Although I have been following this project closely, I am still blown away by the quality of this volume and would urge anyone at all interested in archaeometallurgy to read it closely. I think that it is particularly notable for its exemplary integration of field survey, excavation, documentary and oral history, experimental archaeology and archaeometry.

The volume describes the discovery, during survey of a valley to be flooded by construction of a large dam, of two features of interest. The first was the site of the crucible steel production famously described by Coomaraswamy in 1904. Juleff found that the descendants of those steelworkers still possessed some blooms, crucibles and ingots of crucible steel, and an excellent metallurgical study of these by Michael Wayman is included here as an appendix. The second feature was the discovery of an entirely new type of iron-smelting furnace. As reconstructed by Juleff (and the data presented here allow no doubt as to the accuracy of her reconstruction) these were low subrectangular structures, 1.5 - 2 m in length, 0.4-0.8 m wide and (particularly suprising) only 0.5 m high. Large numbers of these were found, invariably placed near the crest of west-facing hills, with the front long wall, bearing a single line of up to a dozen tuyeres, facing downslope. Juleff argued that these were wind powered furnaces utilizing the force of the monsoonal wind (July to September), which (as she shows in an innovative chapter packed with wind-velocity measurements) achieve sustained wind speeds of 40 km/h, with periodic peaks up to 60 km/h.

Since Juleff was not an archaeometallurgist (at least not yet) and there was no precedent for the technology that she proposed, her reconstruction encountered intense scepticism from the archaeometalurgical community. She countered this in the most effective way - by building full-scale replicas and melting iron in them successfully on four separate occasions, using only the force of the monsoon wind. There can be no doubt that she is correct and that the Sri Lankan furnaces, for which available dates run from the seventh through the eleventh centuries AD, are a significant new chapter in the history of metallurgy. Mathematical modelling of the windflow patterns by David Wilson, an aeronautical engineer, explains why these furnaces work. A complex pattern of boundary layer separation occurs where the pases over the lip of the front walls, producing a low pressure zone that draws air in through the tuyeres. This is NOT a natural draft furnace - Wilson's calculations suggest that the pressure drop achieved in these 0.5 m furnaces is equivalent to that in natural draft furnaces 3 to 6 m tall.

This is the kind of publication that sets new standards for an entire field. The quality of the fieldwork is very high, it is superbly documented, and it is all woven into a complex and extremely coherent argument. Furthermore, unlike much contemporary archaeometallurgy (and I am thinking here particularly of European and Latin American archaeometallurgy) this study stands out for its wide-ranging use of comparative material - African, European, Near Eastern, Indian and Japanese. In summary, this is about as good as it gets in our field.


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This volume is the proceedings of the 5th Archaeological Sciences conference, a biannual meeting held in Britain since 1987. This is the second of the proceedings to be published Oxbow; another was published in the British Archaeological Reports series (Slater & Tate 1988; Budd et al. 1991). While the conference has rotated through various British venues, nationality of the participants and the subjects of the rescals presented is international. The participants at this particular conference were heavily biased towards the USA, Canada and western Europe.

As with proceedings of other conferences, including longer-standing International Archaeometry Symposia, contributions are a mixed bag in terms of subject matter, quality and significance. Archaeological Sciences 1995 includes papers, ranging in length from mere abstracts to a maximum of a dozen pages including references and illustrations. The concise nature of the papers is in keeping with the origins of presentations and, as an overview of a wide range of current scientific applications in archaeology, should make the volume appealing to readers with broad interests who prefer not to be bogged down in full journal article-length detail. For specialists, an introduction and/or epilogue which discussed range and significance of the papers, current and future trends, etc., would have been useful; the editors chose to confine only a half-page preface instead. Many of the articles would be suitable for use in graduate or advanced undergraduate courses as examples of scientific applications in archaeology in conjunction with text/lecture material on the principles the various techniques.

The papers are effectively organized into sections: methodology or material: Petrography (3 papers); Glass (Ceramics (7); Metallurgy (9); Chronological (9) a Dendrochronological (8) Studies; Ancient Environments (1 Remote Sensing (2); Human Remains (5); and Human Evolution/Hominid Artifacts (9). It is not possible here to discuss the individual papers in any detail.

Compared to Archaeological Sciences 1989, the most noticeable change is in the inclusion of the large number of papers on ancient environments, a topic of resurgent interest in archaeology. In general, the organizers of the conference were broadminded in their definition of archaeological science in some circles, the study of biological remains, until technologically sophisticated, would not have been included. Papers in the environmental section include studies of pollen and phytoliths (Tipping et al.; Madella), microfauna and fl (Clapham et al.; Pantazidou et al. [2 papers]; Turner-Wal
The papers on ceramics are split between petrography (de Domingo & Johnston: Eiland; Joyner; Williams & Jenkin and chemical (Brodie; Hughes et al.; Whitbread et al.) studies. These papers are limited in their geographic representation, with five on Greece and Italy, one on Roman pottery in Britain, and the last on Parthian ceramics in the Near East. Two of the chemical studies use atomic absorption, and the other neutron activation analysis. AAS has been widely superseded by IC spectroscopy, while NAA is expected to become less available in the coming decade due to the closure of many research reactors. Perhaps the most important paper in this group is the cautionary tale by Whitbread et al. who attempt to establish representative 'control group' of local ceramic fabrics by analyzing a kiln and its associated pottery.

The papers on metallurgy cover compositional analysis technology of production and decay, and sourcing. They include studies of alloy composition (Bayley & Bucher; Bean), iron production and possible tin sources in South India (Srinivasarao & Srinivasarao), early Islamic smelting processes (Griffiths et al.), documenting panniers and iron with the SEM (Mortimer & Stoney). The possibility of dating metal samples from copper with isotopes (Suzuki & Griffiths), copper sourcing using lead isotope ratios (Johnston et al.), and trace element fingerprinting of gold using laser ablation ICP mass spectrometry (Taylor et al.). While this last paper is only a preliminary report, it demonstrates the efficacy of this technique to produce quantitative trace element information in an almost non-destructive manner.

Two papers on remote sensing are also included, one using techniques appropriate to specific geological and archaeological circumstances (Shell) and the other on theoretical aspects of resolution on data interpretation (Schmidt & Marshall).

While it was undoubtedly a massive effort to extract all the conference papers in a timely manner and the editors a to be commended for publishing the proceedings within 12 years of the conference - there are too many inconsistencies in format that could have been addressed. Many papers had abstracts, but some have none at all, and two 'papers' are fact only half-page abstracts. For two papers with the same first author, the abstract for the first is just two lines in length and for the second paper, the abstract is 24 lines in length! The extent of typographic errors are equally variable, indicating the proofreading was largely left in the hands of the authors rather than the editors. The paper by Kayani and McDonnell particularly rife with distracting errors. In some cases a blank page is included so that papers begin on the right-hand page; in other cases the paper begins on the left. The table of contents is not necessarily accurate; for example, the author 'Brodie' should be 'Brodie'; M.H. Tite has been left as the second author of the paper by Rees-Jones, and the sequence of the two papers by Pantazidou et al. have been switched.

The volume is printed in the large A4 format, with text two columns. This is the new-standard format of all Oxbow publications, and the quality of the text and illustrations is very good. Photomicrographs, remote sensing images, and other figures are sharp and fully detailed. The cloth binding
adequate but my copy is already torn a bit at the spine; large volumes such as this one need a heavier duty binding. The price is undoubtedly a limiting factor for individual purchase, even at a 20% conference discount, although the price is not out of line relative to other publications of similar length and narrow target audience.

In conclusion, this volume is reasonably representative of the broad range of scientific applications in archaeology in the last decade of the 20th century, save for the wide array of recent work on biological remains, especially bone chemistry and residue analysis. While the sheer number of contributors alone attests to the vitality of and continued interest in scientific studies, it is equally clear that science-based archaeological research is not a standard or principal component of many archaeological projects, but something often done as a discrete effort from excavation and classificatory/typological analysis and publication. For the most part the papers in *Archaeological Sciences 1993* are useful contributions to the literature, but won’t change the reasons why many archaeologists find archaeometry to be boring. In some cases it may be the overly narrow focus of some scientific research; in others it may be lack of ‘middle range theory’ which connects the analytical data to the broader humanistic interpretation of archaeological issues of current interest. Hopefully the 21st century will see more widespread integration of scientific studies into archaeological research design and interpretation.

References

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Considered by James J. Miller, chief of the Florida Division of Historical Resources Bureau of Archaeological Resources, to be one of “the three founding monographs of modern Florida archaeology.” Goggin’s 1952 publication, *Space and Time Perspective in Northern St. Johns Archaeology, Florida*, has been reprinted by the University Press of Florida as part of the Southeastern Classics Series. The series editor is Jerald T. Milanch, whose most recent works include *Florida Indian and the Invasion from Europe and Laboring in the Field of the Lord: Spanish Missions and Southeastern Indians*. In his Foreword to the 1998 edition of *Space and Time Perspective*, Milanch states that the purpose behind reprinting of Goggin’s work is to make this ‘timeless treatise’ available to today’s students and scholars. With exception of a few additional pages of front matter, the 1998 edition is a replica of the 1952 original.

This relatively short book contains only eighty-page text supplemented by two appendices, one listing sites key to a map and the other listing artifacts. The book summarises data gathered from four hundred thirty-two archaeological sites spanning approximately two thousand years of occupation of a variety of groups. It does suffer from two shortcomings common to early, fundamental research in archaeology. First, it is descriptive and classificatory rather than interpretive. Second, its dating is relative. Reliable absolute dating was not possible, as this book was written before the use of radiocarbon dating.

Its major strengths include its instrumentality in the development of historical archaeology, and its high level of accuracy. Goggin’s work was so accurate that only minor revisions have been found necessary over the course of past fifty years. Written before the term “Native American” came to be politically correct, Goggin’s book is “modern” in concern with the ecological impact of human occupation, as forward thinking was Goggin’s inventing of underwreck archaeology as a method for learning about Florida’s submerged sites.

Goggin begins by defining the boundaries of the St. Johns Region and introducing the reader to the human physical geography of the area under consideration. He describes the topography, mineral resources, and the man and terran plant and animal life. He explains the changes occurred over time in sea level and climate. He discusses contact between the Native Americans and Europeans, start with the early 1500s and continuing through the beginning British occupation circa 1750. He concludes his overview with the disappearance of the Timucua tribe and the appearance of the Seminoles. In providing the ethnological background, Goggin defines the terms he uses to name the tribes, locates them geographically and discusses their language and style pottery. He speculates on population size and briefly describes the social and religious hierarchy.

He begins his discussion of the archaeological history of the area with the year 1605 when mounds of oyster shell were discovered and studied. He continues by discussing the eighteenth century, including 1765-1766, the period during which the British paid more organized attention to shell mounds burial sites. He also includes the contributions made by promontory Florida archaeologists of the nineteenth and twentieth centuries and concludes with a summary of his own publications.

He explains the process of developing the chronology of the area and defining the eras during which different cultures flourished. Goggin also explains how he combines the findings of several researchers to develop his chronological sequence. Using material remains—primarily pottery—as the basis