



A look at the region

Computer Applications and Quantitative Methods in Archaeology: National Chapter Czech Republic/Slovakia

Ladislav Šmejda^{a,b*}

^aDepartment of Archaeology, Faculty of Arts, University of West Bohemia, Univerzitní 8, 30614 Pilsen, Czech Republic

^bDepartment of Ecology, Faculty of Environmental Sciences, Czech University of Life Sciences, Kamýcká 129, 165 21 Prague, Czech Republic

ARTICLE HISTORY

Received: 22nd December 2015

Accepted: 28th December 2015

Keywords:

digital archaeology
Central Europe
archaeological method and theory
conferences
history of archaeology

ABSTRACT

Computers and information technologies play a very important role in modern archaeology. This article describes the history of group of scholars interested in the use of digital technologies for the study of human past and a later establishment of the “Czech Republic & Slovakia national chapter” affiliated to the “Computer Applications and Quantitative Methods in Archaeology” international organization. The author summarizes the main research directions explored so far in this Central European region and considers the potential for further progress. It is concluded that “digital archaeology” is a dynamic research field here, matching in most aspects the latest developments in the international context. A future more pronounced tendency toward theoretical reflexivity in various computer applications and a wider recognition of certain yet under-represented topics as valuable contributions to the general archaeological discourse is foreseen by the author.

1. Introduction

This article provides a concise report on the history of the joint Czech and Slovak Chapter of the Computer Applications and Quantitative Methods in Archaeology organization (CAA). It presents an overview of how this national section of CAA came into existence and where it might be heading in the future.

It will be useful to start with some historical background. The CAA conference began as a small meeting of archaeologists, mathematicians and computer scientists at the University of Birmingham (UK) in 1973. Subsequent conferences were organized annually at various other British universities for nearly 20 years. The number of presenters and general popularity of the conferences steadily increased – with a growing number of delegates from many countries of Europe, North and South America, Japan, Australia and New Zealand. At the first meeting held outside the United Kingdom, at Aarhus University in Denmark in 1992 (Andersen *et al.* 1993), an agreement was passed that the

conference should be held annually in different countries, thus literally travelling around the world. At around the same time, some national chapters (country sections) were officially established: CAA-UK became the first local organization in 1995, followed by the Netherlands, Spain, Italy, Portugal, India, Germany, North America, Norway, Sweden and others later on. In 2006, the international CAA conference was organized outside of Europe for the first time: in Fargo, North Dakota in the USA (<http://caa-international.org/about/history/>).

In the Czech Republic, where the interest of archaeologists in the mathematical treatment of archaeological data and application of computer methods had started early on (Soudský 1967; Bouzek, Buchvaldek 1971; Malina 1977; Podborský *et al.* 1977; Neustupný 1978), an annual meeting of a similar kind has been running since 2002, quite independently of the international CAA meetings. From the beginning, these nationally-organised meetings took their name after the edited volume “Počítačová podpora v archeologii” (Computer support for archaeology), which had been put together and published by Jiří Macháček five years earlier (Macháček 1997). The very first Czech meeting, designated at that time as a workshop, was held on the grounds of the well-known Early

*Corresponding author. E-mail: smejda@kar.zcu.cz



Figure 1. The national 2003 meeting in Nečtiny, Czech Republic. Presentations by M. Kuna (above) and E. Neustupný (below). Photo L. Šmejda.



Mediaeval archaeological site of Pohansko (near Břeclav) in South Moravia (Šmejda 2002; Švecová 2003–2004). The next year, a follow-up meeting was organized in the chateau of Nečtiny in West Bohemia (Figure 1) and here it took the form of a conference considerably increased in size, with the attendance of some 100 participants. In subsequent years, the size and format has varied but normally between 15 and 30 papers are being presented at each meeting. Oral presentations have been regularly complemented by posters – as well as by stands of commercial companies, advertising their products, where pertinent to the discussed topics (typically surveying instruments and software for handling spatial data). In most aspects these Czech conferences have resembled similar foreign events elsewhere, for example, the CAA meetings or conference series held annually in Vienna under the title

“Archäologie und Computer: Kulturelles Erbe und Neue Technologien”.

2. National Chapter Czech Republic/Slovakia

From time to time questions have been raised as to whether it will continue to be possible to bring new themes, methods and results if the annual frequency of the conference was maintained, and whether at some point all possible IT applications would appear to be exhausted. Nonetheless, every individual year yet another conference has materialized and the “annual tradition” has lived on even more vigorously than before (Table 1). The idea of joining the international CAA organization has gradually grown

Table 1. A list of annual meetings titled “Počítačová podpora v archeologii” (Computer support for archaeology) and most recently “Computer Applications in Archaeology”.

Meeting No.	Year	Location
1	2002	Pohansko (CZ)
2	2003	Hrad Nečtiny (CZ)
3	2004	Kravsko (CZ)
4	2005	Roztoky(CZ)
5	2006	Brněnská přehrada (CZ)
6	2007	Chodová Planá (CZ)
7	2008	Zvíkovské Podhradí (CZ)
8	2009	Hradec Králové (CZ)
9	2010	Litomyšl (CZ)
10	2011	Dalešice (CZ)
11	2012	Loket nad Ohří (CZ)
12	2013	Kočovce (SK)
13	2014	Svratka (CZ)
14	2015	Cieszyn (PL)

since the CAA meetings held in Berlin (2007), Budapest (2008), Williamsburg (2009) and Beijing (2011), as it has become obvious that the very modest representation of Czech archaeology at these truly global events does not do justice to the real progress of the discipline in this central European territory. The possibility of the formal establishment of a local chapter in the Czech Republic was probably suggested and discussed for the first time during the 10th anniversary conference of the Czech group, at that time (2011) held in the Dalešice brewery. Furthermore, it was concluded that merging forces with our colleagues from Slovakia, who regularly attended the Czech conferences, would seem quite

reasonable. The plan was then discussed with the CAA steering committee at the international CAA conference in Southampton, which marked the 40th anniversary of this organization (Figure 2). Finally, the joint chapter for the Czech Republic & Slovakia was formally established in May 2012 at the next Czech conference held in Loket nad Ohří. After a decade of “isolated” development, our group of specialists has become a part of the global CAA family.

Immediately, in the following year, we eagerly took the opportunity to meet in Slovakia for the first time (Figure 3) and, after returning to the Czech Republic in 2014, we have stood up to the new challenge. Thanks to the members of the Polish CAA chapter, established at about the same time as ourselves, the first central European meeting of the Visegrad countries’ national chapters (Poland, Czech Republic, Slovakia, and Hungary) took place in Cieszyn (2015). This look across national borders was certainly useful in many ways – it created new, or strengthened already-established, professional contacts, contributed to the exchange of ideas, and hopefully will continue to stimulate new fruitful research. Last, but by no means least, we can see this growing cooperation as a sign of maturity – of what existed once as small, relatively marginalised and internationally-divided groups of computer enthusiasts within several separate central European archaeological communities. These communities have now grown into fully-fledged professional groups with common interests that seek to critically discuss the latest developments in the field of digital technologies and the impact they may have on archaeological theory and practice. In my view this development gives a positive answer to the main question inherited from the first decade of our conference series – can digital archaeology prosper as a specific area of research?

Figure 2. The CAA International annual meeting in Southampton (2012), a session dedicated to the history of this conference (see also the related film at <http://www.sms.cam.ac.uk/media/1357554>). Photo L. Šmejda.





Figure 3. The CAA-CS national 2013 meeting in Kočovce, Slovakia. The participants gathered in front of the conference venue (above); and an excursion to archaeological sites (below). Photo K. Hladíková and L. Šmejda.



3. Directions and achievements

The early thematic interests of this group are well documented in several edited volumes and conference proceedings. The first two books published in print are inseparably linked to the long-term effort of Professor Jiří Macháček from Masaryk University in Brno. The first volume (Macháček 1997), being intended primarily as a textbook for students of archaeology, focused mainly on databases, geographic information systems, and statistics. The second book, edited by the same editor and published a decade later (Macháček 2008), included chapters based on conference presentations or on student's dissertations (Figure 4). Thematically they followed the topics covered by the previous publication from 1997, but also expanded to the new territories of digital 3D recording and visualization techniques, and specialized web

services. Over the years these books have proved useful and found a much wider audience than was perhaps originally envisaged, and they are still regularly sought after by students and researchers alike. Another edited volume associated with these conferences, the latest one so far, appeared in digital form as the proceedings of the 2010 conference held in Litomyšl (Kuchařík *et al.* 2010). Other books were published as collections of works written by university students, edited and complemented by their supervisors (Neustupný 2003; Neustupný, John 2005).

It is interesting to observe which themes are recurring at the conferences of the Czech and Slovak group and which are more popular than others. Only a very limited selection of relevant references can be cited in this short overview, for which reason I refer here only to publications not included in the above-mentioned collective tomes, which also cover much



Figure 4. The national 2008 meeting in Zvíkovské Podhradí. Evžen Neustupný is commenting on the new book edited by Jiří Macháček. Photo Č. Čišecký.

of what follows. Judging from rough figures, it seems that by far the most popular topic concerns the landscape-oriented applications of geographical information systems (Dresler, Macháček 2013; Lieskovský *et al.* 2013; Kuna, Danielisová 2009), including the integration of survey data and remote sensing into GIS (Šmejda 2009; Gojda 2010; Gojda, John 2013). Intra-site spatial datasets and their analyses in GIS closely follow (Macháček 2002; Šmejda 2014), underscoring the massive impact of spatial technologies on present-day archaeological practice. Contributions on archaeological databases, data warehouses and information management systems also belong to some of the most frequented topics (Kuna 2015).

Archaeological (non-spatial) statistics is another mainstream topic with a wide range of specific applications, although purely numerical methods and statistical tests used alone are seemingly a less inspiring source of knowledge compared to the more eye-catching studies presenting plans and maps. Of course, statistical analysis coupled with spatial visualization provides a revealing and attractive combination in many cases (Smrž *et al.* 2011; Demján 2015; John 2011). More recently, the dramatic increase of 3D recording and modelling techniques can be observed (Preusz *et al.* 2014; Květina *et al.* 2015). The potential of the Internet for archaeological research and presentation is obvious and multifaceted, and aspects of this increasingly prominent phenomenon of our present-day world are included in many

of the above-mentioned publications, as well as in more specifically-focused articles (*e.g.* Šmejda 2007a; Šmejda 2007b). This overview, however, would remain incomplete without a note regarding those papers that present new advances in geodesy, photogrammetry, CAD, computer graphics, and other related technical disciplines applied to archaeology, although they are usually inseparably connected to the various thematic categories and references already mentioned above (Bárta *et al.* 2003). Among the topics with a relatively minor occurrence are the applications of agent-based simulations (Danielisová, Štekerová 2015), network analysis (Sosna *et al.* 2013), use of IT in public archaeology (<http://www.archeologickyatlas.cz>), and contributions to the debate on general methodological issues, critical approaches to the role of modern technologies in contemporary science and society.

4. Conclusion: CAA-CS national chapter in a wider context

From a rough comparison of the papers featuring at CAA international meetings with those at our own local group, we can see that the themes most popular in our country have also been repeatedly discussed at the international CAA conferences, where we can find them among well-established session themes. But is it really the same agenda everywhere or can we spot any differences? In the Czech Republic and Slovakia, internationally recognized themes mostly appear with some delay, but this is surely becoming shorter than used to be the case: before computers became widely available in post-socialist countries. Some differences still remain apparent in the themes requiring large investment into infrastructure and human resources; for example, we are not particularly strong in large projects based on virtual reality, 3D computer reconstruction, and the dissemination of knowledge using augmented reality, for instance. These are gaining more and more attention internationally – but perhaps we do not regard them yet as “serious science”. Of course, 3D modelling is also on the rise in our territory, but on a noticeably smaller scale and with less variety of sub-themes. A similar bias can be recognized in other research too: the semantic web, information retrieval or digital publishing to name but a few, which are only slowly establishing themselves as scientific problems inherent to archaeology in our community, even though they have already been recognized as such in other national chapters, as well as at CAA international meetings. However, even in these emerging themes we can find some outstanding projects that are based on complex, well-thought approach and original technological solutions (Kuna 2015).

We have a very strong and active group of Czechs and Slovaks interested in computer applications in archaeology and a fantastic track record of national meetings. The fact that this group currently has a somewhat dual identity (stemming from its traditional designation of “Computer support for archaeology” and the more recent affiliation to CAA) is, in my view, not a serious matter. After all, both

titles carry some historical baggage and should be taken as “brands”, rather than as a semantically-precise definition of the community’s interests and activities. They represent solid scholarly traditions and stand as trademarks, so to speak. We can legitimately use both, depending on the context; “Computer support” makes sense for the domestic agenda and CAA affiliation for the cross-border communication in English. The more important issue is whether we can move our debate towards a more pronounced reflexivity in our work with advanced technologies. Being members of a large global organization can certainly help this trend. Undeniably, paying more attention to the theoretical background – and to the critical evaluation of our motivations and expectations, which lead to our engagement with computers – would be a good thing.

In the past decade we have witnessed new technologies becoming for the most part widespread, which has to some degree contributed to a perceived loss of their novelty appeal. However, there may permanently appear new and original ways of how these technologies should be approached, utilized and implemented in meaningful projects. I can see a continuous improvement in these matters over the last two decades, and I am convinced that there will always be a horizon of unexplored space where technologies may be innovatively embodied into areas of research. Of course, many of us can perceive a certain danger in what has emerged as a methodology – a tool – but which could begin to control implicitly the way we do archaeology; those very same technologies may have an agency of sorts, dictating our research preferences. On the other hand, if we choose to be critical and self-reflective about it, which is where we would like to aim in our future CAA-CS meetings, we can learn more about the past – and also about the present-day lens through which we view the past. This new “technology awareness” has the potential to direct the future development of research more responsibly. While it would be foolish to take computer and information technologies as theory-free and purely objective tools, we cannot go to the other extreme and discard them as potentially distorting and dangerous agents. Present-day society is already so entangled with the many “gadgets” of modern technology that these have, without too much exaggeration, become part of our self-same personalities and influence how we structure our thinking about our research and about our world. This is not necessarily a bad thing, provided we are able to acknowledge this aspect of our cognition. It will certainly not disappear in the immediate future and, with new advances in the fields of artificial intelligence and human-machine coupling, we may yet witness further highly-interesting new turns in our discipline.

Acknowledgements

This article draws on the results of the grant project titled “The strategy of archaeological research in Europe” (CZ.1.07/2.3.00/20.0036), which was financed between

the years 2011 and 2014 by the European Social Fund and state budget of the Czech Republic under the Operational Programme Education for Competitiveness.

References

- ANDERSEN, J., MADSEN, T., SCOLLAR, I. (Eds.) 1993: *Computing the Past: Computer Applications and Quantitative Methods in Archaeology CAA92*, Aarhus University Press.
- BÁRTA, M., BRŮNA, V., KRIVÁNEK, R. 2003: Research at South Abusir in 2001-2002 – methods and results. *Památky archeologické* 94, 49–82.
- BOUZEK, J., BUCHVALDEK, M. (Eds.) 1971: *Nové archeologické metody*. Praha, Univerzita Karlova.
- DANIELISOVÁ, A., ŠTEKEROVÁ, K. 2015: Sociální simulace při zkoumání společnosti, ekonomiky a využívání krajiny v době železné: metoda a příklady. *Památky archeologické* 106, 137–180.
- DEMJÁN, P. 2015: Evidence of social structure of a Neolithic community in Svodín, southwest Slovakia. *Anthropologie* 53, 363–373.
- DRESLER, P., MACHÁČEK, J. 2013: Vývoj osídlení a kulturní krajiny dolního Podyjí v raném středověku. *Archeologické rozhledy* 65, 663–705.
- GOJDA, M. (Ed.) (2010) *Studie k dálkovému průzkumu v archeologii*. Katedra archeologie Fakulty filozofické, Západočeská univerzita v Plzni, Plzeň.
- GOJDA, M., JOHN, J. (Eds.) 2013: *Archeologie a letecké laserové skenování krajiny*. Katedra archeologie, Západočeská univerzita v Plzni, Plzeň.
- JOHN, J. 2011: Status of Spondylus artifacts within the LBK grave goods. In: Ifantidis, F., Nikolaidou, M. (Eds.): *Spondylus in Prehistory: New data and approaches. Contributions to the archaeology of shell technologies*. BAR International Series 2216, Archaeopress, Oxford, 39–45.
- KUCHAŘÍK, M., GÁL, L., KOŠTIAL, J. (Eds.) 2010: *Počítačová podpora v archeologii III. Sborník příspěvků z deváté konference konané v Litomyšli 19.–21. 5. 2010*. TerraVerita, spol. s r. o., Praha.
- KUNA, M. (Ed.) 2015: *Structuring archaeological evidence. Archaeological map of the Czech Republic and related information systems*. Institute of Archaeology CAS, Prague.
- KUNA, M., DANIELISOVÁ, A. B. T. 2009: Geomorfometrie a analýza reliéfu v archeologii. *Rekonstrukce a experiment v archeologii – Živá archeologie* 10, 1–5.
- KVĚTINA, P., UNGER, J., VAVREČKA, P. 2015: Presenting the invisible and unfathomable: Virtual museum and augmented reality of the Neolithic site in Bylany, Czech Republic. *Archeologické rozhledy* 67, 3–22.
- LIESKOVSKÝ, T., ĎURAČIOVÁ, R., KARELL, L. 2013: Selected Mathematical Principles of Archaeological Predictive Models Creation and Validation in the GIS Environment. *Interdisciplinaria archaeologica. Natural Sciences in Archaeology* IV/2/2013, 177–190.
- MACHÁČEK, J. (Ed.) 1997: *Počítačová podpora v archeologii*. Ústav archeologie a muzeologie, Filozofická fakulta Masarykovy univerzity, Brno.
- MACHÁČEK, J. 2002: *Břeclav-Pohansko. Sídlištní anglomerace v Lesní škole. Digitální katalog archeologických pramenů*. Masarykova univerzita, Brno.
- MACHÁČEK, J. (Ed.) 2008: *Počítačová podpora v archeologii 2*. Ústav archeologie a muzeologie, Masarykova univerzita; Archeologický ústav AV ČR; Katedra archeologie, Západočeská univerzita, Brno, Praha, Plzeň.
- MALINA, J. 1977: *System of Analytical Archaeography*. Academia, Praha.
- NEUSTUPNÝ, E. 1978: Mathematical Analysis of an Aeneolithic Cemetery. *Studia Praehistorica* 1–2, 238–243.
- NEUSTUPNÝ, E. (Ed.) 2003: *Příspěvky k prostorové archeologii 1*. Katedra archeologie ZČU, Plzeň.
- NEUSTUPNÝ, E., JOHN, J. (Eds.) 2005: *Příspěvky k archeologii 2*. Katedra archeologie ZČU, Plzeň.
- PODBORSKÝ, V., KAZDOVÁ, E., KOŠTUŘÍK, P., WEBER, Z. 1977: *Numerický kód moravské malované keramiky. Problémy deskripce v archeologii*. Univerzita J. E. Purkyně, Brno.
- PREUSZ, M., BENEŠ, J., KOVAČIKOVÁ, L., KOČÁR, P., KAŠTOVSKÝ, J. 2014: What Did They Eat, What Did They Drink, and from What?



- An Interdisciplinary Window into Everyday Life of the Early Modern Burgher's Household in Český Krumlov (Czech Republic). *Interdisciplinaria archaeologica. Natural sciences in archaeology* V/1/2014, 59–77.
- SMRŽ, Z., KUNA, M., KÁČERIK, A. 2011: Archeologie mizející krajiny. Terénní průzkum předpolí Dolů Nástup Tušimice. *Památky archeologické* 102, 159–216.
- SOSNA, D., GALETA, P., ŠMEJDA, L., SLADEK, V., BRUZEK, J. 2013: Burials and Graphs: Relational Approach to Mortuary Analysis. *Social Science Computer Review* 31, 56–70.
- SOUDESKÝ, B. 1967: *Principles of Automatic Data Treatment Applied on Neolithic Pottery. Nordiska rådet för antropologisk forskning. Symposium on Classification and Automatic Data Treatment, Stockholm, March 6–12, 1966.* Czechoslovak Academy of Sciences, Archaeological Institute, Prague.
- ŠMEJDA, L. 2002: Workshop Pohansko 2002: Počítačová podpora v archeologii. *Archeologické rozhledy* 54, 927–931.
- ŠMEJDA, L. 2007a: Internetový server pro sdílení a publikaci archeologických prostorových databází. In: Křišťuf, P., Šmejda, L., Vařeka, P. (Eds.): *Opomíjená archeologie*. Západočeská univerzita, Katedra archeologie, Plzeň, 246–254.
- ŠMEJDA, L. 2007b: Letecká archeologie a internetové zdroje dat: situace v ČR. In: Křišťuf, P., Šmejda, L., Vařeka, P. (Eds.): *Opomíjená archeologie*. Západočeská univerzita, Katedra archeologie, Plzeň, 255–260.
- ŠMEJDA, L. 2009: *Mapování archeologického potenciálu pomocí leteckých snímků*. Západočeská univerzita v Plzni, Plzeň.
- ŠMEJDA, L. 2014: GIS visualizations of mortuary data from Holešov, Czech Republic. *Internet Archaeology* 36, <http://intarch.ac.uk/journal/issue36/index.html>.
- ŠVECOVÁ, R. 2003–2004: Krátka informácia o workshope "Pohansko 2002. Počítačová podpora v archeologii". *Sborník prací Filozofické fakulty brněnské univerzity. M, Řada archeologická* 52–53, 301–302.

