RESUME: SHARADA SRINIVASAN, Padhma Shri Awardee (2019)

Name*:* Sharada (Sharda) Srinivasan,
Place of Birth: Bangalore

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Summary of research interests and areas of contribution

Metallurgy, Materials characterization and Engineering applications in the study of Archaeological artefacts, Mining and Extractive Metallurgy, Archaeometallurgy and Archaeomaterials, Archaeological Sciences, Ancient Mining and Metal Production, Experimental metallurgy and archaeology, Artisanal technologies, History of Science and Technology, Ethnometallurgy and Crafts, Archaeoastronomy, Digital and computer vision in heritage studies, Geo-archaeology, Conservation & Corrosion, Materials Heritage & Acoustics

Education:

- Bachelor of Technology (1987), Indian Institute of Technology, Powai, India in Engineering Physics, First Class (4 year BTech)
- Master's (1989), School of Oriental and African Studies, University of London in Archaeology and Archaeometallurgy (Distinction). MA dissertation on 'Technological aspects of use of stone in Indian temples'

- Ph.D. (1996), in Archaeometallurgy from Department of Conservation and Scientific Research, Institute of Archaeology, University College London, UK. Title: "Archaeometallurgical and art historical investigations on south Indian metal icons'; with applications of frontline archaeometric techniques such as lead isotope analysis, compositional and trace element analysis, and ore-artefact analysis for finger-printing and provenancing medieval south Indian statuary bronzes (130) sampled from Victoria and Albert Museum London, Government Museum, Chennai and British Museum with lead isotope studies at Oxford Research Laboratory for History of Art and Archaeology

Distinctions/Awards/Fellowships/Prizes
National

- **PADMASHRI AWARDEE in ARCHAEOLOGY 2019, Fourth highest civilian National award from Government of India**
- **Dec 2021, Indian National Academy of Engineer INAE Woman Engineer of the Year 2022 Award in Academia Lecture**
  https://www.facebook.com/inaehq1/videos/911212889520835
- **Distinguished Alumnus of IIT-Bombay Award 2022**
  https://www.youtube.com/watch?v=9Y_kaymkIeY
- **Dr. Kalpana Chawla Young Women's Scientist Award 2011, given by Karnataka State Council for Science and Technology and Government of Karnataka**
- Indian Institute of Metals, Certificate of Excellence 2007 for book on Indian wootz steel
- Materials Research Society of India (MRSI) Medal 2006
- Malti B. Nagar Ethnoarchaeology Award (2005) for paper on 'Megalithic high-tin bronzes'
- DST-SERB Nurture Scheme Awardee (2006-2008)
- DST-SERC Young Scientist Fellowship (2001-2003)
- Adjunct Fellow since 2019, Indian Institute of Science, Centre for Society and Policy
- Homi Bhabha Fellow (since 1996)
- British Council Chevening Scholar 1990-1995 for PhD research in UK
- JN Tata Scholarship 1988

International

- **Elected to American Academy of Arts and Sciences 2021, as International Honorary Member in Social and Behavioral Sciences: Anthropology and Archaeology**

https://www.amacad.org/person/sharada-srinivasan

- **Elected Fellow, Royal Asiatic Society of Great Britain and Ireland since 2007**
- **Elected Associate Fellow, World Academy for Art and Science, 2010**
- Honorary Research Fellow, University of Exeter since 2011
- Charles Wallace Trust Visiting Scholar 2012
- V&A Nehru Trust Fellow 2007

- Edwardo Waldo Forbes Fellow, 1999, Dept. of Conservation and Scientific Research, Freer Gallery of Art, Smithsonian Institution, Washington DC, USA
- MRS Graduate Student Award, Materials Research Society, USA, 1997, Boston, for best paper on archaeometallurgical insights on high-tin bronze vessels and mirrors
- ODA (Overseas studentship, 1988-89, 90-93), University College London
- Charles Wallace Trust Fellowship
- Flinders Petrie Prize and Medal from University of London, 1989 for MA dissertation

List of best journal papers

- Sharada Srinivasan, 2021, 'Goddess worship and the dancing form: Exploring ritual in Indian prehistory and South Indian antiquity', *Lietuvos Archaeologija 47: 145-166.*
- Srinivasan, S. 2018, Early gold mining and jewellery: Some Insights from the Nilgiris, Tamil Nadu and Karnataka. *SAARC Culture 6: 88-103.* http://www.nias.res.in/sites/default/files/2018-SCCSL-SharadaSrinivasan.pdf
- Srinivasan, S., 2017, Iron Age beta (23% tin) bronze: Peninsular Indian bowls of Adichanallur, Nilgiris and Boregaon, *Materials and Manufacturing Processes, Vol. 32: Issue 7-8: Ancient Metallurgy*, pp. 807-812. http://www.tandfonline.com/doi/full/10.1080/10426914.2016.1244843
- Srinivasan, S., 2017.Ultra-high "wootz"from crucible carburisation of molten iron: Hypereutectoid steel from Tamil Nadu Process at Mel-siruvalur, *Materials and Manufacturing Processes*, DOI: 10.1080/10426914.2016.1221106, Vol 32, 7-8; ISSN: 1042-6914 (Print) 1532-2475 http://www.tandfonline.com/eprint/mthzEJMtV7PvudtNWsQX/full.
- Srinivasan, S., 2016, Copper Smelting Slags at Ingaldhal Mines, Karnataka: Early Historic Satavahana Links, *Transactions of the Indian Institute of Metals*, 70(2), 541-546, **DOI** 10.1007/s12666-016-1013-6http://rdcu.be/m8pL
- Srinivasan, S., 2016., Indian high-tin bronzes and the Grecian and Persian world, *Indian Journal of History of Science*, 51.4 601-612. http://insa.nic.in/writereaddata/UpLoadedFiles/IJHS/Vol51_2016_1_Art05.pdf
- Srinivasan, S., 2016, Tamil Chola bronzes and Swamimalai Legacy: Metal Sources and Archaeotechnology, *Journal of Metals*,JOM, 68(8), 2207-2221 DOI: 10.1007/s11837-016-1959-1.http://rdcu.be/nbyZ
- Srinivasan, S., 2016, Metallurgy of Zinc, High-tin Bronze and Gold in Indian Antiquity: Methodological Aspects, *Indian Journal of History of Science*, 51.1 (2016), pp. 22 - 32. http://insa.nic.in/writereaddata/UpLoadedFiles/IJHS/Vol51_2016_1_Art05.pdf

- Srinivasan, S. 2013, 'Megalithic and surviving binary high-tin bronze traditions in southern India: Tracing binary bronze usage to Harappan times', *Transactions of the Indian Institute of Metals*, Springer, 66 (5-6): 731-737.

- Srinivasan, S. 2007. On higher carbon and crucible steels in southern India: further insights from Mel-siruvalur, megalithic Kodumanal and early historic Pattinam. *Indian Journal of History of Science 42(4):673-95*.

- Srinivasan S. and Glover, I. 2007. Skilled mirror craft of intermetallic delta high-tin bronze (Cu31Sn8, 32.6% tin) from Aranmula, Kerala. *Current Science 93(1): 35-40.* https://www.currentscience.ac.in/Downloads/article_id_093_01_0035_0040_0.pdf

  http://eprints.nias.res.in/236/

- Srinivasan, S. 2004. 'Siva as cosmic dancer: On Pallava origins for the Nataraja bronze'. *World Archaeology. Vol. 36(3): 432-450. Special Issue on 'Archaeology of Hinduism.*

- Srinivasan, S. 1999. Lead isotope and trace element analysis in the study of over a hundred South Indian metal icons. *Archaeometry* 41(1): 91-116. http://www.perspectivecreations.com/hsg/publications/

- 14. Srinivasan, S. 1998. The use of tin and bronze in prehistoric South Indian metallurgy. *Journal of Metals 50(7):44-7, 49.* 13.

- 15. Srinivasan, S and Glover, I. 1995. Wrought and quenched and cast high-tin bronzes from Kerala state, southern India. Part III. Historical dimension. *Journal of the Historical Metallurgy Society 29(2): 81-87*

Doctoral Thesis

- Srinivasan, S. 1996. *The enigma of the dancing 'pancha-loha' (five-metalled) icons: archaeometallurgical and art historical investigations of south Indian bronzes.* Unpublished Phd. Thesis. London: Institute of Archaeology, University of London.

- Srinivasan, S. 1988. *Technological aspects of use of stone in Indian temples.* Unpublished MA Thesis. London: School of Oriental and African Studies, University of London.

Books and monographs

- Srinivasan, S, 2020, *Metal Crafts Heritage of the Cauvery Region*, National Institute of Advanced Studies, Bengaluru, http://www.nias.res.in/publication/metal-craft-heritage-cauvery-and-riverine-regions-niashumhssurr022020

- Srinivasan, S. 2019. *Casting Nataraja: Techniques of South Indian Bronze Casting.* Bangalore: National Institute of Advanced Studies.

- Malik, A., Chaudhury, S., Chandru, V. and Srinivasan, S. (eds), (2018), *Digital Hampi: Preserving Indian Cultural Heritage*, Springer Books. https://www.springer.com/in/book/9789811057373

- Srinivasan, S. 2018. *Chola and Vijayangara Bronzes: Archaeometallurgical Mapping of Shifting Iconographies, 2nd Dr. Frank E. Chookolingo and Evamaria E. Chookolingo Memorial Lecture.* Banaras: Banaras Hindu University. http://www.nias.res.in/publication/chola-and-vijayangara-bronzes-archaeometallurgical-mapping-shifting-iconographies; http://eprints.nias.res.in/1480/

- Tejpal Singh, Sandip Singh and Srinivasan, S. 2016. *Ecstasy of Classical Art: Indian Bronzes, National Museum Collection*, National Museum, New Delhi http://www.perspectivecreations.com/hsg/publications/From%20temple%20to%20mantelpiece.pdf

- Srinivasan, Sharada, 2016, *Hampi: Splendours of a World Heritage Site*, NIAS Backgrounder, http://www.perspectivecreations.com/hsg/publications/Srinivasan,%20S.%202016,%20Hampi%20SPlendours%20of%20a%20World%20Heritage%20Site.pdf

- Srinivasan, S. 2016. Techniques of bronze casting. In: Singh, S., Singh, S. and Srinivasan, S. *Ecstacy of Classical Art: Indian Bronzes, National Museum Collection*. New Delhi: National Museum, pp. 20-36.

- Srinivasan, S., Ranganathan, S. and Guimlia-Mair, A., 2015. (eds.) Metals and Civilisations. Proceedings of the Seventh International Conference on the Beginning of the Use of Metals and Alloys; NIAS Special Publication No. SP7-2015. Bangalore: National Institute of Advanced Studies. http://eprints.nias.res.in/756/

- Srinivasan, S and Ranganathan, R. 2014. *India's Legendary Wootz Steel: An Advanced Material of the Ancient World*. Chennai: Universities Press.

- Srinivasan, S, and Ranganathan, S., 2013, Minerals and Metals in India, NIAS Backgrounder, National Institute of Advanced Studies, Bangalore

- Juleff, G., Srinivasan, S. and Ranganathan, S. 2011. *Pioneering metallurgy: origins of iron and steel making in the southern Indian subcontinent. Telengana Field Survey, Interim Report 2011*. Bangalore: National Institute of Advanced Studies and University of Exeter.

- Srinivasan, S. 2008. *Finger-printing of Bronzes*. *Bulletin of the Government Museum,* New Series-General Section, Vol. XVI, No. 4: 1-27.

- Srinivasan, S and Ranganathan, R. 2004, '*India's legendary wootz steel: an advanced material of the ancient world',* National Institute of Advanced Studies and Indian Institute of Science, supported by Tata Steel. https://www.inae.in/pdf/India's-Legendary-Wootz-Steel.pdf?fbclid=IwAR3LqJDVbQrcl1EiErinBluMsbfb-rxi1CCyPjiXlGr1U8ErVbEwHWhD_hk

Recent Book Chapters

- Srinivasan, S, 2022, The Cosmic Dancer. In Karan Singh ed, *Shiva: Lord of the Cosmic Dance*, Speaking Tiger Books, 285-307.

- Srinivasan, S. 2022. The Nataraja bronze: Image casting traditions, art and technology, In: Anna Slazcka (ed), *Deconstructing the Śiva Naṭarāja. New Research in Multidisciplinary Perspective*, Leiden: Brill, p 91-103.

- Srinivasan, S. 2021. 'Ramayana bronzes from Chola to Vijayanagara times', Pandya Dhar (ed.), *Multivalence of an Epic: Retelling the Ramayana in South India and Southeast Asia*, Manipal: Manipal Universal Press, pp 103-123.

- Srinivasan, S., Sengupta, R., Padhmapriya S., Johnson, P., Kritika, U., Ranganathan, S. and Thakur, P. 2018. Vijayanagara era Narasimha bronzes and sculpture: Digital iconometry. In Malik, A., Chaudhury, S., Chandru, V. and Srinivasan, S. (eds), *Digital Hampi: Preserving Indian Cultural Heritage.* Springer Books, pp 173-87. http://www.perspectivecreations.com/hsg/publications/vijayanagara%20_era%20_narasimha%20_bronzes%20_and%20_sculpture.pdf

- Srinivasan, Sharada . 2017. "Nataraja, Natesa and Orion: Archaeometallurgical and Archaeoastronomical insights into Dancing Siva Images". In Iconography of the Hindus, Buddhists and Jains: *Proceedings of the National Conference, Iconography of the Hindus, Buddhists and Jains: Proceedings of the National Conference*, Chennai: C P R Publications, 265-285. http://eprints.nias.res.in/799/

- 3. Srinivasan, S. 2016. From temple to mantelpiece: Changing paradigms in the art and crafts of south Indian metal icons, In: Branfoot, C. (ed.), *Traditional Arts of South Asia: Continuity in Contemporary Practice and Patronage.* London: Saffron Press: pp.110-48.
- http://www.perspectivecreations.com/hsg/publications/From%20temple%20to%20mantelpiece.pdf

- 4. Srinivasan, S. 2016, Techniques of Bronze Casting, In Tejpal Singh, Sandip Singh and Srinivasan, S. *Ecstacy of Classical Art: Indian Bronzes, National Museum Collection*, National Museum, New Delhi, pp. 20-36.http://www.perspectivecreations.com/hsg/publications/Techniques%20of%20Bronze%20Casting.pdf

- Sharada Srinivasan, 2019, Book Review: Early Indian Metallurgy: The Production of Lead, Silver and Zinc through Three Millennia in North West India by P. T. Craddock, K. T. M. Hegde, L. K. Gurjar and L. Willies, Indian Journal of History of Science, IJHS, Vol 54.3, Sept 2019, p 376-378.

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Other Published papers:

(some uploaded on http://www.perspectivecreations.com/hsg/sharada.html)

- Haricharan, S., Nalini, N.S, Srinivasan, S. and Ranganathan, S. 2019. A landscape analysis of fortification in Tamil Nadu using satellite images, *Heritage: Journal of Multidisciplinary Studies in Archaeology 7 (2019): 195-210*

- Udayakumar, and Srinivasan, S, 2018. Traditional techniques of gold jewellery: A case study of Devakottai, Tamil Nadu. *Journal of the Center for Heritage Studies 313-21*. http://www.nias.res.in/sites/default/files/2018-SCCSL-SharadaSrinivasan.pdf

- Srinivasan, S., 2017, Key Metals and Alloys from Indian and South Indian Antiquity: An Archaeometallurgical Review, *Advances in Construction Materials and Systems*, *Rilem Proceedings Pro 118*, Vol. 1: 99-113. http://rilem2017conference.org/download-pdf/ICACMS%20Proceedings%20Vol%201.pdf (Keyote Address at RILEM 2017)

- Haricharan S, Nagabhooshan, Srinivasan S, Rajani M B, Ranganathan S. 2016. Insights on locating iron production sites in Telangana using satellite imagery. Current Science 111(9): 1536-1543.

- Srinivasan, S. 2015. Elements of Siva's dance: Finger-printing of Chola bronzes and the Reitberg Nataraja. In: E. Deschler-Erb, P. D. Casa (eds.), *New Research on Ancient Bronzes. Zurich Studies in Ancient Archaeology Series 10: 317-27.*

- Srinivasan, S. 2015. Bronze image casting in Tanjavur district, Tamil Nadu: Ethnoarchaeological and archaeometallurgical insights. In: Srinivasan, S., Ranganathan, S. and Guimlia-Mair, A. (eds). *Metals and Civilisations, Proceedings of the Seventh International Conference on the Beginning of the Use of Metals and Alloys, NIAS Special Publication No. SP7-2015*. Bangalore: National Institute of Advanced Studies, pp. 209-216 (http://eprints.nias.res.in/756/).

- Srinivasan. S, 2015. Of Face and phases: High tin bronze metallurgy and South Indian and Tamil innovations. *The Indian Institute of Metals NMD ATM 2015, Souvenir.* Coimbatore: pp. 82-90

- Balasubramaniam, R. Srinivasan, S. and Ranganathan, S., pp. 112-123. In: Srinivasan, S., Ranganathan, S. and Guimlia-Mair, A., 2015. (eds.) *Metals and Civilisations. Proceedings of the Seventh International Conference on the Beginning of the Use of Metals and Alloys;*

NIAS Special Publication No. SP7-2015. Bangalore: National Institute of Advanced Studies, pp. 112-123. http://eprints.nias.res.in/756/

- Srinivasan, S. 2014. Aesthetics and foundations of science: Insights from Indian metallurgical traditions. In: B.V. Sreekantan (ed), *Foundation of Sciences, Vol XIII, Part* 5, *History of Science, Philosophy and Culture in Indian civilization, PHISPC Series.* New Delhi: Pearson, pp. 210-54. http://eprints.nias.res.in/601/

- Srinivasan, S. 2013. Techno-cultural Perspectives on Medieval Southeast Asia and Southern India: Pallava bronzes and beyond. In: Klokke, M.J. and Degroot, V. (eds.) *ed. Materializing Southeast Asia's Past: Selected Papers from the 12th International Conference of the European Association of Southeast Asian Archaeologists, Volume 2*. Singapore: NUS Press, pp. 167-78.

- Srinivasan, S., 2013. Iconographic trends in Rama worship: Insights from techno-cultural studies of bronzes. In: Krishna, N. (ed.), *Ramayana in Literature, Society and the Arts.* Chennai: CP Ramaswamy Aiyar Institute of Indological Research, CPR: pp 345-62.

- Srinivasan, S. 2013. Indian iron and steel, with special reference to southern India. In: Humphris, J. and Rehren, T.H., *World of Iron.* London, Archetype Press: pp. 83-90. http://eprints.nias.res.in/606/

- Srinivasan, S. 2012. Carving a global icon: The Nataraja bronze and Coomaraswamy's legacy. In: Manatunga, A. (ed.), *Asian Art and Culture: A Research Volume in Honour of Ananda Coomaraswamy.* Kelaniya: Centre for Asian Studies, p. 245-56. https://www.sahapedia.org/the-nataraja-bronze-and-coomaraswamys-legacy

- Srinivasan, S. 2012. Aspects of continuity in bronze and high-tin bronze traditions from pre-history to present day. In: Sharma, D. P. (ed.), *Science and Metal Technology of Harappans.* Kaveri Books, pp. 179-193.

- Srinivasan, S. and Ranganathan, S, 2012, 'Minerals and metals heritage of India', Souvenir, XXVI International Minerals Processing Congress, IPMC 2012, New Delhi, Sept. 24-28, 2012, pp. 41-52.

- Srinivasan, S. 2012. Swamimalai bronze casting: Chola traditions and changing parameters. *International Steel Institute of Japan ISIJ 25: 816-20.*

- Srinivasan, S. 2011. Nataraja and Cosmic Space: Nature and culture intertwinings in the early Tamil tradition, In *Nature and Culture,* ed. R. Narasimha, History of Science, Philosophy and

Culture in Indian Civilization, PHISPC Series and Centre for Studies in Civilisation, pp. 271-291. http://eprints.nias.res.in/259/

- Srinivasan, S., 2011. Jain bronzes in Karnataka: some art historical and technical aspects. *IUP Journal of History and Culture 5(2): 1-9.* http://eprints.nias.res.in/244/

- Srinivasan, S. and S. Ranganathan, 2011. Significance of wootz steel to history of materials science. *Pioneering metallurgy: origins of iron and steel making in the southern Indian subcontinent. Telengana Field Survey, Interim Report 2011.* Bangalore: National Institute of Advanced Studies and University of Exeter, pp. 1-4

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- Juleff, G., Srinivasan, S. and Ranganathan, S. 2011, Telengana Field Survey: post-survey analysis of field data', 'Pioneering metallurgy: origins of iron and steel making in the southern Indian subcontinent. Telengana Field Survey, Interim Report 2011', National Institute of Advanced Studies and University of Exeter, pp. 24-29.

- Srinivasan, S. 2010. Megalithic high-tin bronzes and India's living prehistory. In: Bellina, B., Bacus, E. Pryce, O. (eds.), *50 years of Archaeology in Southeast Asia: Essays in honour of Ian Glover*. Bangkok: River Books, p. 260-271. http://www.perspectivecreations.com/hsg/publications/No%206%20%202010%20Sharada%2050%20Years%20of%20Southeast%20Asian%20Archaeology%20Essays%20in%20Honour%20of%20Ian%20Glover.pdf

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- Srinivasan, S. 2009. Social History of Indian metalcrafts: Some archaeometallurgical and ethnoarchaeological insights. In: Chattopadhyay, B.D. (ed.), *A Social History of Early India, Vol II, PHISPC Series, Part 5.* New Delhi: Pearson and Longman, 251-69. http://www.perspectivecreations.com/hsg/publications/No%207%20%20Srinivasan%20S.%202009'%20South%20Indian%20Iron%20Age%20iron%20and%20high%20carbon%20steel%20with%20reference%20to%20Kadebakele%20and%20comparative%20insights%20from%20Mel-siruvalur'.%20Metallurgy%20and%20Civilisation%20%20Internation.pdf

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- Srinivasan, S. 2009. Singing Rocks (of Neolithic Kupgal, Karnataka). *Songlines 60:54-7.*

- Srinivasan, S. 2008. Mirrors: Metal mirrors from India. In Selin H. (ed.): *Encyclopedia of the History of Science, Technology and Medicine in Non-Western Cultures*, Vol. 2, Berlin, Springer Verlag: 1699-704. http://www.perspectivecreations.com/hsg/publications/encyclopedia_of_the_history_of_science_technology_and_medicine_in_non_western_cultures.pdf

- Srinivasan, S. 2008. Megalithic and Early Historic metalwork in southern India: some issues of technology, emergence and transmission. In: Sengupta, G. and Chakraborty, S. (eds): *Archaeology of Early Historic South Asia.* New Delhi: Pragati Publications with Centre for Archaeological Studies and Training, Eastern India.

- Srinivasan, S. 2007. On icons, vessels and mirrors from South India: tracing early use of tin, zinc and high-tin bronze. In: Bilimoria, P. (ed.), *Traditions of Science: Cross-cultural perspectives*. New Delhi: Munshiram Manoharlal Publishers Pvt. Ltd, pp. 157-76.

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- Srinivasan, S. 2006. Megalithic high-tin bronzes: ethnoarchaeological and archaeometallurgical insights on manufacture and possible artistic and musical significance. *Man and Environment XXXI (2): 1-8.* (Malti B. Nagar Ethnoarchaeology Award winning paper).

- Srinivasan, S. 2006. Art and Archaeometallurgy of Nataraja: Exploring visual metaphors for consciousness. In S. Menon (ed.) *Consciousness, Experience and Ways of Knowing: Perspectives from Science, Philosophy and the Arts.* Bangalore: National Institute of Advanced Studies, pp. 242-254.

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- Srinivasan, S. 1998. Highlights of ancient south Indian metallurgy-technical evidence for the early use of high-tin bronzes, high-carbon steel, metallic zinc, smelting of bronze and cast images. *Beginning of the Use of Metals and Alloy (BUMA-IV).* Matsue: Japan Institute of Metals, pp. 79-84.

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Some popular pieces

- Srinivasan, S, March 7, 2021. Decoding the Nataraja Bronze: A cosmic dance through the ages, Livehistory
  https://www.livehistoryindia.com/story/cover-story/decoding-the-nataraja-bronzes-a-cosmic-dance-through-centuries/
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- Srinivasan, S, July 2021, Metal Marvel of India, Sahapedia
  https://www.sahapedia.org/metal-mirror-marvel-aranmula?fbclid=IwAR1Pa0QjmA31OPkF8N5GiIlgigtmGC6bLOj0j05B-a6WIUHNDur0uGRDuk4

- Srinivasan, S, 2021, Saga of the Tambura, Deccan Herald
  https://www.deccanherald.com/spectrum/the-saga-of-the-tambura-936990.html

- Sharada Srinivasan, Nov 12th 2021 New Indian Express, Marvellous Metal Mirror from Aranmula

  https://www.newindianexpress.com/opinions/columns/2021/nov/12/marvellous-metal-mirrors-from-aranmula-2382425.html

Online Lectures of Prof Sharada

'Vijayanagara Heritage and Digital Perspectives: Cultural and geological landscape of Hampi' National Museum, New Delhi coinciding with the Digital Heritage exhibition in Feb 2020

https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107 HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20Heritage%20Forum%20national%20museum"& HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20Heritage%20Forum%20national%20museum"external_log_id=0934c2791752058abb04e492584cfe3a HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20Heritage%20Forum%20national%20museum"& HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20Heritage%20Forum%20national%20museum"q=NIAS%20Heritage%20Forum%20national%20muse

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-May 1st 2020, Indian contributions to metallurgy in an archaeological context, Vijnana Bharati, Lockdown Live Lecture Series
https://www.youtube.com/watch?v=BIO58EySx_0 HYPERLINK "https://www.youtube.com/watch?v=BIO58EySx_0&t=2s"& HYPERLINK "https://www.youtube.com/watch?v=BIO58EySx_0&t=2s"t=2s

-April 19th 2020, Indian Museum, Kolkata, Stories of World Cultures, Video of Aranmula mirror making by Prof Sharada Srinivasan, https://www.youtube.com/watch?v=nyGqZISN4To

-May 16th, 2020, Indian Museum, Kolkata, Stories of World Culture, 'Nataraja bronze and Cosmic Dance' with Padmashri Sharada Srinivasan (2020)
https://www.youtube.com/watch?v=cC91oeOLF3Q HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"& HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"feature=youtu.be HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"& HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI

-June 11th, 2020, Ancient Metallurgy in India (AICTE), All India Council of Technical Education (AICTE) webinar on Traditional Knowledge Systems
https://www.youtube.com/watch?v=WjqKmehKtx8 HYPERLINK "https://www.youtube.com/watch?v=WjqKmehKtx8&t=3064s"& HYPERLINK "https://www.youtube.com/watch?v=WjqKmehKtx8&t=3064s"t=3064s

-18th June 2020, Nataraja: A confluence of Arts and Sciences, https://www.facebook.com/VIBHAIndia.org/videos/268416710911956
https://www.youtube.com/watch?v=vVa3vj8fqy0 HYPERLINK "https://www.youtube.com/watch?v=vVa3vj8fqy0&t=3576s"& HYPERLINK "https://www.youtube.com/watch?v=vVa3vj8fqy0&t=3576s"t=3576s

-12th June 2020, Archaeometallurgy and Ethnoarchaeology in the Nilgiris, (INTACH-Bangalore) https://youtu.be/zFj8GImxckI

-July 7th 2020, Early High-Tin Bronzes from South India and Southeast Asia, Karwaan Online History Festival Season 2, https://www.youtube.com/watch?v=Bt6XvQWgrhM

-10th August 2020, Highlights of Indian metallurgical heritage, INTACH Conservation Insights Lecture Series; https://www.youtube.com/watch?v=w0SCFhdsxqA

-11th August 2020, Bronzes and brasses and lead isotope ratio archaeometry in the study of south Indian and Chola metal icons, INTACH Conservation Insights Lecture Series; https://www.youtube.com/watch?v=wcMiYPNUfUM

-14th August 2020, Rare artisanal trajectories of binary high-tin bronze mirrors and vessels and bell casting, INTACH Conservation Insights Lectures
https://www.youtube.com/watch?v=LSgD_y0FKUg

-19th August 2020, A Journey in Archaeology Sharada Srinivasan on Studying the metals and materials heritage of Southern India. BIC STREAMS, Bangalore International Centre. https://www.youtube.com/watch?v=DPs4u6QpJSc

-19th Sept 2020, Metal working traditions of Kammalar and Vishwakarma of Southern India. IGNCA, Delhi https://www.facebook.com/IGNCA/videos/364382484740620

https://www.youtube.com/watch?v=1lw_KqP-Q4Y

-8th October 2020, 'Harappan and Dholavira metal processing: some archaeometallurgical and ethnometallurgical explorations' . Two Days International Web-Seminar on Metal Art Object of Indus Saraswati Civilization. Jointly organized by National Museum New Delhi & Ishan Promote Art, Culture and Improve Society, Uttar Pradesh

-4th October 2020, Chola Bronzes: Artistic and Metalworking Legacy. Pune, Purattatva Samvardhan
https://www.facebook.com/puratattvasamvardhan/videos/2734854796780492

-Oct 12th 2020, Lecture on Indian metal crafts for webinar on Folklore & Intangible Cultural Heritage organised by IGNCA, New Delhi

-7th November 2020, 'Zinc extraction and Steel making: Archaeometallurgical Insights' webinar on Chemistry in Ancient India under the aegis of TIFR and ACS (American Chemical Society) https://www.youtube.com/watch?v=b6kV2v4dl2k

-4th December 2020, Kreyol Indika with Sharada Srinivasan, Thinnai Katcheri Season 2: 6, Paris, https://www.youtube.com/watch?v=v3Gz7FdIpac

-5th December 2020, Chola Bronzes-Art Historical and Archaeometallurgical Insights. Tamil Heritage Trust Indology Festival, Tamil Heritage Trust Youtube Channel

https://www.youtube.com/watch?v=lcylzVEM_0s HYPERLINK "https://www.youtube.com/watch?v=lcylzVEM_0s&t=858s"& HYPERLINK "https://www.youtube.com/watch?v=lcylzVEM_0s&t=858s"t=858s

-13th December 2020, Megalithic/Iron Age and Early Historic Metallurgy in the Tamil Region. Asian Megaliths lectures; https://www.facebook.com/selvakumar.veerasamy/videos/10224573489905661

-19th December 2020, India's Heritage in Sculpture. National Gallery of Modern Art with Gandhi Centre for Science and Human Values, Bengaluru;
https://www.facebook.com/ngmablr/videos/1759825697500557

-23rd December 2020, Musical Instruments at the Indian Music Experience Museum: A virtual Tour. India international Science Festival, Congress of the History of science in India

-24th December 2020, Traditional Metallurgy and Experimental Archaeology: Some insights on mirror making and iron smelting, India international Science Festival, Congress of the History of science in India

-3rd February 2021, Hampi as Cultural and Geological Landscape: Technical and Digital Perspectives. NIAS Wednesday Discussion

-6th February 2021, Art and Metal Technology of Chola Bronzes, Tamil Nadu Science Forum, Popular Science Lecture 34
https://www.youtube.com/watch?v=78huGl8rONQ
-16th February, 2021, Art and Technology of South Indian Bronzes and Chola Nataraja, India International Centre Youtube Channel;
https://www.youtube.com/watch?v=53gLYHOAvrI

March 31, 2021, Chola Bronzes and Archaeometry, Indo-Russian Seminar organised by Russian Academy of Sciences and ICSSR webinar on 'Preservation of Cultural Heritage'
April, 2021, Archaeology of Metals in India: Iron Age Tamil Nadu, Digital Museum, UK
https://www.youtube.com/watch?v=0XCHUfcBIkg HYPERLINK
"https://www.youtube.com/watch?v=0XCHUfcBIkg&t=4397s"& HYPERLINK
"https://www.youtube.com/watch?v=0XCHUfcBIkg&t=4397s"t=4397s

August 6th, 2021, Highlights of Indian heritage in ferrous metallurgy and the legendary wootz steel, ASET Colloquium, Tata Institute of Fundamental Research
https://www.youtube.com/watch?v=wLRLWibK8GI

July 25th 2021, Metallurgical Heritage of India, International Centre for Theoretical Sciences, Kuriosity During Kuarantine Series
https://www.youtube.com/watch?v=Z0a2sTeuzlc HYPERLINK
"https://www.youtube.com/watch?v=Z0a2sTeuzlc&t=228s"& HYPERLINK
"https://www.youtube.com/watch?v=Z0a2sTeuzlc&t=228s"t=228s

Sept 1st 2021, Dance Heritage of India, Cultural Heritage of India Seminar, Dept of History, Jyoti Nivas College, https://www.youtube.com/watch?v=RplH-hO-wak

August 8th 2021, Dance and Architectural Intertwining, Confluence of Heritage Narratives, Destination Heritage,
https://m.facebook.com/destinationheritage/videos/549722136371371/?locale2=ne_NP

Sept 8th 2021, Art and Science of Metallurgy and Metal Artefacts, Sandeep and Gitanjali Maini Foundation,

https://en-gb.facebook.com/SGMF2020/videos/art-science-of-metallurgy-metal-artefacts-by-prof-sharada-srinivasan/333269365224854/

Sept 8th 2021, Art and Science of Metallurgy and Metal Artefacts, Sandeep and Gitanjali Maini Foundation,

https://en-gb.facebook.com/SGMF2020/videos/art-science-of-metallurgy-metal-artefacts-by-prof-sharada-srinivasan/333269365224854/

Oct 4 2021, Science in Culture, International Day of Scientific Culture, DSC, Nehru Science Centre webinar https://www.youtube.com/watch?v=ZyAWKCbiCww

16th Dec 2021, Indian National Academy of Engineer INAE Woman Engineer of the Year 2022 Award in Academia Lecture
https://www.facebook.com/inaehq1/videos/911212889520835

Dec 20th 2021, Metallurgy and History of Technology, Seminar of Army War College
https://drive.google.com/file/d/1QnPK-Z--5qPZB8JAadI7pDTDJE1-GGwt/view

Dec 2021, Indian National Academy of Engineer INAE Woman Engineer of the Year 2022 Award in Academia Lecture https://www.facebook.com/inaehq1/videos/911212889520835

Jan 22nd 2022, Dance and Archaeology, India Science Festival
https://www.youtube.com/watch?v=BCiC9jWXn1Q HYPERLINK "https://www.youtube.com/watch?v=BCiC9jWXn1Q&t=955s"& HYPERLINK "https://www.youtube.com/watch?v=BCiC9jWXn1Q&t=955s"t=955s

12th Feb 2022, Wootz Steel: Technology Transfers in Antiquity, Webinar for IIT-B Alumni network in Bangalore IITABC https://www.youtube.com/watch?v=93k8vdpH8Qs HYPERLINK "https://www.youtube.com/watch?v=93k8vdpH8Qs&list=PL0zMQ-70IHlX-df3u2Tto6dkKHCRC6iFL&index=51"& HYPERLINK "https://www.youtube.com/watch?v=93k8vdpH8Qs&list=PL0zMQ-70IHlX-df3u2Tto6dkKHCRC6iFL&index=51"list=PL0zMQ-70IHlX-df3u2Tto6dkKHCRC6iFL HYPERLINK "https://www.youtube.com/watch?v=93k8vdpH8Qs&list=PL0zMQ-70IHlX-df3u2Tto6dkKHCRC6iFL&index=51"& HYPERLINK "https://www.youtube.com/watch?v=93k8vdpH8Qs&list=PL0zMQ-70IHlX-df3u2Tto6dkKHCRC6iFL&index=51"index=51

March 8th 2022, Felicitation by Embassy of Mexico for International Woman's Day event with Tagore Cultural Centre Mexico and IIT-Kharagpur as Woman of Substance (event as part of Azadi ka Amrit Mahotsav)
https://www.facebook.com/iccrmexico/videos/1689045021438865

25th March 2022, SAMVAD Episode 4, Reimagining girls education in STEM
https://www.facebook.com/malshree.kalla/videos/676195686917981

Documentaries, Videos and A/V interviews

- Prof Sharada gave interviews and content for 2 episodes of Natgeo/Hotstar on Wootz steel and Hampi pillar (Episode 7 and Episode 10)

https://www.hotstar.com/in/tv/it-happens-only-in-india/1260074401/episode-7/1260078870

Podcast by Prof Sharada Srinivasan on Aranmula Metal Mirror for NisCPR Svastik

- Made in India Wootz, film for Epic TV channel with Sharada Srinivasan commentaries https://open.spotify.com/episode/2shBl3StNAYETE6xXApQL6
- Hour length documentary on Metal Mirror Marvel of Aranmula on Sahapedia channel https://www.youtube.com/watch?v=xnpUXCEuEE8
- DVD completed and to be released in Oct 2021 on 'Fading Songs of the Anvil: The blacksmiths and wootz steel makers of southern India and Golconda', directed by Sharada Srinivasan, produced by Indira Gandhi National Centre for Arts, 50 mins
- DVD completed and to be released in Oct 2021 on 'Remnant Music, Re-cycled Metal: The wrought bell metal and vessel makers of the Malabar', directed by Sharada Srinivasan, produced by Indira Gandhi National Centre for Arts, duration 50 mins
- Sharada Interview with Pallava Bagla on the Digital Hampi Exhibition and Gallery Tour, 22Feb 2020, 'When Science meets Art' on use of laser-scanning, 3-D scanning and augmented reality in exploring heritage of Hampi https://youtu.be/inIrP0oYaNc
- Swamimalai Bronze Casting with Prof Sharada Srinivasan's commentaries aired in Asian Museum of Art, San Franscisco, since 2017 https://www.youtube.com/watch?v=0The8sbE-0g (screened at Asian Museum, San Fransisco)
- Lost wax bell casting, documentation from Thanjavur district with Prof Sharada Srinivasan's commentaries, made with Peter Vemming, Medieval Centre, (over 300,000 views) HYPERLINK "https://www.youtube.com/watch?v=owxuoXyZo1U&t=1s"https://www.youtube.com/watch?v=owxuoXyZo1U HYPERLINK "https://www.youtube.com/watch?v=owxuoXyZo1U&t=1s"& HYPERLINK "https://www.youtube.com/watch?v=owxuoXyZo1U&t=1s"t=1shttps://www.youtube.com/watch?v=fLA3Zg3pADI
- Concept of Nataraja, Sharada Srinivasan interview (mystic heights) https://www.youtube.com/watch?v=0ps0WJ1jBjM
- Sharada Srinivasan ETV interview 2007 https://www.youtube.com/watch?v=m8aNrx6Ulu8
- Indian Museum, Kolkata, Stories of World Culture, 'Nataraja bronze and Cosmic Dance' with Padmashri Sharada Srinivasan (2020)

- https://www.youtube.com/watch?v=cC91oeOLF3Q HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"& HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"feature=youtu.be HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"& HYPERLINK "https://www.youtube.com/watch?v=cC91oeOLF3Q&feature=youtu.be&fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI"fbclid=IwAR1h-lAsNfCFAU2eRMm_eQgvh1u8gZ__QqecSideCxQEF8xPF68-Vv5_WtI

- Indian Museum, Kolkata, Stories of World Cultures, Video of Aranmula mirror making by Prof Sharada Srinivasan, made in 2008, https://www.youtube.com/watch?v=nyGqZISN4To

- Credited as Collaborator on Sculpture of India, acclaimed 26 episode series made by Benoy Behl for Doordarshan and Interviews and Collaborations in particularly 2 episodes (2006 onwards)

    - Interview and collaboration in Sculpture of India: Darshan of the Divine, https://www.youtube.com/watch?v=CDGL3CaBp1c HYPERLINK "https://www.youtube.com/watch?v=CDGL3CaBp1c&t=326s"& HYPERLINK "https://www.youtube.com/watch?v=CDGL3CaBp1c&t=326s"t=326s
    - Interview and collaboration in Sculpture of India: Ellora, A Vision of India; on the making of stone monolithic shrine of Ellora https://www.youtube.com/watch?v=VPvWOGZmmlQ HYPERLINK "https://www.youtube.com/watch?v=VPvWOGZmmlQ&fbclid=IwAR2MKWTlUY6SLwz0MTTLEudTxmvUZWO-Qk8mha49xESaAx-TUN3vjqdQCi0"& HYPERLINK "https://www.youtube.com/watch?v=VPvWOGZmmlQ&fbclid=IwAR2MKWTlUY6SLwz0MTTLEudTxmvUZWO-Qk8mha49xESaAx-TUN3vjqdQCi0"fbclid=IwAR2MKWTlUY6SLwz0MTTLEudTxmvUZWO-Qk8mha49xESaAx-TUN3vjqdQCi0

    - Online Lectures under e-Patshala Series (Vidya-mitr)
    - Chola Art and Bronzes
    - https://www.youtube.com/watch?v=qyB5r0EWabk HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"& HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"list=RDCMUCCUr096WDp86n HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"62CXBeHlQw HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"& HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"start_radio=1 HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"& HYPERLINK

"https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"t=4 HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"& HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"t=6 HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"& HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"t=7 HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"& HYPERLINK "https://www.youtube.com/watch?v=qyB5r0EWabk&list=RDCMUCCUr096WDp86n62CXBeHlQw&start_radio=1&t=4&t=6&t=7&t=7"t=7

- History of Metal Icons
- https://www.youtube.com/watch?v=hAtC0j5FrQc
- History of Metals and Alloys
- https://www.youtube.com/watch?v=jDl9adgyp-QA

Exhibition events

- Week long Materials Heritage Exhibit curated by Prof Sharada at Viswesharaya Museum Bangalore from 25th Feb as part of exhibition on Indian Contribution to Science (part of Azadi Mahotsav, 75years)

- Museum, New Delhi, on 'Indian Heritage in Digital Space' including 3-D printed models and mixed reality tours with NIAS as a partnering institutions

- Video of Curatorial Lecture on 'Vijayanagara Heritage and Digital Perspectives' and Curatorial Walk

- https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107 HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20Heritage%20Forum%20national%20museum"& HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20Heritage%20Forum%20national%20museum"external_log_id=0934c2791752058abb04e492584cfe3a HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20Heritage%20Forum%20national%20museum"& HYPERLINK "https://www.facebook.com/Nationalmuseumnewdelhi/videos/287500025545107/?v=287500025545107&external_log_id=0934c2791752058abb04e492584cfe3a&q=NIAS%20

Heritage%20Forum%20national%20museum"q=NIAS%20Heritage%20Forum%20national%20museum

- Sharada Interview with Pallava Bagla on the Digital Hampi Exhibition and Gallery Tour, 22Feb 2020, 'When Science meets Art' on use of laser-scanning, 3-D scanning and augmented reality in exploring heritage https://youtu.be/inIrP0oYaNc
- Write-up on Digital Hampi citing Prof Sharada (May 2020)
- https://culture360.asef.org/magazine/arttechnology-indian-digital-heritage-digital-hampi-project/?fbclid=IwAR0_8zxsJPhxgsus_PorELXDGyKtEp5z9ij9qK1kxuHegLLRDsdtXNnTI6Y

- 3-7th Jan 2020, Curator of 'Artisanal Technologies', NIAS Stall at Indian Science Congress; Interview for DD Science Channel
- (https://www.indiascience.in/videos/vigyan-se-samadhan-h-telecast-on-05-slash-02-slash-2020)

- 24th October 2019, Exhibition as Padma Awardee in Archaeology and Craft History, Festival of Art, Craft and Design, Art Mantram Felicitation of Padma Awardees, ITC Windsor, Bangalore

- 5th Sept 2019, 'Karu: the womb-mould', Multi-media Exhibition on Art, dance and technology in South Indian bronzes, Curated by Sharada Srinivasan and Udaya Kumar, NIAS, with workshop materials of South Indian bronze casting and photo-exhibition, screening of videos with Prof Sharada's commentaries, 'Darshan of the Divine' and 'Image Casting in Swamimalai' https://www.youtube.com/watch?v=0The8sbE-0g and Prof Sharada's Bharata Natyam Dance https://www.youtube.com/watch?v=rpEeqWqYBi0 HYPERLINK "https://www.youtube.com/watch?v=rpEeqWqYBi0&list=PLp1Eyml255yfHUiwVnCxAF-V55s4Oea9h&index=18"& HYPERLINK "https://www.youtube.com/watch?v=rpEeqWqYBi0&list=PLp1Eyml255yfHUiwVnCxAF-V55s4Oea9h&index=18"list=PLp1Eyml255yfHUiwVnCxAF-V55s4Oea9h HYPERLINK "https://www.youtube.com/watch?v=rpEeqWqYBi0&list=PLp1Eyml255yfHUiwVnCxAF-V55s4Oea9h&index=18"& HYPERLINK "https://www.youtube.com/watch?v=rpEeqWqYBi0&list=PLp1Eyml255yfHUiwVnCxAF-V55s4Oea9h&index=18"index=18
- March 2016-2019, Co-curator of Eight Editions of Exhibition on 'Materials Heritage', IISc Open Day, Indian Institute of Science, Bangalore, with screening of video with Srinivasan's commentaries on high-tin bronze metal mirror making at Aranmula and Swamimalai bronze casting

- 26th-30th Sept 2016 Co-curation of exhibition of Indian Metal Crafts for ICOM-Metals 2016 Conference at IGNCA, New Delhi

- 18th-19th November, Steering Committee Member, IDH-DST Digital Hampi Workshop and Exhibition, New Delhi, India Habitat Centre, with published catalogue on 'Digital Hampi'

- Photo-montage (non-commercial) exhibition 'Cosmic Dance of Siva: art, science, dance interfaces in the Nataraja bronzes', Cite De L'Espace, Toulouse, Indian Institute of Astrophysics, Oct. 2009; Alliance Francaise, Bangalore, 2009, 2008, Tata Institute of Fundamental Research, Mumbai, 2012, 2014,; Jain University, 2014, NIAS, 2019

Review of photo-montage exhibition, "Cosmic Dance of Siva: art-science-dance perspectives on the Nataraja bronze', La Lettre, Alliance Française Newsletter, Oct. 2008, p. 7, Tim Poston:

'*The photo-exhibition conveyed careful scientific reasoning about the metal of Chola bronzes fused with a vivid sense of the artisans and poems behind them, and even-surprisingly but plausibly-the astronomy. 'Art history' rarely presents this weave of sculptural aesthetics, songs and ritual enfolding the artisans and their physical techniques with the sense of the metallurgical realities they worked with.*'

- Review in Deccan Herald, Sept, 15th 2009 https://www.deccanherald.com/content/25363/combination-art-dance.html; cites late Prof Ian Glover "*She has been able to combine archaeometallurgy with dance, science and cosmos"*

- DVD to be released in 2020 on 'Fading Songs of the Anvil: The blacksmiths and wootz steel makers of southern India and Golconda', directed by Sharada Srinivasan, produced by Indira Gandhi National Centre for Arts, duration 50 mins approx

- DVD to be released in 2020 on 'Remnant Music, Re-cycled Metal: The wrought bell metal and vessel makers of the Malabar', directed by Sharada Srinivasan, produced by Indira Gandhi National Centre for Arts, duration 50 mins approx

- Interviews and script contributions to documentary 'Made in India: wootz steel', Epic Channel, aired several times over past 3 years
- Recordings of Hampi 'musical' pillars made by Sharada used in BBC Radio 4 programme by Prof David Hendey of University of Sussex in 'Noise: A human history',

http://www.bbc.co.uk/iplayer/episode/b01rlmq0/Noise_A_Human_History_Heavenly_Sounds/

Member National/International bodies/Felicitation

- Member, Advisory Board, Centre for South Asian Studies, University of Exeter
- Member, Editorial Board, Journal of Ethnoarchaeology, USA
- Standing Committee Member, International Conference of the Beginning of Use of Metals and Alloys, (BUMA) (since 2009)

- Member, Board, Institute of Archaeometallurgical Studies, Institute of Archaeology, London
- Advisory Committee Member, Department and Science of Technology, Science and Humanities Research Initiative (DST-SHRI)
- Advisory Committee Member, CSIR-Traditional Knowledge Digital Library
- Advisory Committee Member, C.V. Seshadri Endowment, Anna University

Research Experience

- 2012- till date Professor, National Institute of Advanced Studies, Indian Institute of Science Campus, Bangalore 560012
- 2006-2011, Associate Professor, National Institute of Advanced Studies, Bangalore
- 2001-2006, Assistant Professor, National Institute of Advanced Studies, Bangalore
- 2003-2005 DST Young Scientist Awardee in metals heritage and archaeometallurgy
- 1999, Edwardo Waldo Forbes Research Associate, Dept. of Conservation and Scientific Research, Freer Gallery of Art, Smithsonian Institution, Washington DC, USA
- 1996-1998, Homi Bhabha Postdoctoral Fellow in Archaeometallurgy, Department of Metallurgy, Indian Institute of Science, Bangalore

Projects and grants

- Vilakku: Lamp craft, Dallapiccolla Foundation (2020-21)
-
- Stylistic and Technical Authentication of Karnataka Bronzes, Karnataka Government (3 years upto 2020)
- NIAS-TCS Initiative on Metal Crafts Heritage of the Cauvery Region (Feb 2016-2020)
- Collaborator in archaeomaterials study on Tipu era rockets for Shivappa Nayaka Museum (acknowledged in Shejeshwara and Olikara, JAAS, Volume XXII, No 6, 2018)
- Social Sciences and Humanities Research Council, Canada, Insight Development Award, Co-investigator 'Metallurgy, Materiality and Society in South India' (Maski) 2019
- IGNCA Vishwakarma project to make artisanal technology documentaries and to write book monograph on Metal crafts of the Vishwakarma and Kammalar (since 2015)
- Indian National Science Academy, Art of making Kerala Mirror', (3 years since 2016)
- British Council UKIERI-II Awardee and Co-Chair for British Council project on Split-site PhDs with Exeter University (2012-2016) in Archaeology
- Co-Director,NIAS project on 'Explorations in northern Telangana for megalithic and iron age sites', Survey Permit awarded by Archaeological Survey of India for 2013
- Royal Society-DST India-UK networking scientific grant co-awardee 2011-2012
- Charles Wallace Trust India Grant Awardee for UK visit March 2012 for conservation
- Digital Hampi, India Digital Heritage (IDH) project supported by DST, PI for project on 'Analytical cum digital applications in the study of Vijayanagara bronzes', 2011-2014
- British Council UKIERI-I (UK-India Education Research Initiative) Standard Research Grant Awardee (2009-2011), & Lead Investigator with Exeter University on 'Pioneering metallurgy: origins of steel making in the southern Indian subcontinent' (Telangana)

- Co-investigator, RESPOND & ISRO supported project 'Geospatial techniques in heritage management', 2010-13
- Grant from University of Michigan for study on ferrous metal artefacts excavated from megalithic site of Kadebakele in Karnataka, 2010
- Grant from National Science Foundation award to Prof Carla Sinopoli, University of Michigan for studies on ferrous metal from the site of Kadebakele2009
- Tata Institute of Fundamental Research and Centre for Excellence in Basic Sciences, University of Mumbai, grant in astronomy-art-metallurgy interfaces, 2008-2009.
- Department of Science & Technology, India (DST) Nurture Scheme Awardee (2005-8) for study of metal artefacts from Harappan sites such as Dholavira
- V&A Nehru Fellow (Nehru Trust for Victoria & Albert Museum collections, 1994, 2007)
- India Foundation for Arts, Arts Documentation Award (2004-6) on 'India's metals heritage' https://indiaifa.org/sharada-srinivasan.html
- TataSteel funded book project on wootz steel for Twin Centenary
- Dorabji Tata Trust and Ratan Tata Trust grants for conference attendances in 2005, 2007
- India-Sri Lanka Fund Awardee, New Delhi, 2001
- British Chevening Scholar for PhD at Institute of Archaeology, London (1990-4)
- Overseas Research Studentship (ORS), UK, towards overseas PhD. tuition (1990-4)
- Charles Wallace Trust-India, Topping-up Award for PhD. research in UK (1990-1).
- J.N Tata Fellow, 1988

Published abstracts from conferences (excluding those published as full papers listed above)

- March 7th 2020, 'Sustainable craft, unsustainable heritage: the aspect of re-cycling in south Indian metal crafts', Craft and Sustainability, Shiv Nadar University, Delhi and Cambridge University
- Feb 9, 2018, 'Artisanal metal technologies: historical trajectory and survival', Session on Traditional Knowledge Systems', Conference on *'Dialogues at the Science-Society Interface'* (8th-10th Feb) in memory of Prof C.V. Seshadri, organized by Anna University and PPST Foundation at IIT-M Research Park, Chennai
- 3rd Nov 2016, "Iconic Traditions, enigmatic alloys: Swamimalai "Panchaloha' icons and Aranmula 'Kannadi' mirrors", Material Culture in Pre-Colonial and Early Colonial, JNIAS, JNU, New Delhi,
- 26th-30th Sept, 2016, Poster for ICOM Metals-2016 conference, at IGNCA, New Delhi, on 'High-tin bronzes from peninsular India: some corrosion and conservation issues'
- Srinivasan, S., 2012, Ranganathan, S. and Suwas, S., 2016, 'Ultra-high carbon steels and high-tin bronzes: insights into mechanical processing', *ICSMA-16, Conference on Strength of Materials*, Indian Institute of Science Bangalore, p. 57.

- 'The Nataraja Bronze: Insights on Art, Technology and Philosophy', *Indian Art and Religion: An Interactive Approach*, 21st Indian Art History Congress, Kolkata, 2012, p 113
- 'Cosmic inspiration and art in relation to the Shiva Nataraja bronze', *'Seventh International Conference on Inspiration of Astronomical Phenomena', INSAPVII*, Bath Royal Literary & Scientific Institution, UK, 25-29, Oct., 2010, p. 41, University of Wales, RAS
- Srinivasan, S. and Balasubramaniam. R.. 2009, Crucible steel and phosphoric iron: Issues of Innovation and Technology from the Indian/Asian context., *World of Iron Conference*, 16-20 Feb 2009, Natural History Museum, London, p. 23.
- Srinivasan, S. Balasubramaniam, R. and Jaikishan, S. 2007. On the common microstructural features of wootz steel crucibles from Tamil Nadu and Andhra Pradesh. Metallo 2007, International conference on Metals and Alloys: Past, Present and Future, IIT Kanpur, 7-10 Dec 2007, p. 194
- Nov 2011, 'Telangana archaeomaterials', Dissemination seminar, NIAS-Exeter UKIERI Pioneering Metallurgy Project, NIAS

Conferences (unpublished presentations) and Invited Lectures

Conferences Overseas

- 6th Dec 2020, 'Marginalised crafts of metal musical instruments from southern India', University of Liverpool, School of Architecture, UK
- 27th Nov 2019, 'Peripherals of Performance, Peripheral Performance: metal musical instruments from southern India', University of Liverpool
- 2nd March 2019, 'Archaeometallurgy in India' Bandaranayake Memorial Conference, Postgraduate Institute of Archaeology, Sri Lanka
- 29, June 2017, 'Nataraja framed by Betelguese and Syrius: insights in medieval Tamil iconography', ATINER Conference, Athens, Greece
- 4th Sept 2016 Sharada Srinivasan and Vijayluxmi Panray, 'The intangible aspect of 'artefact' as 'heritage': artisanal legacies in southern India and Mauritius', SOAS South Asia Institute, 'The Past before us: Heritage and History of South Asia'
- 23-25th March 2016, High-tin bronzes and cast images from southern India 171st ISIJ Meeting, International Sessions, Tokyo, Japan
- 6th-10th July, 2015, Megalithic and early historic Indian high-tin bronzes and comparisons with Thailand, 15th European Association of Southeast Asian Archaeologists, University of Nanterre, Paris
- 7-9th March 2012, 'Telangana wootz steel', Royal Society-DST, Exeter-NIAS Seminar on 'Indian iron and steel – archaeometallurgy and geospatial archaeology' at Exeter University

- ‘Telangana Archaeomaterials’ and ‘Theatre and Art of South Indian bronzes’, June 2011, High level Delegation meet, Exeter University
- ‘High-carbon wootz/Damascus steel from southern India', Department of Materials Processing and Tribilogy, Purdue University, May 14th, 2010
- ‘Art & Science of Chola bronzes’, organized by Interdisciplinary Archaeology Workshop & TAPSA, University of Chicago, May 13, 2010
- ‘Wootz steel: pioneering metallurgy from southern India’, CISAC, Stanford, USA, May 3rd 2010
- ‘Skilled metal craft of delta bronze mirrors at Aranmula, Kerala’, University of Toyoma, Japan, Seminar on Asian high-tin bronzes, July 2008
- ‘Dholavira: insights on metals ’. 19th Conference on European Association of South Asian Archaeologists, Ravenna, Italy, July 2007
- ‘Indian wootz steel’, Centre de Rechercheet de Restauration des Musees de France, Louvre, Paris, Feb 2007.
- 'Technology as social construct: Chola bronzes', Nottingham University, UK, 24th Jan 2007‘
- ‘Dialogue between Science and Religion: the Nataraja bronze’, 22nd International Conference of History of Science, Beijing, July 23-28 2005
- ‘Investigating martial arts swords from Kerala’, for ‘Metallurgy: A touchstone for cross-cultural interactions’ at British Museum, April, 2005
- ‘Bronzes from South India and Sri Lanka’ Uppsala University, Sweden, Nov 2002 as Visiting Faculty, Dept of Archaeology
- ‘Lead isotope analysis on south Indian bronzes’ Seminar, UNESCO and Central Cultural fund, Sri Lanka at Habarana (May 2002)
- ‘Image casting and high-tin bronze traditions in south India’, Metals in Antiquity: Founders, Platers and Smiths at Oxford (Sept. 1999)
- ‘Ethnographic metal working in India’, Research School for Archaeology, University of Sheffield, Nov. 1999
- ‘Finger-printing south Indian images using lead isotope analysis’, COST-G1 committee on Ion Bean Analysis in Art and Archaeology, European Commission & University of Oxford (Nov. 1998)
- ‘High-tin bronzes from south India from prehistory into present day, at Dept. of Materials Science, Lehigh University, USA, Oct. 1998.
- ‘Aspects of continuity in copper-base metallurgy from Indus Valley into present day southern India”, The Present and Future of Indus Valley Archaeology, 27th Annual Conference on South Asia held at University of Wisconsin-Madison, 1998.
- ‘Archaeometallurgy of South Indian bronzes’ at Nehru Centre, London, ‘Festival of India’s South’ in UK, June 1996
- Srinivasan, Sharada & Sarma, Nataraj on ‘History of Measurement and Calibration of Time in Bombay’ Eighth International Scientific Instrument Symposium, Society for History and Philosophy of Science, London, Burlington House, Society for Antiquaries, 12-16, Sept. 1988

Co-presented papers

- 2013, Bharat Dixit, Satyam Suwas, Sharada Srinivasan, S Jaikishan and S Ranganathan, 'Microstructure of a wootz steel blade from contemporary northern Telangana', BUMA VIII, Japan,
- July 2-6, 2012 S, Srinivasan, K. Morrison, C. Sinopoli, K. Gopal and S. Ranganathan 'South Indian iron age complex of Kadebakele and iron and steel finds', European Association of Southeast Asian Archaeologists, Paris, France
- June 2012, S Ranganathan, Sharada Srinivasan, K Nagata and M Inaba, Cultural Heritage Science- Examples from Japan and India, India-Taiwan Bilateral Seminar, Taichung,
- 2011, G. Juleff, S. Srinivasan, S. Ranganathan, S. Jaikishan and B. Gilmour, "Pioneering Metallurgy of iron and steel – survey in Telangana', IAAH, Sri Lanka
- 20 – 22 August 2010 H. Thakur, S. Srinivasan, S. Ranganathan, G. Juleff, B. Gilmour, J. Sriperumbudur, 'Typological classification of archaeometallurgical remains from northern Telangana', Third SOSAA Congress of the *Society for South Asian Archaeology*, University of Kelaniya, Sri-Lanka,.
- 20 – 22 August 2010 N S Nalini, M B Rajani, S. Srinivasan, S. Ranganathan, Gill Juleff, Brian Gilmour, J. Sriperumbudur 'GIS in the study of Telengana wootz production', Third SOSAA Congress of the *Society for South Asian Archaeology*, University of Kelaniya, Sri-Lanka,
- 20 – 22 August 2010 T. Neogi, S. Srinivasan, S. Ranganathan, G. Juleff, B. Gilmour, J. Sriperumbudur, 'Mammayee Festival in Northern Telengana', Third SOSAA Congress of the *Society for South Asian Archaeology*, held in University of Kelaniya, Sri-Lanka

Conferences in India

- 8th July 2019, 'Tipu era legacy of wootz steel and rockets and insights from murals', 'Ínterweavings of Tangible and Intangible Heritage: A case study of the Historic town of Srirangapatna, NIAS with University of Liverpool and Mysore School of Architecture, NIAS
- March 15, 2018, Finely wrought high-tin bronzes from Iron Age/Megalithic Tamil Nadu, Early Iron Age in South Asia, Saraswathi Viswa Mahavidyalaya, Kanchipuram
- Feb 20 2018, 'Peripherals of performance: the marginalized cymbal makers of Kerala', NIAS-Exeter Workshop on 'Performing the Periphery' at NIAS, with MOD, Berlin.
- Feb 1, 2018, 'Art, Science and Dance Perspectives on Chola Bronzes', Government Museum, Chennai, 'Iyal Isai Series', celebrating UNESCO recognition of Chennai as Creative City in Music
- Jan 24, 2018, Invited Honour Lecture on Chola Bronzes and Metal Technology, for Indian Council of Historical Research, Bangalore
- Nov 4, 2017, 'The Nataraja icon: Contemporary musings on design and cognition', Conference on Culture, Cognition, IGNCA-SRC) with NID, Bengaluru
- July 12th 2017, 'Some Ethnoarchaeological Aspects of Nilgiris', NIAS Wednesday

Discussion Meeting

- April 12, 2017, "Art of Making Kerala Mirror', History of Science Project Investigators Meet, New Delhi.
- 25th November 2016, 'Jain bronzes from Karnataka', 'Seminar on Jainism with respect to excavated remains and site Aratipura', Archaeological Survey of India, Bangalore Circle.
- 15th November 2016, 'Metal craft traditions and intangible heritage some cases studies from Southern India and Andhra', Intangible Heritage Festival, Amravathi
- 25th- 30th September 2016, Special Session on Delhi Iron Pillar, ICOM-Metals 2016 Conference, New Delhi, IGNCA
- 22th June 2016, 'Iron Age high-tin bronzes from Tamil Nadu and comparisons with southeast Asia'. Conference on Metal and Materials Research (ICMR 2016). Indian Institute of Science
- 20-21st June 2016, Authentication of bronzes, "Illicit Trafficking of Indian Cultural Wealth', Seminar organized by Archaeological Survey of India, Bangalore.
- 19th March 2016, Lecture on 'Technology of traditional crafts and design', DFrost Festival, National Institute of Design, Bangalore
- 5th December 2015, Art of Aranmula high-tin bronze mirror, Intangible Heritage Festival 2015, SSUS Kalady.
- 7th October 2015, "Archaeometallurgy –An Emerging Science". The Bangalore Science Forum, National College Basavanagudi, Bangalore
- 28th March 2015, 'Bell metal tradition', Seminar on 'Cultural Heritage Management: A Global Perspective', The Asiatic Society, Kolkata
- 21-23rd January 2014, Cultural Anthropology of Bronze Casting, Lalit Kala Akademi, New Delhi
- 7th-9th Jan 2014, Role of 'scientific cultural anthropology' Future of Liberal Arts in India, Yale-India Initiative and Raman Research Institute.
- 9th-11th 2013, Dec, Cultural and artisanal landscapes of Tanjavur and Kumbakonam, Workshop on Cultural Landscapes, National Monuments Advisory, India International Centre, New Delhi
- Aug, 2013, Tutor for workshop on 'Personal Adornment from Pattanam and beyond', KCHR, British Museum, Pondicherry University.
- Nov 1 2012, Archaeometallurgy of wootz steel: insights from productions sites, Archaeometallurgy of the Deccan, organised by S. Jaikishan, Dharmapuri
- 14th December, 2012, 'The Nataraja Bronze and Coomaraswamy's Legacy: Archaeometallurgical insights', Bangalore International Centre
- 1st Oct 2012, 'Perspectives on Technology in Ancient India', NIAS-DST course on Multi-disciplinary perspectives in Science and Technology.
- 17th October, 2012, "Old gold and copper workings from Karnataka: Observations from archaeometallurgical field visits of 1990-91", NIAS Wednesday Discussion Meeting

- 18th October, 2012, "Indian Contribution to Metallurgy", Seminar on Indian contribution to the world, Kaveri Auditorium, KSOU, Mysore
- 13th Sept, 2012, 'Metallurgy of artisans and commercial utilization', organized by Karnataka Council for Science and Technology, IISc
- 'Archaeometallurgical studies on ferrous metal finds from megalithic site of Kadebakele', for National Geographic Society, (USA), Grant Committee visit to Bangalore Jan 7th 2011.
- 'Vijayanagara bronzes: ICT and digital approaches', GeoICT PAMC Meeting, Sept, 14th 2010, DST, Indian Institute of Technology, Madras
- 'Wrought and quenched high-tin bronzes from south Indian megaliths', Workshop of Archaeological Sciences, ASI, New Delhi, Aug 2010.
- 'Bronze and high-tin bronze metalware traditions from southern India', Centre for Contemporary Studies, IISc, Bangalore, 4th Feb 2010,
- 'Phases and faces: Splendours of South Indian bronzes', NIAS-DST course on Dimensions of Nanotechnology, NIAS, Bangalore, 15th Dec 2009
- 'High-tin bronzes and mirrors', Homi Bhabha Fellows Conclave, Homi Bhabha Centenary celebrations, TIFR, Mumbai, Nov 20th 2009
- 'Report on Dholavira; studies on Harappan archaeometallurgy', SERC-DST Projects Review, 6th April, NIT, 2008, Raipur.
- 'Communicating Science: place of traditional knowledge ', World Academy of Art and Science with UNESCO, Sept 2008, Hyderabad
- 'Ancient Indian Metallurgy and Technology', Symposium on Classical Indian Sciences, Poornapragnya Institute, Feb 2008
- 'Poetry, theatre and arts in Tamil traditions, Seminar on 'Sangam: Interactions of Poetry and Theatre', NIAS, Sahitya Akademi, Oct 26th 2007
- 'Lead isotope studies on Jain bronzes', Jainism in Karnataka, South Asia Institute, Heidelberg University & NIAS, Feb 3rd, 2007
- 'Authenticating art objects: global perspectives.' Conference on 'Authenticity of Art' at Government Museum, Chennai, Dec 2006
- MRSI Medals Lecture: 'Phases and faces: archaeometallurgical studies on Indian high-tin bronzes', MRSI-AGM, Feb 12th, 2006, Lucknow
- 'Megalithic high-tin bronzes', National conference on History of Science and Technology, Hyderabad University, Sept 2004
- 'Early Historic bronzes from southern India: technical insights', Conference on Early Historic Archaeology, CASTEI, Kolkatta, Oct 2003.
- 'High-tin bronze vessels and mirrors from south India', Symposium on Indian contributions to History of Science, MAHE, Manipal, May 2003
- 'Aesthetics and Foundations of Science', seminar on Foundations of Science at NIAS, supported by PHISPC series, Feb 2003
- 'Finger-printing and authentication of metal icons', at C.P. Ramaswamy Aiyer Indological Foundation, Madras/Chennai, Feb 1999

- 'Finger-printing of metal artefacts', 'Authentification of Museum Artefacts' at National Museum, New Delhi, Enduring Image exhibition from British Museum, UK, Dec 1997.

- 'Crucible steel from South India' at Seminar on 'Early Steel', at Institute of Archaeology, University College London, June 1996.

Organisation of workshops, seminars, conferences

- Co-organiser September 5th-6th 2019, ‘Karu’, the womb-mould: Art & Science of Image Casting’ (Workshop, with Sthapathis, Exhibition) in NIAS
- Co-organiser, Seminar with University of Liverpool, 8th July 2019, Ínterweavings of Tangible and Intangible Heritage: Historic town of Srirangapatna”
- Co-organiser Feb 9 2018, 'Dialogues at the Science-Society Interface' (8th-10th Feb) in memory of Prof C.V. Seshadri, with Anna University, PPST Foundation and IIT-M Research Park, Chennai
- Co-organiser with Prof Mark Kenoyer, Experimental Iron Smelting and Wootz Steel Making Workshop, NIAS, Aug 2017.
- Co-organiser of Royal Society- DST supported India-UK, NIAS-Exeter scientific seminar on ‘Indian iron and steel’ at Exeter University between 7-9th March 2012 (with Gill Juleff)
- Co-organiser of UKIERI Dissemination seminar Nov 14th-18th 2011 (with S. Ranganathan, G. Juleff), on ‘Pioneering metallurgy’ inaugurated by British Minister for Science and Technology
- Co-organiser, International Workshop on Material Culture, co-organised by NIAS with Jain University, Bangalore, ASI and Exeter University (11th-14th April 2014)
- Co-organiser, ‘Sessions and practicals in experimental archaeology’ and ‘Lithic technology and archaeometallurgy’, NIAS-Exeter UKIERI workshop, Feb 23-25th, 2011
- Co-chair and Co-organiser, International Conference on Beginning of Use of Metals and Alloys (BUMA VII), Sept 2009, NIAS
- Indian Subcontinent Session Chair, World of Iron Conference, Natural History Museum, London, Feb 2009
- Co-organiser, international seminar on ‘Tangible and intangible heritage of Hampi’, NIAS, in association with Global Heritage and Friends of Hampi, Jan 2009
- Co-organiser, Sixth NIAS-DST Training Programme on ‘Multi-Disciplinary perspectives in science and technology’, NIAS, Jul 21-Aug 2, 2008.
- Session chair, Sixth international conference of ‘Beginning of Use of Metals and Alloys’ at Beijing, China, Sept 2006

Outreach and Special Lectures in India (excluding those published and listed above)

- 27th Feb 2020, ‘Artistic and Technical Analysis of South Indian Bronzes’ Government Museum Chennai
- 22nd Feb 2020, ‘Vijayanagar Heritage and Digital Perspectives’, National Museum, Delhi,
- 5th Sep 2019, ‘Karu: the womb-mould: Traditions of south Indian bronze casting’, Workshop on Bronze Casting, NIAS
- 21st Aug 2019, "Hampi and its Environs: Insights into Techno-Cultural and Geological Landscapes", Centre for Society and Policy, IISC
- 9th August 2019, International Day for Worlds Indigenous People, Indira Gandhi Rashtriya Manav Sangraharaya, in Bhopal

- 31st July 2019, 'Material Heritage of India', CSMVS Museum metal Conservation workshop, Tata Trusts Art Conservation Initiative
- April, 2019, Nilgiris Material Culture, Rotary Club of Nilgiris West, Ooty
- Feb 28th 2019, Archaeotechnological insights on south Indian metals heritage, Keynote, National Science Day, ISRO Satellite Centre.
- March 8th 2019, 'Archaeotechnological insights on bronzes', Indian Institute of Astrophysics, International Women's Day Lecture
- Feb 26th, 2019, Valedictory on 'Innovation of iron technology and its impact on society', Dravidian University, Kuppam.
- 7th October 2018, 'Indian Metals Heritage' Crafts & Artisan Session on Development & Promotion of Arts & Crafts, India International Science Festival, Lucknow.
- March 12, 2018, 'Indian primacy in crucible steel making' for 'Steel Panorama: Yesterday, Today and Tomorrow', SAIL (Steel Authority of India) with Indian Museum, Kolkata
- 11th August, 2018, 'Digital Hampi', Seminar on Recording and Documentation of Cultural Heritage, CEPT University, Ahmedabad.
- Dec 16, 2017, Keynote, 'Intangible and contested notions of heritage' Conference on Contesting Heritage of Shristi Institute of Art, Design and Technology
- 26th Oct 2016. 'Spectroscopic studies in the provenancing of Chola bronzes', Mashelkar Lecture, CSIR-National Chemical Laboratory, Pune.
- Nov 26th, 2013, 'Metallurgy in Archaeology', National seminar on South Indian Archaeology, World Heritage Week celebrations, ASI and Christ University
- 7th Oct 2013, 'Art history and inter-disciplinary interventions', Karnataka Chitrakala Parishat, Dept of Art History, College of Fine Arts
- Aug, 6, 2013, Metallurgical analysis: Role of Chemistry in Archaeology, Symposium on application of sciences in Archaeology, Indian Museum, Kolkata
- January 29th, 2013, "Wootz and the Damascus Blade in the 18th Century", Visvesvaraya Technological museum for Tipu Series Talks
- Asiatic Society Endowment lecture 12 Jan 2012 on 'Archaeometallurgical and art historical insights on south Indian bronzes', Mumbai
- Keynote 'Conservation of Manuscripts', Workshop of National Manuscripts Mission, New Delhi, Government Museum, Chennai, 9th Sept 2011
- Diamond Jubilee, National Metallurgical Laboratory, Jamshedpur, on 'Archaeometallurgy', April 2011
- Lecture as Chief Guest, National Science Day Celebrations, ISRO Telemetry and Tracking Network Centre 10th March 2010

Selected press write-up, quotes and interviews

Press on AMACAD Nomination

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- https://www.hindustantimes.com/cities/mumbai-news/indian-archaeologist-sharada-srinivasan-elected-to-american-academy-of-arts-and-sciences-101619540672015-amp.html

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- https://www.newsindiatimes.com/artists-scholars-scientists-and-leaders-elected-to-top-arts-and-science-body/

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- Work extensively cited and featured in writeup on Nataraja https://scroll.in/article/947584/nataraja-how-the-dancing-avatar-of-shiva-made-its-way-from-rock-sculptures-to-modern-physics
- Work extensively cited and featured in Write-up on Damascus steel in Livehistoryindia https://www.livehistoryindia.com/cover-story/2019/12/20/damascus-steels-indian-origins
- Press write-up on lecture on Nilgiris material culture May 2019 https://timesofindia.indiatimes.com/city/coimbatore/metallurgy-skills-of-ancient-nilgiris-yet-to-be-showcased/articleshow/69121130.cms

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- https://www.asianage.com/age-on-sunday/100319/of-such-eloquent-metal.html
- http://www.newindianexpress.com/states/karnataka/2019/jan/26/meet-the-fantastic-5-padma-shri-awardees-from-state-1930211.html
- https://www.deccanherald.com/looking-and-down-answers-716212.html
- https://researchmatters.in/news/two-bengaluru-scientists-shine-list-2019-padma-awardees
- Interview on book Digital Hampi, The Hindu, 2018 https://www.thehindu.com/society/history-and-culture/hampis-digital-revamp/article23455397.ece?fbclid=IwAR24_1f-X9y5B2v4RHnA9VBRkOLoLgwidn1-DGSiy-6fIE7e7pIpfBE3N-Y

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- Featured in Better India, 2018 on work on wootz steel, https://www.thebetterindia.com/158830/tamil-nadu-research-facts-damascus-steel/?fb=organic HYPERLINK "https://www.thebetterindia.com/158830/tamil-nadu-research-facts-damascus-steel/?fb=organic&fbclid=IwAR3AhsNqP08narb41woVhk06oqBvkR6OFHxecgGf-dSQlMqWmY4ELtnDwJM"& HYPERLINK "https://www.thebetterindia.com/158830/tamil-nadu-research-facts-damascus-steel/?fb=organic&fbclid=IwAR3AhsNqP08narb41woVhk06oqBvkR6OFHxecgGf-dSQlMqWmY4ELtnDwJM"fbclid=IwAR3AhsNqP08narb41woVhk06oqBvkR6OFHxecgGf-dSQlMqWmY4ELtnDwJM
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- Rajan Gurukkal, Review, The Hindu, Feb, 20, 2012, on article by Sharada in 'Science and metal technology of Harappans', Ed D.P. Sharma, Kaveri Books: "Sharada Srinivasan's study of sophisticated high-tin bronze-crafts points to the existence of a developed copper bronze alloying technology in the ancient Indian metallurgical tradition" http://www.thehindu.com/arts/books/article2913312.ece
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- Historical Metallurgy Society (HMS) Journal 39(2), 2005, p. 124. Paul Craddock '*This is an …engaging study of a material with a fascinating metallurgy and history… generally well produced...lively and informative narrative.'*
- New Indian Express Sunday, August 31, 2005, Made in India by Nanditha Krishnan: '*This book is a fascinating combination of history and technology, and it is supplemented by colourful paintings recreating some of the scenes where wootz was used. It is a trailblazer in popular archaeo-metallurgy, a new science in this country.'*

Interview in Historical Metallurgy Society Journal Crucible

One Minute Interview

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?

SHARADA SRINIVASAN: 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 identifiy 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 IGNCA, 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.

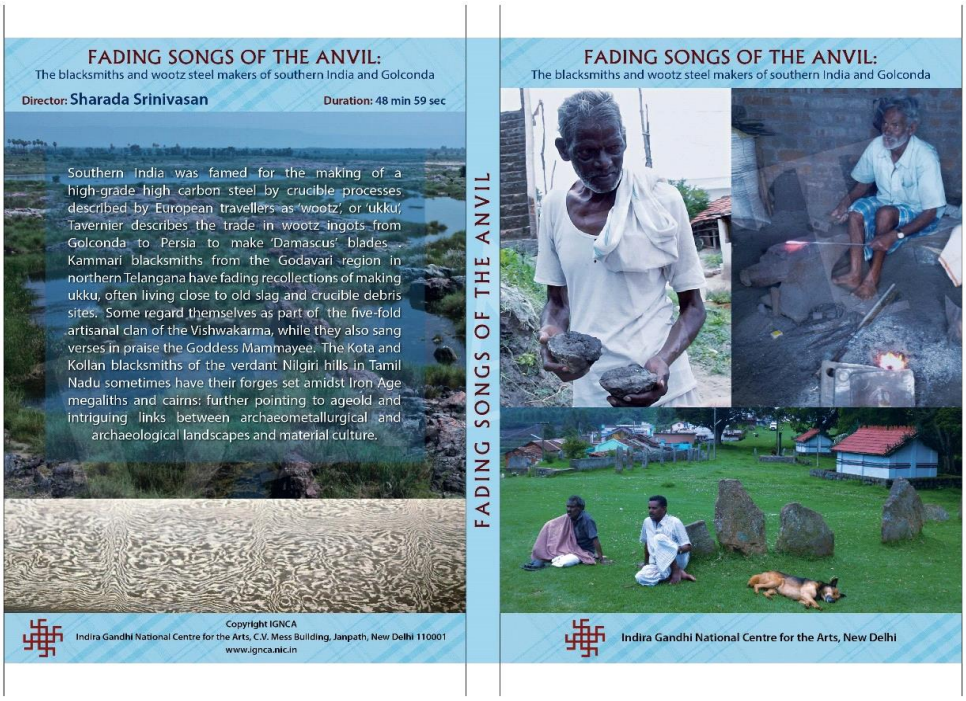
[Sharada Srinivasan, Srinivasa Ranganathan and Alessandra Guimlia-Mair eds, 2009, Metals and Civilizations, The Proceedings of the Seventh International Conference on the Beginning of the Use of Metals and Alloys; NIAS Special Publication No. SP7-2015; http://eprints.nias.res.in/756/].

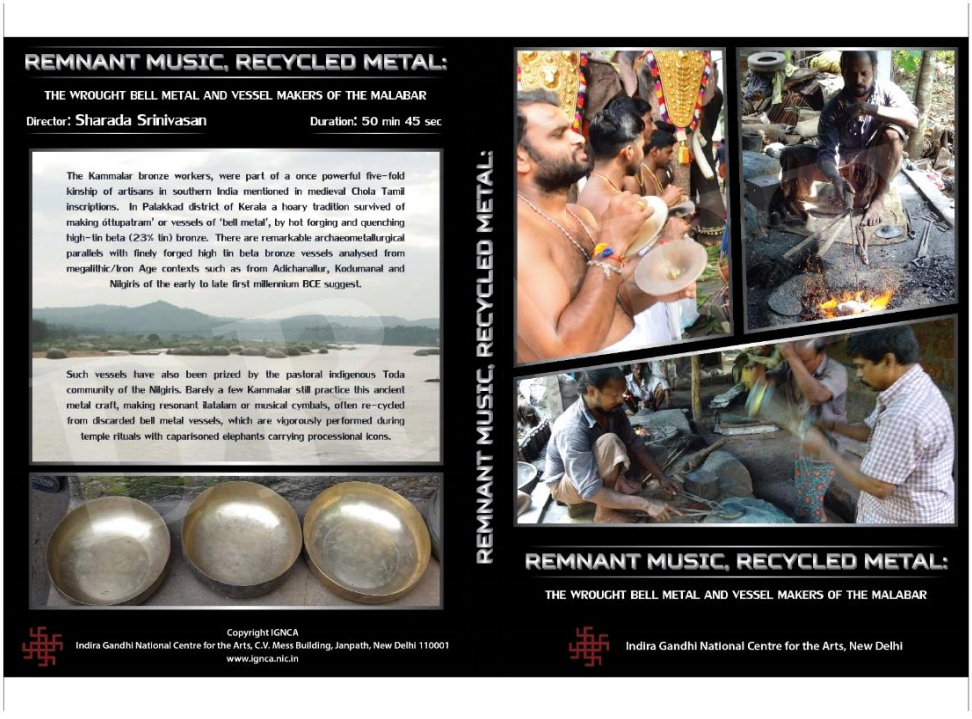
THE CRUCIBLE: Have you got any advice for young students interested in archaeological and historical metallurgy?

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 productions 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.





Documentaries on metalcrafts made for IGNCA

Lectures-cum Dance Performances in Bharata Natyam style at international and national museums, cultural and academic venues

- Mahadeva Shiva Shambo, Bharata Natyam Performance (2008, Alliance Francaise)
- https://www.youtube.com/watch?v=rpEeqWqYBi0
  - Anandanatamaduvar (1990) https://www.youtube.com/watch?v=8valMu4qpNA

- Mohamana varnam late 80's
  https://www.youtube.com/watch?v=Lnxa7yzk3-Q
- Shiva Ashtamurti (1990)

https://www.youtube.com/watch?v=hX1Lij4Eh6o

- Nataraja varnam 3 min extract (2007)
- https://www.youtube.com/watch?v=CRdGvNejGKs
- Excerpt of piece inspired by Hampi 'Musical Pillars'
- https://www.youtube.com/watch?v=OIiBlna47ms
- Performance inspired by 10th century Chola queen and patron
- https://www.facebook.com/NeoNarthaki/videos/674936363157775
- https://www.youtube.com/watch?v=Jtglf6fP4us
- https://www.facebook.com/serfojirajah2museum/posts/3252707688181063
- TEDX-PES; Archaeotechnology and dance; at sites of Sanganakallu and Hirebenkal with resonant rocks, PES, 12th March 2016, https://www.youtube.com/watch?v=HChbigVKc-s
- TEDX-GCT, Cosmic dance and science perspectives on Chola Bronzes, https://www.youtube.com/watch?v=OfKibs7dhWk
- Interview on the artistic, technical and dance related perspectives on the Nataraja bronze with performance clips (2016)

https://www.youtube.com/watch?v=0ps0WJ1jBjM HYPERLINK "https://www.youtube.com/watch?v=0ps0WJ1jBjM&fbclid=IwAR0Vx9AcmbmcdNkuGAD78JMHmuiXTkQaZxWdUtD9Zq2HLeVvsdyQe8dRlCk"& HYPERLINK "https://www.youtube.com/watch?v=0ps0WJ1jBjM&fbclid=IwAR0Vx9AcmbmcdNkuGAD78JMHmuiXTkQaZxWdUtD9Zq2HLeVvsdyQe8dRlCk"fbclid=IwAR0Vx9AcmbmcdNkuGAD78JMHmuiXTkQaZxWdUtD9Zq2HLeVvsdyQe8dRlCk

- Performance of Tanjore Quartet Shabdam Tillai Ambalam for online Serfoji IInd 243rd birth anniversary celebrations
- https://www.youtube.com/watch?v=h2FDVG_ZKLE HYPERLINK "https://www.youtube.com/watch?v=h2FDVG_ZKLE&t=482s"& HYPERLINK "https://www.youtube.com/watch?v=h2FDVG_ZKLE&t=482s"t=482s
- Interview ETV

https://www.youtube.com/watch?v=m8aNrx6Ulu8 HYPERLINK "https://www.youtube.com/watch?v=m8aNrx6Ulu8&t=9s"& HYPERLINK "https://www.youtube.com/watch?v=m8aNrx6Ulu8&t=9s"t=9s

Site performance at Hirebenkal

https://www.youtube.com/watch?v=SDY2HFU-M9s

- International La Novela Festival, Toulouse, First Festival of Knowledge, speaker and performer in unique first-time, intercontinental, interactive, internet-streamed duet 'Danse e-Toile: Nataraja et le Cosmos' (45 min), across Indian Institute of Astrophysics, Bangalore and Cite de L'espace, Toulouse, Oct 17th 2009, in collaboration with K.Danse, France, live-streamed by X-Réseau of Théâtre Paris-Villette, supported by Observatoire de Midi-Pyrenees, Centre for Excellence in Basic Sciences, ISRO and JSW Foundation

  http://bibliolmc.uniroma3.it/node/1136

  http://www.myowndocumenta.art/danse-e-toile/?fbclid=IwAR2TJq9KUqMeWeh5H3n7UlF7EoIG35LvbkWMwLX38RMq2n6dRZaZVtTsfHc

- Featured on prestigious website of Communications of the ACM: http://cacm.acm.org/opinion/interviews/54307-breaking-the-art-science-divide/fulltext
- The Hindu, Dec 13, 2009, 'Sharada has been breaking art-science boundaries to show that there is art in science and vice-versa', 'Breaking art-science divide', Aruna Chandaraju https://www.thehindu.com/todays-paper/tp-features/tp-sundaymagazine/Breaking-art-science-divide/article15941964.ece
- 'Amazing synthesis of art, science and advanced technology' Arunachandara Raju, in 'Cosmic ball', The Week, Nov 8th 2009.
- Performance Excerpt https://www.youtube.com/watch?v=47EV84dxrZM HYPERLINK "https://www.youtube.com/watch?v=47EV84dxrZM&t=150s"& HYPERLINK "https://www.youtube.com/watch?v=47EV84dxrZM&t=150s"t=150s
- Performance Excerpt https://www.youtube.com/watch?v=tAWFcZZyB80
- Curated Excerpt E-danse https://www.youtube.com/watch?v=i0syeIr0z-c
- Abhinaya excerpt https://www.youtube.com/watch?v=KXRahDTx4qY
- https://www.youtube.com/watch?v=3aNXIvAdXWY
- Photos https://www.youtube.com/watch?v=jtFWWS3v__8

- Srinivasan, S. (2010) 'Cosmic Dance of Shiva: Art, Science and Dance perspectives on Nataraja', *Norton Simon Museum Newsletter, Spring 2010*, p.5. & 4 page supplement.
- 'Cosmic Dance of Siva', Lecture and Performance, Homi Bhabha Fellows Conclave, Centenary Celebrations, Tata Institute of Fundamental Research, Mumbai, Nov 20th 2009
- 'Siva as Cosmic Dancer: Archaeoastronomical studies on Nataraja bronze', International Astronautical Federation, International Astronautical Congress, Hyderabad, Sept. 2007
- 'Nataraja bronze: Art, Science & Dance perspectives' World Heritage Week, Brhadiswara Temple, Tanjavur, 2008, organized by Tamil Nadu Tourism, Nov, 22, 2008,
- 'Materials and Culture', National Metallurgical Day, Nov 14th 2008, Indian Institute of Metals, New Delhi, India Expo Centre.
- "Nataraja: art, science, dance perspectives', Sept 2008, Leiden University, European Association of Southeast Asian Archaeology Conference

- Royal Academy of Arts, London for exhibition 'Chola: Sacred bronzes from Southern India', Jan 19th 2007

- 'Art & Science of Chola bronzes', Royal Asiatic Society, London, coinciding with the exhibition 'Chola: Sacred bronzes from southern India', Feb 6th 2007

Write-up by Jon Stock in 'The Week' of Dr. Sharada Srinivasan's lecture-event at Royal Asiatic Society, 1 April 2007:

'*For the first time, South Asian metal artefacts were subjected by Srinivasan to trace element and lead isotope analysis to scientifically date different styles of icons to specific periods.. In an article in THE WEEK in 2003, Sharada revealed that the metal icon of Nataraja, dancing with his leg extended, had already emerged in the Pallava period*'.

- 'The 'musical' pillars of Hampi', INTACH-Belgium, Leuven, coinciding with the exhibition at BOZAR 'Tejas: 5000 years of Indian art', Brussels, 16th Jan 2007.

- 'Archaeometallurgical and archaeo-astronomical insights on south Indian bronzes', Science in Culture, UNESCO, International Centre for Theoretical Physics, Trieste, Italy, 23-28 Oct 2006

- South Indian bronzes: concepts of inner and outer space', Indian Arts Circle, London, Jan 30 2007
- 'Stone architecture and 'musical' pillars of Hampi', China Conservatory of Music, Beijng, Sept. 2006
- 'Musical' pillars, Nehru Centre, London, May 2005
- 'Dance and material culture', Jain University, Material Culture Workshop, NIAS, with ASI,11th April 2014

- 'Cosmic dance of Siva', 100 years of Cosmic Rays, International Conference, TIFR, Mumbai, Dec 9th, 2012
- 'Under the Hampi Skies', Planetarium Vaulx-en-Velin, Lyon, France10th May, 2012 (collaboration with lithophonist Sebastien Sauvage)
- Sept 2011, 'Cosmic Dance of Siva: exploring art, science and dance aspects of Indian sculpture', In celebration of re-installation of Asian Galleries, Santa Barbara Museum of Art, USA,
- 'Nataraja: art, science, dance and gender perspectives', DST-NIAS course on 'Gender in Science and Technology', Nov 2010
- 'Dancing Shiva Nataraja: art-science insights', UC Berkeley, USA, May 6, 2010
- "Cosmic Dance of Shiva', Norton Simon Museum, USA, Apr. 30, 2010

- 'Cosmic Dance of Siva', Lecture and Performance, Homi Bhabha Fellows Conclave, Homi Bhabha Centenary celebrations, Tata Institute of Fundamental Research, Mumbai, Nov 20th 2009
- 'Siva as Cosmic Dancer: Archaeoastronomical studies on Nataraja bronze', International Astronautical Federation special event, International Astronautical Congress, Hyderabad, Sept. 2007
- 'Nataraja bronze: Art, Science & Dance perspectives' World Heritage Week, Brhadiswara Temple, Tanjavur, 2008, organized by Tamil Nadu Tourism, Nov, 22, 2008,
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- Royal Academy of Arts, London for exhibition 'Chola: Sacred bronzes from Southern India', Jan 19th 2007

- 'Art & Science of Chola bronzes', Royal Asiatic Society, London, coinciding with the exhibition 'Chola: Sacred bronzes from southern India', Feb 6th 2007

- 'Hampi's inspiring pillars', International History of Science Congress, Beijing, July 2005
    - Interview in Asian Age (2019)

OF SUCH *ELOQUENT* **METAL**

The Padma Shri award winner with Swamimalai bronze icon maker Radhakrishna Sthapati

THE HISTORY OF ALLOYS THROUGH THE AGES HAS CONSUMED PADMA SHRI AWARD-WINNING SCIENTIST SHARADA SRINIVASAN. HER TRYST WITH DANCE WAS ALSO INSPIRED BY HER TIRELESS RESEARCH

● SURUCHI KAPUR-GOMES

Deep in excavations, hands grimy from digging mine sites to unearth olden day metals with sweat on her brow, her body of work spans decades. Yet in the mudras and varnams she has practiced early in her life, science and dance have come together so beautifully. Ever questioning the nature of being, prying through what's the norm to unearth metallurgical explorations, she is inspired by alloys and bronze though the ages, with the famed *Cosmic Dance of Shiva* — Nataraja as her muse. Scientist, archaeologist, archaemetallurgist, culture explorer and danseuse Sharada Srinivasan has toiled over decades to experiment and understand metals through prehistoric era. The mother and wife who has spent years travelling to far off villages, mine trails and interacted with tribes that were once the brandishers of metal won the coveted Indian honour, the Padma Shri for her patient, determined and committed research. Sharada used archaeometric techniques to explore the classification of south Indian copper alloy metal icons. That lead to understanding the metallurgical finger-prints for bronzes of different periods such as Chola and Vijayanagara, which could be used as a diagnostic to categorise bronzes of uncertain dates and stylistic attributions.

Excited, and honoured, the scientist and dancer walks (limping slightly) in the lush IISC campus' National Institute of Advanced Studies where the 53-year-old academician supervises Phd students, continuing her research and analysis with the ASI and is now working on a project looking at bronze in Karnataka.

A fellow of the Royal Asiatic Society of Great Britain and World Academy of Art and Science, she was the recipient of the Dr Kalpana Chawla State Award for Women Scientists 2011. Behind her calming and expressive eyes lies an acclaimed performer of Bharatanatyam whose *Danse e-toile: Nataraja and the Cosmos* was an original experiment of a cross-continental internet-streamed duet performance. The professor and alumni of Indian Institute of Technology (Mumbai), SOAS University of London and University College London (where she did her Phd) who comes from an august family of academicians, unearths the glint in her metal journey, and her life in this exclusive interview:

Q Firstly, congratulations. How does it feel to win the Padma Shri for a lesser known subject like archaeometallurgy?

It is indeed momentous when one's work over several decades gets such recognition at a national level, and in the subject area that I work in, of archaeological sciences which is a niche with less avenues for support. As a woman scientist and archaeometallurgist, I feel gratified that the award may serve as inspiration for more women to get into STEM disciplines, as well as into archaeology, which is inherently more challenging for women in terms of travel to remote areas, physically demanding surveys or excavation etc. It has also been overwhelming to receive so much goodwill and wishes, nothing prepares one for that.

Q How would you describe your work and its relevance today? And what were your findings with the Chola Bronze?

My work falls in the domain of what can largely be described as archaeometallurgy and ethnometallurgy — the technological study of metallic archaeological artefacts and art objects which helps us gain insights into the manufacturing techniques and history of technology, and the provenance and sources of metal. Some of my significant contributions are in 'technical art history.' For example, given the challenges in dating of south Indian bronze icons, I attempted to use archaeometric techniques to classify them by calibrating them against their metallurgical profiles since metals made of different sources could have different chemical profiles of lead isotope ratios and trace elements. One of the interesting finds was that the famous Nataraja icon had probably already been cast by the Pallava period since a couple of pieces had lead isotope ratios and chemical fingerprints that did not fit the 10th century Chola period but rather the 7th-8th Century Pallava period. This fits with the emergence of devotional Bhakti poetry by this period by saints such as Appar in praise of Kuttan or Nataraja worshipped at Tillai, the old name for Chidambaram. My studies have also demonstrated ancient skills in exploiting the alloys in bronze in Tamil Nadu and southern India going back to the Indian Iron Age and south Indian megaliths (such as Adichanallur and Nilgiris in Tamil Nadu).

I have also been studying iron and steel making traditions, for which India has been famed, particularly the high carbon wootz crucible steel made in southern India which was the first grade steel made in antiquity and was traded as far as Persia and west Asia to make the fables Damascus sword blades. Wootz steel attracted the scholarly attention of many European scientists going back to Michael Faraday. Most recently, I was involved in studies published in the *Journal of Arms and Armour*, UK on the Mysorean rocket of the Tipu era. The finding were the precursors to modern rocket technology!

I also collaborated with a lithophonist, Sebastien Sauvage, who had been making musical instruments from stones from the Alps, and we performed themes inspired by the Hampi pillars and resonant rocks to his music, that too shortly after an attempt at skiing

Sharada with her husband (third from left), brother and daughter at a Toda hut in Nilgiri

What motivates me is also the concern for the artisanal communities who are increasingly marginalised in the face of globalisation and industrialisation, and to highlight the need for more sustainable and inclusive ways of development that could also benefit them

Q When does science stop, and dance begin? Uncannily, they find a meeting ground in your work too?

As a Bharatanatyam dancer, the ways in which the mystique of the Nataraja icon has tended to meld together responses of artists, scientists and dancers alike has held a special place in my heart. An aspect that intrigued me was that given that the icon is often described as the 'cosmic dance' of Siva, the makers of the icons were probably inspired by celestial observances. To that effect, in a collaboration with late astrophysicist Nirupama Raghavan, former Director, Nehru Planetarium, we explored plausible links of the iconography to the star positions around the Orion constellation (since Nataraja is linked to the star Arudra or Betelgaese in the Orion constellation). *Danse e-toile: Nataraja and the Cosmos* was an original experiment which I co-conceptualised with Jean-Marc and Anne Matos of France, and performed with Anusha Emrith — I was dancing in Bangalore and she was performing in Toulouse and we were interactively dancing via our internet images in a classical-contemporary fusion. The performance not only aimed to explore the interplay of the classical, Descartian and quantum mechanical world, but it also wove in the mystical insights from the Nataraja imagery. It was the most extraordinary and even humbling experience to dance with a virtual image, like an alter ego. So, if dance is poetry in motion, the most satisfying aspect for me has been the encounter of what Ananda Coomaraswamy (a Ceylonese Tamil philosopher and metaphysician), writing on the dance of Siva, succinctly described as 'poetry but nonetheless science'.

Q How were your growing years and the influences that saw you take to this profession?

I have to say that I am indeed lucky that I had an upbringing which was very cosmopolitan, and yet very rooted in Indian ethos. My parents, uncles, aunts and family have made prominent contributions in scientific developments and teaching, as well engaged deeply with cultural studies, Indology, environmental issues and wildlife preservation. Of course, like many girls of a south Indian (Tamil-Kannadiga) background, I started learning Bharata Natyam as a child and this passion endured over the years, even though my academic inclinations in my teens was to study physics, which I was glad to have the opportunity to do through a B.Tech in Engineering Physics at IIT Mumbai. My father MR Srinivasan, who was involved with the nuclear power programme and eventually became Chairman of the Indian Atomic Energy Commission, was a big inspiration in my scientific pursuits having heard him lecture often on the peaceful uses of nuclear fission for energy. He used to take me to the power projects as a child and say, 'See this is the calandria, these are the zirconium tubes!' He encouraged me to excel at a time when women were not really seen in science. As children, my brother and I spent a lot of time rambling around the rock-cut Pallava monuments at Mahabalipuram (my father was then involved in the construction of the nearby Kalpakkam nuclear power plant where we lived). My uncle CV Seshadri always said, 'Don't be a lab scientist, go out there and get concerned in rural development.' I guess all this had an impact and I began to feel at some point during my studies at IIT that I would like to explore scientific applications in the study and conservation of art and archaeological objects. In fact, the lead isotope ratio analysis technique that I eventually used to study Chola bronzes also has links to uranium geo-chemistry. It was the allure of the Nataraja, that drew me to the study and the quest to understand and document the technology and metallurgical and crafts traditions.

At the Hirebenkal megalithic site

Q Who is Sharada, the dancer. Your limp, how has it affected your dance?

My husband Digvijay Mallah and family have been huge pillars of support. Our 18-year-old daughter and I enjoy swimming together. At 14, she induced me to go scuba diving in the Andamans. My husband has a tea plantation in the Nilgiris, and also has interests in anthropological studies. His experience in photography and filming has enriched my work, for example, two documentary films I made on metal crafts also includes footage of Kota blacksmithy and remote Toda settlements; He was also a crucial part of *Danse e-toile*. I am very lucky to have a new-age husband, who has also been hugely supportive in running the household. In fact, my husband and daughter are both way better cooks than me! We all chill out to classical, Carnatic, Hindustani or western, jazz, African or even Korean BTS which is my daughter's pick! My husband now and then strums a guitar. Of course, the daily *sadhana* and rigour of Bharata Natyam sustained and gave me a lot of inner strength and physical equilibrium. I suffer from a birth condition called bilateral developmental hip dysplasia. I started noticing it during pregnancy, that I had this congenital problem, thus the limp (she smiles wryly). And yes, it has affected my dance. The hip bones are not properly aligned, and need surgery. I think my hanging on to dance as long as I did helped keep the symptoms at bay, and also added a certain philosophical character to my dancing, the aspect of creation emerging from destruction. To me, it symbolised overcoming your physical disabilities and that added a certain dimension, it makes you take life in a more philosophical manner, and not to take many things so seriously whether you fail or succeed. Now, I have to devise new ways to dance... I like swimming, so maybe something in water!

The Padma Shri and beyond

It draws attention to less conventional subject areas that do not get much support. There will be increased exposure to the area, more support forthcoming, and it will also create more awareness that will have a beneficial effect.

On the mining industry

A lot of what I do is tracing the places of mining in antiquity. One of the main problems with rampant mining is there is no sense of mining heritage... of protecting the sites. A very important way to preserve our heritage would be to create archaeometrological parks. If you go to a place like Konasamudram, the school children are not even aware that there was this steel making heritage that was so prized across the world. At least, in Kudremukh it is preserved as a reserve forest.

Tell us about Nuclear Winter, the film?

It was a low budget docudrama shot on the campus of IIT Mumbai in 1988 when the Cold War had not yet ended. In some ways, it was ahead of its time. It was brilliantly conceptualised by late Zul Vellani and produced by Homi Sethna. As a dancer, I tried to depict the sense of total annihilation. The Indian nuclear programme was envisioned for peaceful purposes of energy generation and nuclear disarmament, and it remains a critical goal globally.

The learning & discoveries

Some of the crafts and phenomenal techniques of making these high-tin bronze vessels are remarkable, but sadly, the tribes and metal craft communities don't get copper and tin to make freshly alloyed vessels, and it survives on recycling older ones. A community museum and giving such families remuneration is a good idea. This Toda man I encountered gave this beautiful vessel as a gift, innocently, without knowing the value and significance of it.

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History through a different lens

Studying material culture could help piece together history, says archaeo-metallurgy expert Sharada Srinivasan

HARSHINI VAKKALANKA

Metals have answers says Sharada • SPECIAL ARRANGEMENT

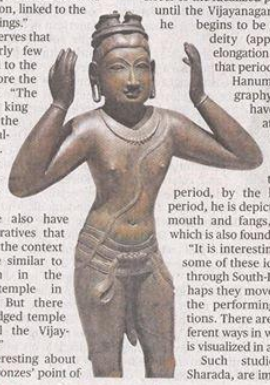
"It is harder to study Hindu artefacts as compared to Buddhist and Jain artefacts because the former are not inscribed," says Sharada Srinivasan, professor at the National Institute of Advanced Studies. She holds a Ph.D from the Institute of Archaeology, University College London (1996) on Archaeo-metallurgy of South Indian bronzes.

She recently gave a talk on 'Ramayan a Bronzes and Sculpture from the Chol a to Vijayanagara Times' at the DSA Memorial International Conference on 'Connecting Cultures: Ramayan a Retellings in South India and Southeast Asia' held at REVA University in honour of noted historian Prof D S Achuta Rao's centenary celebration.

"Archaeo-metallurgy is the study of the metallurgical profile of artefacts which could contribute to the stylistic analysis of the subject," Srinivasan said. "Here scientific analysis is used to clarify the dating of bronzes through certain criteria."

It is this technique that Sharada used to study the Chola and the Vijayanagara bronzes pertaining to the Ramayana.

"This paper talks about the earlier depictions of the Ramayana through the cultural narratives of that period. In the Chola period, for instance, we find the first appearances of Rama as a princely icon, linked to the notion of god kings."



Sharada observes that there are fairly few bronzes linked to the Ramayana before the Chola period. "The idea of a god king appears in the context of Pallava epigraphs. These influences have also spread to South-East Asia. And we also have Ramayana narratives that come in under the context of Shiva, quite similar to the depiction in the Nageshwara temple in Kumbakonam. But there was no full-fledged temple to Rama until the Vijayanagara period."

What is interesting about this from the bronzes' point of view is that if you look at the iconometry in the Chola times, Rama is still closer to the idealized prince. It is not until the Vijayanagara period that he begins to be depicted as a deity (apparent in the elongation of the body in that period).

Hanuman's iconography too seems to have had variations. While his form is still more human in the Chola period, by the late Pandyan period, he is depicted with open mouth and fangs, a depiction which is also found in Thailand.

"It is interesting to see how some of these ideas travelled through South-East Asia, perhaps they moved along with the performing arts traditions. There are so many different ways in which the epic is visualized in art."

Such studies, believes Sharada, are important from the scientific point of view as well because they involve looking at material culture to piece together narratives of trade and exchange.

"We don't get all the answers through inscriptions and literature and some of the evidence may even be lost. Looking at the history of technology and material culture throws up answers."

And the subject of the Ramayana in this context remains relevant because of the many ways in which the epic has been internalised and portrayed across South India and South-East Asia.

"It is great to see that the Ramayana generated so much artistic and literary interest across centuries. Such conferences are a way to energize and give life to it as art historians, archeologists and anthopologists," explains Sharada.

"It is also great in the broader sense of how great literature has inspired great artistic output." In case of the Cholas, for instance, what really sets them apart is their clear inspiration from the Bhakti tradition. The inspiration from the Alwar and the Nayanmar poet saints and their devotional poetry infused a certain life in the bronzes.

"They were steeped not only in literature, but also in the performance art traditions. A lot of the performance art tradition also moved to South-East Asia. The nuances of the episode involving Soorpanakha, which is critical to the narrative, in many ways, is found in the shadow puppetry traditions of Hampi. It was a feature in the Chalukya depictions and also find itself in the narratives of Khmer."

In terms of the nature of the bronzes, especially the Chola ones, their craftsmanship and skill remains unparalleled.

"But this skill didn't emerge from a vacuum, the megalithic bronzes are highly skilled and finely wrought and the tradition seems to have continued. What is significant about the South Indian bronzes is that the craftsmen were clearly cognizant of what type of alloy would give the best output. And the moulding technology was far superior. That skill is lost now."

Sharada is now working on documenting her research on the subject, working with master craftsmen, while writing a book.

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FRIDAY REVIEW

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The dancer frozen in bronze

Archaeologist Sharada Srinivasan has traced the history of metallurgy in India from prehistoric to modern times

KAUSALYA SANTHANAM

Leg upraised as he performs the cosmic dance, *damaru* in one hand and fire in the other, the demon of ignorance lying crushed under his foot... the image of Nataraja fascinates everyone who sees the perfectly balanced and proportioned form. In the magical hands of the craftsmen of the Pallava and Chola eras, bronze took the form of poetry, as molten metal was frozen to capture beauty and grace in motion. This image has attracted scholars, writers and artists from across the world.

"Leonardo [da Vinci] in the 15th-century Italian Renaissance drew together art and science in the two-dimensional *Vitruvian Man* within a circle. In a preceding era, the casters of the Nataraja bronze had drawn together art, science and dance in an even more daring, dynamic, three-dimensional vision," says Sharada Srinivasan, archaeologist and archaeometallurgist, who is a professor at the National Institute of Advanced Studies, Bengaluru.

For her work of over three decades, Sharada was recently elected International Honorary Member to the American Academy of Arts and Sciences, whose past members have included greats like Albert Einstein and T.S. Eliot. She has made valuable contributions to the study of archaeology and history of art by exploring engineering applications in these disciplines. She has also traced the history of metallurgy in India from prehistoric to modern times, including present-day craft practices.

Archaeometallurgy – the study of metallic artefacts, ancient mining and metal extraction – is a sub-discipline of the archaeological sciences. As a B.Tech student of Engineering Physics at IIT Bombay, Sharada looked out for kindred spirits who combined scientific and artistic pursuits, such as Nobel Laureate C.V. Raman. "I became interested in spectrochemical analysis for characterising art objects. The archaeometallurgy and art historical study of South Indian and Chola bronzes seemed an ideal research topic for me," she says. "This was undertaken through a British Chevening Ph.D Scholarship at the Institute of Archaeology, London. To me, the ethno-metallurgical studies of remote foundries were the most fulfilling – to experience first-hand the skill, immersion and resilience of crafts communities."

As a Bharatanatyam dancer, the South Indian Nataraja bronzes have always been of great interest to Sharada. Her research in the area has led to exciting discoveries, she says. "So, while the dancer in me appreciated the metaphorical five elements of Siva's dance, as a scientist I was intrigued by the prospect that the metallurgical analysis of the elemental composition of the Nataraja and South Indian bronzes might reveal insights into the history of technology, and related art historical trajectories. For representative South Indian bronzes of the early historic, Pallava, Chola, late Chola and Vijayanagara periods, I tried to identify characteristic metallurgical profiles – of both elemental composition and lead isotope ratios – which could then be used as additional criteria to distinguish between them in chronology and style".

Sharada's work draws on a plethora of sources including literature, iconography, and Saivite hymns. "In two examples of bronzes that I technically identified as Pallava (800 CE) – one from the British Museum, and the other, the Kuniyur Nataraja in the Government Museum, Chennai – the mudras of the drum held slanted are strikingly similar. Neither has the flying matted locks found in the later 10th century Chola bronzes, such as the Nataraja stone and bronze images in the Aduthurai temple built by Queen Sembiyan Mahadevi. Taken together with seventh century CE devotional poetry such as that of Appar, who sang of the Kuttan or dancer with the raised golden foot, this suggests that the Nataraja bronzes were already prevalent under the Pallavas."

As an archaeometallurgist, Sharada embarked on an arduous journey that took her on a study of not only South Indian bronzes made by the ancient lost-wax process, practised even today by artisans in the temple town of Swamimalai in Tamil Nadu's Thanjavur district, but also the Aranmula metal mirrors of Kerala and the bronze temple bells of Nachiyarkoil. Another in-depth study was on the manufacture of wootz steel, which the country was renowned for. "I have studied wafer-thin, high-tin bronze vessels (heat treated copper-tin alloys of 23% tin), from the South Indian Iron Age and megalithic sites of the Nilgiris, Adichanallur and Kodumanal, which rank amongst the most finely forged in the world. And I have identified similar rare continuing practices amongst the Kammalar of Palakkad in Kerala," she says.

Archaeometallurgy is also useful in the detection of metal idols and artefacts spirited away from India. "South Indian metal icons are rarely inscribed, particularly Hindu images as compared to Jaina and Buddhist images, and so there are problems in dating and making stylistic attributions," she points out. "This is complicated by similar artistic conventions being followed over centuries and into the present day at icon-making centres such as Swamimalai. We have the example of the smuggled Sripuranthan Nataraja, which was artificially patinated to change the look before it was sold to the Australian National Gallery and has now been restituted. Hence, having a database of the metallurgical profile and intrinsic fingerprints, such as lead isotope ratio data, can be useful for forensic purposes to tell apart antiques from recent examples."

Sharada is currently working with the Tamil Nadu State Archaeology Department to look at finds from recent excavations to better establish the early trajectory of copper and ferrous metallurgy. She had earlier made some preliminary identification of ferrous crucible processes from Kodumanal, a megalithic site dating to 300 BCE, which testifies to the country's millennia-old legacy in the field.

The author is a Chennai-based writer and critic.

I was intrigued by the prospect that the metallurgical analysis of the Nataraja and South Indian bronzes might reveal insights into the history of technology, says Sharada

From the past (Clockwise from top left) Sharada Srinivasan inspecting a Kodumanal artefact; a Chola era Nataraja statue, National Museum, New Delhi and the archaeometallurgist at a bell-making workshop ■ PHOTOS: THE HINDU ARCHIVES AND SPECIAL ARRANGEMENT

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