CAA2015

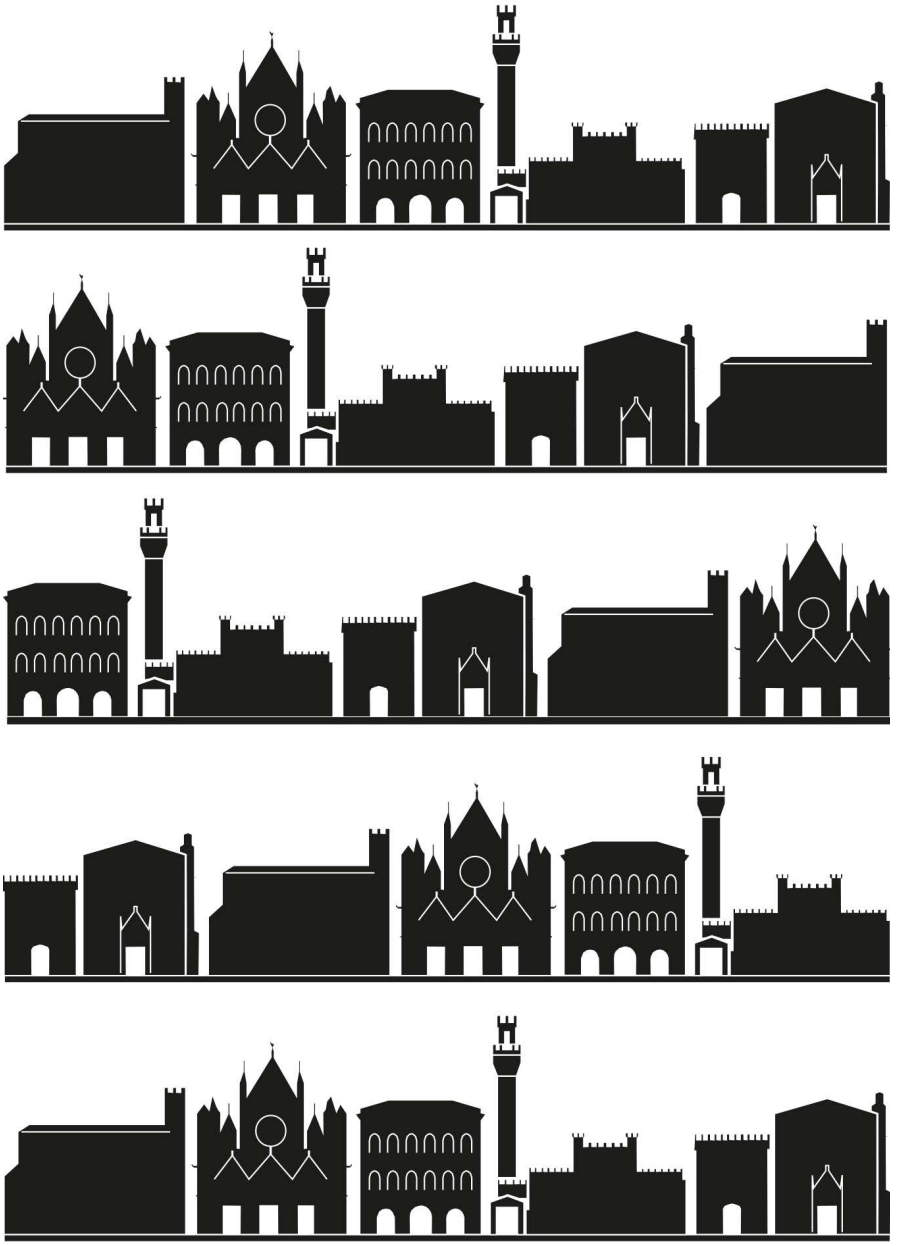
KEEP THE REVOLUTION GOING >>>

PROCEEDINGS OF THE 43RD ANNUAL CONFERENCE ON COMPUTER APPLICATIONS AND QUANTITATIVE METHODS IN ARCHAEOLOGY

Edited by

Stefano Campana, Roberto Scopigno,
Gabriella Carpentiero and Marianna Cirillo

Volume 1



UNIVERSITÀ DI SIENA 1240

CAA Computer Applications & Quantitative Methods in Archaeology

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Volume 1

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Introduction

Stefano Campana

Roberto Scopigno

Chairmen of the 43rd CAA
KEEP THE REVOLUTION GOING

This volume brings together all the successful peer-reviewed papers that have been submitted for the proceedings of the 43rd conference on Computer Applications and Quantitative Methods in Archaeology that took place in Siena (Italy) from March 31st to April 2nd 2015.

The number of people who signed on for CAA 2015 really took us by surprise: 550 delegates registered for the conference, from many more places than we would ever have anticipated. Altogether, within the four days of the conference 280 papers were presented in 48 sections divided into ten macro topics, 113 posters, 7 roundtables and 12 workshops.

That number, in itself, has prompted a thought or two. Above all it says to us that CAA is very much alive and kicking, that it is in robust good health, and that it remains a wholly relevant force in the scientific community, fully engaged with the questions of the day, and a continuing focal point for the profession. All of that speaks well for the motto of CAA 2015: KEEP THE REVOLUTION GOING

Although the significance of our motto is obvious, we think it is worth some thoughts. Few would deny that in the past 30 years or so, digital technologies have profoundly revolutionised archaeology – in the office and laboratory, in the field and in the classroom. The progressive introduction of digital techniques in the archaeological process has of course led to a general increase in efficiency. But perhaps more importantly it has provided a spur to the discussion of methodology and through that has strongly influenced not only the way we go about things but also the outcomes that we have been able to achieve.

The pioneering phase in the application of digital techniques in archaeological research has clearly been fruitful and today computer applications such as GIS, databases, remote sensing and spatial analysis as well as virtual and cyber archaeology are deeply embedded within our universities. This is all good, of course, but we must not assume that the task has been completed. An intrinsic revolutionary instinct towards technological development has been awakened. But it will only survive by virtue of the results that it brings about. Or using the words of our Chairman Prof Gary Lock: 'Computers not only change the way we do things, but more importantly they change the way we *think* about what we do and why we do it'. The general thrust of this statement can be summed up and reinforced by recalling a quote from the philosopher Don Ihde, who has argued we should never forget that all technologies should be regarded as '*cultural instruments*', which as well as strategies and methodologies implemented in our researches are also '*non-neutral*'.

So KEEP THE REVOLUTION GOING is a motto that lays stress on the need to maintain innovation in archaeology through technological advances. But innovation must have at its root the fostering of critical thought and the framing of new archaeological questions. So there is much work still to be done, and fresh challenges to be faced in the months, years and decades ahead.

One final thought. The date of this conference, and most of all the opening ceremony, has not come about by chance. The 30th of March, for the University of Siena and in particular for the human sciences and archaeology, represents a sad but enduring anniversary. Eight years ago on this day we lost a key figure in the Italian archaeological community of the last 50 years; a man who had an extraordinary influence on many aspects of medieval and archaeological studies. Not least we call to mind his role in the promotion and development of digital archaeology. Our thoughts and memories go therefore to our friend and mentor Professor Riccardo Francovich. He always inspired us to seek new horizons and without him we doubt that this conference would have found its way to Siena.

Introductory Speech

Professor Gabriella Piccinni
Dean of the Department of History and Cultural Heritage, University of Siena

First of all, on behalf of the Rector of the University, and as Dean of the Department of History and Cultural Heritage, I wish you all a very warm welcome to the University of Siena.

This greeting goes in the first instance to all of the distinguished speakers at this meeting but also to all who are here in our company to listen and to take part in scientific debate. A warm welcome, naturally, goes to all of the institutions represented at this table, to the Chairman of CAA International, Professor Gary Lock, to the National Research Council, our partner in the organization of this congress, and to the Ministry of Heritage, Culture and Tourism. Last but not least I extend my thanks to all who have committed their time and energy to the organisation of this meeting: the scientific secretariat, the conference office, our student volunteers, the institutions that have kindly agreed to act as patrons, and the sponsors who have so generously supported this initiative.

I confess that when Stefano Campana first told me about the opportunity for our university here in Siena to organise such a prestigious event as the international meeting of the CAA, now in its forty-third year, I was immediately excited and engaged because I strongly believe that events like this represent one of the most tangible and concrete demonstrations of how a University works, how it forms and reinforces knowledge; these kinds of events delight me as a scholar and as a teacher, as well as the director of a university department.

It is a great honour for us to host CAA International, bearing in mind the history of our university, and in particular its tradition of archaeological studies, within which it has played a pioneering and leading role in the field of Digital Archaeology. I cannot but recall how the University of Siena has, since the early nineties, played a central role both nationally and internationally in the development of computer applications in archaeology. My thoughts and deep gratitude go inevitably to our late colleague and friend, Professor Riccardo Francovich, who remains always in our work and in our hearts. His exceptional energy and his qualities as an innovator provided an extraordinary impetus in this area of studies; an impetus that lives on through the work of his students and through the many many people who were inspired by his example.

The conference numbers are frankly astonishing: roughly 550 delegates – the organizers were actually forced to close registration because the results were beyond their wildest dreams. The University's halls are overflowing, its facilities at full stretch to host this event. The congress has representatives from more than 50 countries and from all of the most prestigious universities and institutions in Europe and beyond. In the short space of the next four days the work programme will be intense, with 46 thematic sessions, 12 workshops, 7 panel discussions, 4 key-note speeches and all sorts of informal discussions and social activities that will promote the continuing exchange of ideas.

Let me end with a simple thought. Without entering into discussions and analyses that lie outside my role (or even competence) here today, I feel that seeing so much dynamism and so many young scholars, teachers and researchers coming together here in Siena from all around the world to talk about the new opportunities offered by the application of technology within archaeological studies should prompt a few moments of reflection about the ways and means through which we deliver our higher education and training. Today more than ever, in front of this audience, we see how vibrant and strong is the demand for discussion and training in these topics. In keeping with the motto of the conference, the future is still to be built, let us show the same commitment that enabled our predecessors to overcome the first heroic phase of the 1990s and the early years of the new millennium. Always, of course, keeping alive the flame of innovation that has from the outset been the guiding light of this of CAA International initiative.

Acknowledgements

It goes without saying that the organization of an event such as CAA is a complex and demanding task that only achieves success through real teamwork. So we will start by offering heartfelt thanks to all who have helped to make this meeting possible: the University of Siena. We are particularly grateful to the Rector prof Angelo Riccaboni and the Director of the Department of History and Cultural Heritage prof Gabriella Piccinni for their constant support and valuable advice. Particular thanks are offered to the conference office Giuliana Pasquini, Roberta Corsi, Elisa Pratali and Serena Mazza and to our many students volunteers, Mirko Buono, Marta De Pari, Valery Del Segato, Cesare Felici, Ilenia Galluccio, Nadia Messina, Michele Pellegrino, Sara Linda Russo. Last but by no means least we owe a deep debt of gratitude to all who have given their time and enthusiasm to the organisation of the meeting – to the Scientific Secretariat under the leadership of Dr Marianna Cirillo.

For the same reasons, I am most grateful to the Monte dei Paschi Foundation and to Verince srl for the outstanding work in organizing the social events including the 'ice-breaker' party, visits to various monuments and cultural activities within the city of Siena, the social dinner and the field trip. In particular I would like to mention Marco Forte, Laura Tassi and Laura Manzi, who have substantially contributed towards making CAA Siena unforgettable for their delegates.

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CHAPTER 1
Teaching and Communicating Digital Archaeology

From the Excavation to the Scale Model: a Digital Approach

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Abstract: Lyon's archaeological department took the opportunity of a recent rescue excavation to fulfil two purposes: improving (geo)archaeological knowledge of the city of Lyon while developing a set of tools for scientific mediation. The excavated site spanned 40000 years, from the Würmian period to the 19th century. Occupation from the ancient and medieval periods was the main focus points of this excavation. A 3D diachronic reconstruction was achieved for this site using a fully digital workflow. Stratigraphic and architectural data obtained from the fieldwork, or reconstructed afterwards, were integrated into GIS and modelling software to produce 3D volumes. We could produce static high-resolution renderings, a 3D printed scale model of the stratigraphy and buildings, as well as digital interactive media. This project allowed us to explore the interest of 3D both for archaeological research, as a way to develop and validate research hypotheses, and for scientific education.

Keywords: Landscape and Archaeological reconstruction, 3D printing, Virtual reality, Scientific mediation, Lyon (France)

Introduction

Our project started with the will to collaborate with the FabLab of Lyon in order to experiment with 3D printing (Wohlers 2013) applied to archaeology. Such techniques are already used for artefacts (Fantini *et al*. 2008), but we aimed at applying them to stratigraphy. We widened this initial goal to encompass other 3D methods and tools and developed an uninterrupted digital process that finally allowed us to produce several virtual and physical restitutions of an archaeological site.

Our questions were 1/ how could we, as archaeologists, adopt these innovative techniques 2/ how could they enhance our scientific practices 3/ how could they improve our educational practices 4/ could we obtain valid results with limited resources?

An emergency excavation that started at the beginning of 2014 in Lyon (France) proved to be the ideal testing ground for this experiment (Bouvard *et al*. 2015).

Salvage archaeology must adapt to several constraints that we have to overcome if we want to understand the evolution of a territory wider than the plot we dig. Time remains the first constraint, but is not the only one: urban sites for example are characterized by their confinement, fragmented nature, and stratigraphic unevenness. Therefore we need a tool that can offer the opportunity to, first fill the stratigraphic unknowns, and then help us to understand human and landscape evolution in terms of topography and sedimentology.

Moreover, sharing the cultural heritage and transmitting the knowledge to a large audience is an important part of our mission as a public institution. This is why Lyon's archaeological department involves the local community in the care of the anthropic and landscape relics that are parts of their history. For this reason, we decided to participate in a science festival ('Fête de la Science') lasting more than a week, whereby universities, museums, and other research centres offer workshops to pupils from schools and colleges, and to anyone interested in meeting scientists and learning about various scientific topics. For this event we wanted to innovate with a new and interactive education tool, associating makers and archaeologists. The goal was to create a 3D scale model of the site we excavated. We had to be able to assemble and disassemble the main stratigraphic layers and buildings, in order to explain to the general audience both the evolution of the site and the archaeological process itself. We also wanted to explore the potential of innovative human/computer interaction for archaeology and scientific mediation with various tools: contactless interaction with 3D restitutions