-5604, USA

eMail: mxgpci@rit.edu

Uwe Golle

Klassik Stiftung Weimar (KSW)

3.6 Abteilung Restaurierung, Direktion Museen

Burgplatz 4

99423 Weimar, Germany

eMail: uwe.golle@klassik-stiftung.de

Marcel Gygli (Würsch)

Fachhochschule Nordwestschweiz -

Hochschule für Technik

Institut für Interaktive Technologien

Bahnhofstrasse 6

5210 Windisch, Switzerland

eMail: marcel.gygli@fhnw.ch

Nehemia Gordon

Bar-Ilan University

Bible Department

Ramat Gan, 5290002, Israel

eMail: ngordon4@gmail.com

Volker Grabowsky

Universität Hamburg

Fakultät für Geisteswissenschaften

Asien-Afrika-Institut

Edmund-Siemers-Allee 1, Flügel Ost

20146 Hamburg, Germany

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: volker.grabowsky@uni-hamburg.de

Oliver Hahn

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: oliver.hahn@uni-hamburg.de

BAM Federal Institute for Material Research and Testing

Division 4.5

Unter den Eichen 44-46

12203 Berlin, Germany

eMail: oliver.hahn@bam.de

Vanessa Hannesschläger

Österreichische Akademie der Wissenschaften

ACDH-CH — Austrian Centre for Digital Humanities and Cultural Heritage

Sonnenfelsgasse 19

1010 Wien, Austria

eMail: vanessa.hannesschlaeger@oeaw.ac.at

Agnieszka Helman-Ważny

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: agnieszka.helman-wazny@uni-hamburg.de

Lukas Imstepf

University of Fribourg

Department of Informatics

PER 21 bu. B429

Boulevard de Pérolles 90

1700 Fribourg, Switzerlan

eMail: Lukas.imstepf@unifr.ch

Rolf Ingold

University of Fribourg

Department of Informatics

PER 21 bu. B429

Boulevard de Pérolles 90

1700 Fribourg, Switzerland

eMail: rolf.ingold@unifr.ch

Direk Injan

Chiang Mai Rajabhat University

Office of Arts and Culture

202 Chang Phueak Road, Tambon Chang Phueak

Mueang Chiang Mai District

Chiang Mai, 50300, Thailand

eMail: direkcmru@gmail.com

manuscript cultures mc N° 15

Damianos Kasotakis

Early Manuscripts Electronic Library (EMEL)

904 Silver Spur Road, #254

Rolling Hills Estates, California 90274, USA

http://emel-library.org/>

eMail: damian07@gmail.com

Keith T. Knox

Early Manuscripts Electronic Library

<www.emel-library.org>

2739 Puu Hoolai Street

Kihei, Hawaii 96753, USA

eMail: knox@cis.rit.edu

Myriam Krutzsch

Egyptian Museum and Papyrus Collection SMB

Geschwister-Scholl-Str. 6

10117 Berlin, Germany

eMail: aemp@smb.spk-berlin.de

Volker Märgner

Technische Universität Braunschweig

Institut für Nachrichtentechnik

Schleinitzstraße 22

38106 Braunschweig, Germany

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: maergner@ifn.ing.tu-bs.de

David Messinger

Chester F. Carlson Center for Imaging Science

Rochester Institute of Technology

54 Lomb Memorial Drive

Rochester, NY 14623-5604, USA

eMail: dwmpci@rit.edu

Hussein Mohammed

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: hussein.adnan.mohammed@uni-hamburg.de

Tyler R. Peery

Chester F. Carlson Center for Imaging Science

Rochester Institute of Technology

54 Lomb Memorial Drive

Rochester, NY 14623-5604, USA

eMail: tp5281@rit.edu

Michael Phelps

Early Manuscripts Electronic Library (EMEL)

904 Silver Spur Road, #254

Rolling Hills Estates, CA 90274, USA

http://emel-library.org/>

eMail: mphelps@emelibrary.org

Ira Rabin

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: ira.rabin@uni-hamburg.de

BAM Federal Institute for Material Research and Testing

Division 4.5

Unter den Eichen 44-46

12203 Berlin, Germany

eMail: ira.rabin@bam.de

Rolando Raqueno

RDSC - Rochester Data Science Consortium

260 East Main Street, Suite 6108

Rochester, NY 14604, USA

eMail: rraqueno@cs.rochester.edu rdsc@rochester.edu

Vinodh Rajan Sampath

Universität Hamburg

Department of Informatics

Vogt-Kölln-Str. 30

22527 Hamburg, Germany

eMail: vinodhrajan.sampath@uni-hamburg.de

Marçal Rusiñol

Univ. Autònoma de Barcelona

Computer Vision Center,

Dept. Ciències de la Computació, Edifici O

08193 Bellaterra (Barcelona), Spain

eMail: marcal@cvc.uab.es

Tilman Seidensticker

Friedrich-Schiller-Universität Jena

Institut für Orientalistik, Indogermanistik, Ur- und Frühgeschichtliche Archäologie

Seminar für Orientalistik

Zwätzengasse 4

07743 Jena, Germany

Universität Hamburg

Centre for the Study of Manuscript Cultures

Warburgstr. 26

20354 Hamburg, Germany

eMail: tilman.seidensticker@uni-jena.de

Mathias Seuret

University of Fribourg

Departement of Informatics

DIVA Research Group

Boulevard de Pérolles 90

1700 Fribourg, Switzerland

eMail: mathias@seuret.com

H. Siegfried Stiehl

Universität Hamburg

Department of Informatics

Vogt-Kölln-Str. 30

22527 Hamburg, Germany

eMail: stiehl@informatik.uni-hamburg.de

Peter A. Stokes

École Pratique des Hautes Études – Université PSL

Section des Sciences Historiques et Philologiques

4-14 rue Ferrus

75014 Paris, France

eMail: peter.stokes@ephe.psl.eu

Daniel Stökl Ben Ezra

Ècole Pratique des Hautes Études (EPHE)

Section des Sciences Historiques et Philologiques

4-14 rue Ferrus

75014 Paris, France

eMail: Daniel.Stoekl@ephe.psl.eu

Dominique Stutzmann

Institut de Recherche et d'Histoire des Textes, CNRS

14, cours des Humanités

93322 Aubervilliers Paris, France

eMail: Dominique.stutzmann@irht.cnrs.fr

Christopher Tensmeyer

Brigham Young University

Dept. of Computer Science

Provo, UT 84602, USA

eMail: tensmeyer@byu.edu

Carsten Wintermann

Klassik Stiftung Weimar (KSW)

3.6 Abteilung Restaurierung, Direktion Museen

Burgplatz 4

99423 Weimar, Germany

eMail: carsten.wintermann@klassik-stiftung.de

manuscript cultures mc № 15

Written Artefacts as Cultural Heritage

Ed. by Michael Friedrich and Doreen Schröter

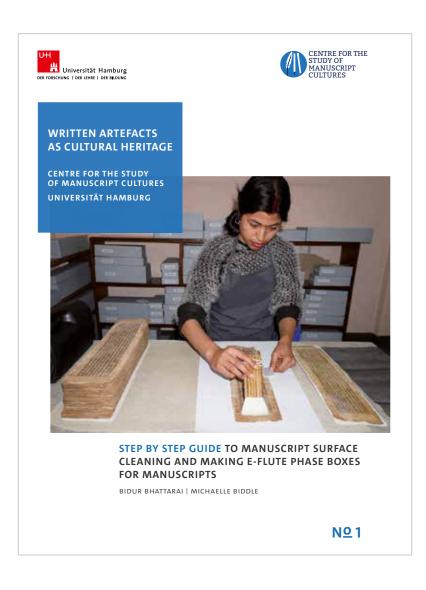
Written Artefacts as Cultural Heritage was established in 2020. The series is dedicated to the double role of written artefacts as representations and generators of humankind's cultural heritage. Its thematic scope embraces aspects of preservation, the identity-defining role of artefacts as well as ethical questions.

The mix of practical guides, colloquium papers and project reports is specifically intended for staff at libraries and archives, curators at museums and art galleries, and scholars working in the fields of manuscript cultures and heritage studies.

Every volume of *Written Artefacts as Cultural Heritage* has been peer-reviewed and is openly accesible. There is an online and a printed version..

If you wish to receive a copy or to present your research, please contact the editorial office:

https://www.csmc.uni-hamburg.de/publications/cultural-heritage.html









manuscript cultures (mc)

Editors: Michael Friedrich and Jörg B. Quenzer

Editorial office: Irina Wandrey

CSMC's academic journal was established as newsletter of the research unit 'Manuscript Cultures in Asia and Africa' in 2008 and transformed into a scholarly journal with the appearance of volume 4 in 2011. *manuscript cultures* publishes exhibition catalogues and articles contributing to the study of written artefacts. This field of study embraces disciplines such as art history, codicology, epigraphy, history, material analysis, palaeography and philology, informatics and multispectral imaging.

manuscript cultures encourages comparative approaches, without regional, linguistic, temporal or other limitations

on the objects studied; it contributes to a larger historical and systematic survey of the role of written artefacts in ancient and modern cultures, and in so doing provides a new foundation for ongoing discussions in cultural studies.

Every volume of *manuscript cultures* has been peerreviewed and is openly accessible:

https://www.csmc.uni-hamburg.de/publications/mc.html

If you wish to receive a copy or to present your research in our journal, please contact the editorial office: irina.wandrey@uni-hamburg.de

manuscript cultures 14



manuscript cultures 11



manuscript cultures 13



manuscript cultures 10



manuscript cultures 9



manuscript cultures 7



manuscript cultures 5



manuscript cultures 8



manuscript cultures 6



manuscript cultures 4



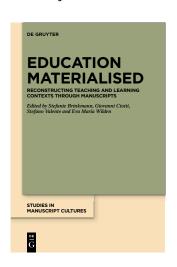
Studies in Manuscript Cultures (SMC)

Ed. by Michael Friedrich, Harunaga Isaacson, and Jörg B. Quenzer

From volume 4 onwards all volumes are available as open access books on the De Gruyter website: https://www.degruyter.com/view/serial/43546 https://www.csmc.uni-hamburg.de/



Forthcoming



23 – Education Materialised: Reconstructing Teaching and Learning Contexts through Manuscripts, edited by Stefanie Brinkmann, Giovanni Ciotti, Stefano Valente and Eva Maria Wilden

Manuscripts have played a crucial role in the educational practices of virtually all cultures that have a history of using them. As learning and teaching tools, manuscripts become primary witnesses for reconstructing and studying didactic and research activities and methodologies from elementary levels to the most advanced.

The present volume investigates the relation between manuscripts and educational practices focusing on four particular research topics: educational settings: teachers, students and their manuscripts; organising knowledge: syllabi; exegetical practices: annotations; modifying tradition: adaptations.

The volume offers a number of case studies stretching across geophysical boundaries from Western Europe to South-East Asia, with a time span ranging from the second millennium BCE to the twentieth century CE.

New release



22 – Dunhuang Manuscript Culture: End of the First Millennium, by Imre Galambos

Dunhuang Manuscript Culture explores the world of Chinese manuscripts from ninth—tenth century Dunhuang, an oasis city along the network of pre-modern routes known today collectively as the Silk Roads. The manuscripts have been discovered in 1900 in a sealed-off side-chamber of a Buddhist cave temple, where they had lain undisturbed for for almost nine hundred years. The discovery comprised tens of thousands of texts, written in over twenty different languages and scripts, including Chinese, Tibetan, Old Uighur, Khotanese, Sogdian and Sanskrit. This study centres around four groups of manuscripts from the mid-ninth to the late tenth centuries, a period when the region was an independent kingdom ruled by local families. The central argument is that the manuscripts attest to the unique cultural diversity of the region during this period, exhibiting – alongside obvious Chinese elements – the heavy influence of Central Asian cultures. As a result, it was much less 'Chinese' than commonly portrayed in modern scholarship. The book makes a contribution to the study of cultural and linguistic interaction along the Silk Roads.

Studies in Manuscript Cultures (SMC)

Ed. by Michael Friedrich, Harunaga Isaacson, and Jörg B. Quenzer

From volume 4 onwards all volumes are available as open access books on the De Gruyter website: https://www.degruyter.com/view/serial/43546 https://www.csmc.uni-hamburq.de/



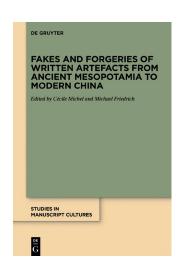
New release



21 – Disiecta Membra Musicae: Studies in Musical Fragmentology, edited by Giovanni Varelli

Although fragments from music manuscripts have occupied a place of considerable importance since the very early days of modern musicology, a collective, up-to-date, and comprehensive discussion of the various techniques and approaches for their study was lacking. On-line resources have also become increasingly crucial for the identification, study, and textual/musical reconstruction of fragmentary sources. Disiecta Membra Musicae. Studies in Musical Fragmentology aims at reviewing the state of the art in the study of medieval music fragments in Europe, the variety of methodologies for studying the repertory and its transmission, musical palaeography, codicology, liturgy, historical and cultural contexts, etc. This collection of essays provides an opportunity to reflect also on broader issues, such as the role of fragments in last century's musicology, how fragmentary material shaped our conception of the written transmission of early European music, and how new fragments are being discovered in the digital age. Known fragments and new technology, new discoveries and traditional methodology alternate in this collection of essays, whose topics range from plainchant to ars nova and fifteenth- to sixteenthcentury polyphony.

New release



20 – Fakes and Forgeries of Written Artefacts from Ancient

Mesopotamia to Modern China, edited by Cécile Michel and Michael Friedrich

Fakes and forgeries are objects of fascination. This volume contains a series of thirteen articles devoted to fakes and forgeries of written artefacts from the beginnings of writing in Mesopotamia to modern China. The studies empha sise the subtle distinctions conveyed by an established vocabulary relating to the reproduction of ancient artefacts and production of artefacts claiming to be ancient: from copies, replicas and imitations to fakes and forgeries. Fake are often a response to a demand from the public or scholarly milieu, or ever both. The motives behind their production may be economic, political, reli gious or personal – aspiring to fame or simply playing a joke. Fakes may be revealed by combining the study of their contents, codicological, epigraphic and palaeographic analyses, and scientific investigations. However, certain fa mous unsolved cases still continue to defy technology today, no matter hov advanced it is. Nowadays, one can find fakes in museums and private collec tions alike; they abound on the antique market, mixed with real artefacts tha have often been looted. The scientific community's attitude to such objects calls for ethical reflection.

mc N° 15 2020

ISSN 1867-9617

© 2020

Centre for the Study of Manuscript Cultures

Universität Hamburg

Warburgstraße 26

D-20354 Hamburg

www.csmc.uni-hamburg.de





