



SHARADA SRINIVASAN

Sharada Srinivasan is Professor at the National Institute of Advanced Studies, Bangalore. She has made pioneering contributions to the study of archaeology and history of art from the perspective of exploring engineering applications in these disciplines, i.e. archaeometry, archaeometallurgy and archaeological sciences. Her landmark contributions have included archaeometric characterisation of bronzes of South India using lead isotope analysis, archaeometallurgical studies on ancient mining and metallurgy in southern India, studies on wootz steel, and documenting artisanal technologies such as mirror making and bronze casting at Swamimalai. She is also an acclaimed performer of Bharata Natyam and has given numerous lecture-demonstrations such as the artistic and scientific perspectives on the Nataraja bronze.

THE CRUCIBLE: Can you summarise your career in a couple of sentences?

SHARADASRINIVASAN: I guess the areas I have contributed to, can be clubbed under archaeometallurgy, archaeotechnology, technical art history and ethnometallurgy. I have been exploring the art and science of statuary bronzes from southern India, such as the famed Chola Nataraja bronze of the Hindu god Siva, to suggest that one can tell apart earlier from later medieval bronzes from their lead isotope ratios and trace element profiles. I have been engaged in exploring early evidence for mining and metallurgy such the legendary wootz steel from Golconda, said to be exported to the Islamic Arab and Persian world to make Damascus blades; and the study of rare metal crafts such as the

exotic Aranmula delta high-tin bronze mirror.

THE CRUCIBLE: What is your most memorable professional moment?

SHARADA SRINIVASAN: I may say that the conferment of the Dr Kalpana Chawla Women Scientist Award (2011) by the Government of the Indian State of Karnataka did move me somewhere deeply. Firstly for the recognition that it gave archaeological sciences within the mainstream scientific world: as a discipline with some scientific rigour, which can yield outcomes of scientific value. Secondly it is named after NASA's Dr Kalpana Chawla, who perished in the Columbia Shuttle in 2003 as the first Indian-born woman astronaut (actually as a young girl I really wanted to become an astronaut! However, after my undergraduate in engineering physics I realised I wasn't cut out for that and that the remote frontiers of earth outside the window of the scientist's lab would do fine for me). Moreover, the fields of archaeometallurgy and archaeology also involve a level of adventure, which especially apply to us as women exploring remote areas in developing countries... I still remember a spectacular cheetah that sprang out from an old lead mine that I visited in 1991, in the Guntur area in southern India.

THE CRUCIBLE: Who has been your most influential colleague, and why?

SHARADA SRINIVASAN: It is never easy to pinpoint any one person 'most influential' since so many people have contributed along the way to the journeys I have engaged in

whom I cannot fully list. But some researches or writings of colleagues have more closely influenced outcomes. The paper by Nigel Seeley and W. Rajpitak in *World Archaeology* (1972) on the enigmatic Thai high-tin bronzes of prehistory was one of such. That article mentioned the account in Strabo's *Geography* that 'Indians used vessels which shattered like pottery', which the author's point out fitted the description of high-tin beta bronze. That struck a bell, and when I went to India and asked my grandmother if she could tell me about her old pots and pans, she mentioned the 'ottupatram' which broke like pottery when dropped and which was said to be made near Trichur in Kerala. That led me to identify previously unknown craft survivals for making Indian high-tin beta bronze vessels. I would also like to mention that my colleague historian Dr. Jaikishan's work identifying numerous surface sites for iron and wootz steel production in the Telangana region and the intangible heritage of rituals of blacksmiths, which have been very valuable for us to build a deeper understanding of the social history and archaeometallurgy of that region.

THE CRUCIBLE: What is your main current project?

SHARADA SRINIVASAN: I am currently involved with the making of a series of documentary films on 'Vanishing heritage of Kammalar' or traditional metalworking clans in southern India with IGNCAs, whose legacy we see in many splendid Indian metal artefacts; from the incredibly finely forged megalithic high-tin bronze vessel of the Nilgiris, to the legendary high-carbon wootz steel. The sad irony is that, even I could not have envisioned when I started this endeavour, it really would be about capturing the fading story of the very last vestiges of a range of once vibrant artisanal technologies now down to few struggling individuals. For example, the high-tin beta bronze vessel making (23% tin) no longer survives in that form due to the lack of demand and the physical rigours of the metal craft. It's also sad that these are being re-cycled en masse in Kerala, to make high-tin beta bronze musical cymbals for which there is at least some demand; as fresh metal is too expensive for them to afford and as the old vessels are discarded by householders. Filming is a whole new field for me and that has been challenging and rewarding too. It imposes a different kind of discipline since you have to try to capture the most compelling nuances; and especially the human dimension which perhaps, as detached archaeometallurgists/scientists, we don't usually encounter, such as the poignance of the Kammalar or bronze-smith who has gone deaf from a lifetime of hitting at the anvil...

THE CRUCIBLE: What multi-million project would you like to develop?

SHARADA SRINIVASAN: Ha ha! You would like me to engage in wishful thinking? The sad fact is that a country like India really does need multi-millions at its disposal to serve the fields of archaeometallurgy and historical metallurgy, although there has been a general lack of awareness of the importance of fostering such fields. So many archaeometallurgical production sites and old workings dotted across the landscape need to

be studied and documented, even as they are being lost by cultivation, construction, indiscriminate modern mining and so on. I would like to explore the heritage of gold mining in southern India; and in relation to the surviving crafts and undocumented temple treasures, setting up a metal museum, better conserving temple bronzes corroding in vaults or reviving crafts traditions and promoting artisans, an endless wish list...

THE CRUCIBLE: Which publication should every HMS member read?

SHARADA SRINIVASAN: I am quite pleased with the way our volume on 'Metals and Civilizations' has turned out, as the proceedings of the first and only conference under the Beginning of Use of Metals and Alloys Series, founded by eminent archaeometallurgist Robert Maddin, to have been held in India at Bangalore. Through the diligent efforts of many of my colleagues in the editorial and BUMA committees, it features many landmark articles on a range of topics in Asian Archaeometallurgy by leading international scholars and also a sizable number of contributions from India. It includes our tribute to late Dr Balasubramaniam, who made seminal contributions on the Delhi Iron Pillar before his untimely death.

[Sharada Srinivasan, Srinivasa Ranganathan and Alessandra Guimilia-Mair eds, 2009, *Metals and Civilizations, The Proceedings of the Seventh International Conference on the Beginning of the Use of Metals and Alloys*; NIAS Special Publication No. SP7-2015; <http://eprints.nias.res.in/756/>].

THE CRUCIBLE: Have you got any advice for young students interested in archaeological and historical metallurgy?

SHARADA SRINIVASAN: I would like to say to young students that it does not require multi-millions to make significant contributions! It just takes grit and determination, sometimes probably just exploring in one's backyard (at least in countries like India or Africa which may still have continuing crafts, remnants of metal production sites, scientific heritage and so on), and of course some serendipity. Also, one doesn't have to be obsessed with looking for the 'earliest' or the 'first', the technological heritage of every age, including the recent past, and of every part of the world, and every cultural milieu is just as significant and important to document.

THE CRUCIBLE: I would like to tell every reader of *The Crucible* that...

SHARADA SRINIVASAN: What I like best about archaeometallurgy is the inter-disciplinarily and out of the box thinking it can draw out of us. In fact, the scientific investigations on the Nataraja bronze spurred me to get back to performing south Indian classical Bharata Natyam dance, to engage with the devotional poetry and to experiment with the expressive repertoire to elucidate some of the material aspects and crafts traditions related to cultural artefacts. The work with late Indian astrophysicist Nirupama Raghavan is such a cross-disciplinary exploration, where she and I speculated that the iconographic aspects of the Nataraja bronze may have been inspired by star positions in the Orion constellation.