

CURRICULAM-VITAE

- 1. Name** : Dr. Manager Singh
- 2. Position and Present Address** : Director General
National Research Laboratory for Conservation of
Cultural Property
Sector-E/3, Aliganj, Lucknow - 226024
- 3. Permanent Address** : Plot no. 61, "Nandishwar" Devanagari,
Shah Noor Miya Dargah Road,
Aurangabad – 431 005 (MS)
Mob: 9890623704
- 4. Date of Birth** : 01.01.1956 (First January nineteen fifty-six)

5. Educational Qualifications:

Year	Name of Degree	Name of University	Subjects	Division
2014	PhD.	Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad –431 004	Thesis entitled "Comprehensive Scientific investigation of Ajanta Paintings and Performance Evaluation of Materials and Measures"	
1977	M.Sc.	Gorakhpur University, (U.P)	Physical Chemistry	I
1975	B. Sc.	Gorakhpur University, (U.P)	Chemistry, Zoology, Botany	II

6. Professional Qualifications:

Office/Institute	Post Held	From	To	Scale of Pay and Basic Pay	Nature of Duties
National Research Laboratory for Conservation of Cultural Property (NRLC), Lucknow	Director General	19-09-2019	Till date	Pay Band 14	Research and Development work, Running the training institute, Administrative work and Project work
National Museum Institute, Department of Conservation, New Delhi	Professor (Conservation)	11-05-2017	18-09-2019	Matrix pay (7 th pay commission) Rs. 148500+Allowance	Teaching & Research in Archaeological Science Conservation & Preservation
Deccan College Post-Graduate and Research Institute, Pune	Visiting Faculty	2016	2017	N.A.	Lectures for Diploma Course on Heritage Site Management and Scientific Conservation
Archaeological Survey of India, Aurangabad	Superintending Archaeological Chemist	03-01-2011	31-12-2015 (Retd.as SAC on 31-12-2015)	15600-39100 Grade Pay 7600/-	Scientific conservation of centrally protected monuments of Maharashtra & Goa

Archaeological Survey of India, Dehradun	Superintending Archaeological Chemist	09-06-2008	31-12-2010	15600-39100 Grade Pay 7600/-	Scientific Analysis & Improvement of Methodology used in Conservation of ancient Objects
Archaeological Survey of India, Ajanta caves	Deputy Superintending Archaeological Chemist	26-05-1997	08-06-2008	Rs. 700-1300/-	Conservation & Preservation of Ajanta caves Paintings & Stone sculptures
Archaeological Survey of India, Southern Region, Hyderabad	Deputy Superintending Archaeological Chemist	16-10-1990	25-05-1997	Rs. 700-1300/-	Conservation & Preservation of ancient Monuments, Plasters and works of Art Pertaining to south India
Geological Survey of India (Airborne Mineral survey and exploration), Bangalore	Assistant Chemist	02-08-1983	15-10-1990	Rs. 650-1200/-	Analysis of Rocks, Ores and Minerals
Defence R & D lab, Naval Dockyard Visakhapatnam	Jr. Scientific Assistant	22-05-1979	01-01-1983	Rs. 425-700	Analysis of metals, alloys, water, Battery fluids and diving gases
Gorakhpur University	Research Scholar	14-11-1977	20-05-1979	Rs. 400/fixd	Research work on Inorganic glass forming systems with reference to Borates and Phosphate glasses

7. List of Publication

- 1) Sneha Bakshi and **M.R.Singh** (2020), A petro-chemical study of Mughal plasters of Quila-I-Ark, Aurangabad with respect to technology and repair, History of Science and Technology, Vol.10.
- 2) Deepakshi Sharma, **M.Singh**, Gabrick Krish & M. Velayadhan Nair (2020), Pigment analysis of palm leaf manuscript of India, Current Science, Vol. 118, No.2.
- 3) Siva Sankar Panda, Surendra Kumar Bisaria, **M.R. Singh** (2020), The spectroscopic and microscopic evaluation of cellulose used in conservation of archival materials, Microchemical Journal, <https://doi.org/10.1016/j.microc.2020.105707>
- 4) Meenakshi Malsure, Preeti Verma, **M.R.Singh**(2020), Metallurgical Investigations of Indo-Sasanian Copper-Silver Alloy Coins of Gurjara – Pratiharas Dynasty, Metallurgical and Materials Engineering Association of Metallurgical Engineers of Serbia AMES, <https://doi.org/10.30544/524>
- 5) Anjali Sharma, **M.R.Singh** (2020), Execution technique and pigment characteristics of the decorative wall from seventeenth-century CE Chatta Chowk at Red Fort Complex, New Delhi, India, Periodico di Mineralogia, DOI: 10.13133/2236-1002/16761
- 6) Meenakshi Malusare, **M.R.Singh** (2020), Pewter filled seashell coins from central India (500BC-11th CE) – Surface Morphology and Micro-structure, International Journal of Conservation Science, Volume 11, Issue 4. pp. 965-978

- 7) **M.R.Singh**, D.A. Gupta (2020), Removal of Bats' Excreta from Water-Soluble Wall Paintings Using Temporary Hydrophobic Coating, Journal of the American Institute for Conservation, <https://doi.org/10.1080/01973160.2020.1734749>
- 8) Singh, S.K., and **M.Singh**. (2020), The mineralogical and physical behaviour of brick aggregates in 12th century brick-lime stepwell plasters of Gandhak-Ki-Baoli, New Delhi, Journal of Architectural Conservation, pp 1-17, <https://doi.org/10.1080/13556207.2020.1768480>
- 9) Anjali Sharma, **M.R. Singh** (2020), A Multi-Analytical Investigation of the Materials and Panting Techniques of Wall Paintings in the Eighth to Tenth-Century CE Jain Caves at Ellora, India, Studies in Conservation, <https://doi.org/10.1080/00393630.2020.1753353>
- 10) **M.R. Singh**, Deepakshi Sharma (2020), Investigation of Pigments on an Indian Palm Leaf Manuscript (18-19th century) by SEM-EDX and other Techniques, De Gruyter, Uppsala University Library, 41(1): pp 49-65, <http://doi.org/10.1515/res-2019-0006>
- 11) **M.R.Singh**, K. Ganaraj, P.D.Sable (2020), Surface mediated Ca-phosphate biomineralization and characterization of the historic lime mortar, Janjira Sea Fort, India, Journal of Cultural Heritage, pp 1-10, <http://doi.org/10.1016/j.culher.2020.02.004>
- 12) B. Dighe, **M.R. Singh**, Anil K. Pokharia (2020), Ancient Indian techniques for sustainable and environmentally friendly decorative earthen plasters of Karla and Bhaja Caves, India, Materials Today: Proceedings, pp 1-8, <http://doi.org/10.1016/j.matpr.2020.02.040>
- 13) Bhushan Dighe and **Singh, M.R.**, (2019), Initial Evidence of Plant and Animal origin Organic Additives from the 2nd Century BC Earthen Plaster of Rock cut Caves of Karla, India, Archaeometry Journal, doi: 10.1111/arc.m.12522
- 14) Vandana Singh and **M.R.Singh**, (2019), Steelmaking in India – new evidence from microscopic & archaeometallurgical analysis from middle Ganga plain, Balirajgarh, Journal of Microscopy, doi:10.1111/jmi.12846.
- 15) Sanjeev K. Singh, Bhushan Dighe and **M.R. Singh**, (2020), Characterization of 12th century brick lime stepwell plasters from New Delhi, India, Journal of Archaeological Science Reports, 29, pp1-13, <http://doi.org/10.1016/j.jasrep.2019.102063>.
- 16) Tahseen Karache and **Manager Rajdeo Singh**, (2019), The application of hemp (*Cannabis sativa* L.) for a green economy; a review, Turkish Journal of Botany, 43; pp710-723, doi: 10.3906/bot-1907-15.
- 17) **Singh, M. R.**, and Mani, B., R., (2019). Characterization of Pigments and Binders in Mural Painting Fragments from Bezeklik, China, *Indian Journal of History of Science*, Vol 54.3 348-360.
- 18) Sharma D., **Singh, M.**, Nair M.V., (2020), Pigment analysis of palm leaf manuscript of India, Current Science, Vol.118, No.2.
- 19) D.Manmania., and **Singh, M.R.** (2019), Analysis of Kushan Coins (1-3Centure CE) by Multi-spectroscopic techniques. *Journal of Applied Spectroscopy*, 86(5), pp840-846.
- 20) Nagar Aditi., and **Singh, M.**, (2019), Behaviour of lead coated with Benzotriazole Solution in and organic acid environment. *ICOM-CC, MetalNeuchater*, Switzerland, pp 198-201.

- 21) Kanth A.P., and **Singh, M.**, (2019), Spectroscopic and chromatographic investigation of the wall painted surfaces of an 18th century Indian temple, New Delhi, *Vibrational Spectroscopy*, 104, pp, 102947. DOI: <https://doi.org/10.1016/j.vibspec.2019-102947>
- 22) Singh, V., **Singh, M.R.**, Verma, P., (2019), Microscopic examination of the 2,300 year old excavated steel plowshare from northern India. *X-ray Spectrometry*, pp 1-8. <https://doi.org/10.1002/xrs.3101>
- 23) Sharma, A., and **Singh, M.**, (2019). Multi-analytical investigation of the composition and binders used in earthen support layer of 5th-14th CE painted fragments from, Bezeklik, China. *Studies in Conservation*, pp 1-17 DOI: 10.1080/00393630.2019.1625592
- 24) **Singh, M.**, (2019). Urease activity and deposition of calcium carbonate layers on a 16th century Mughal monument, *Current Science*, 116(11), pp 1840-1849 .
- 25) Singh, V., **Singh, M.**, and Verma, P., (2019). Characterization of Corrosion Behavior of Archaeological Iron Spear from Sanur (300 BC - 50 AD) - A Megalithic Site in Southern India. *Acta Chemica Malaysia*, 3(1), pp. 21-28
- 26) **Singh, M.**, and Kumar, Vinod, S., (2019), Architectural features and characterization of 16th century Indian Monument Farah Bagh, Ahmed Nagar, India. *International Journal of Architectural Heritage*, pp.1-4
- 27) Kanth, A.P., and **Singh, M.**, (2019). Vibrational spectroscopy and SEM-EDX analysis of wall painted surfaces, Orchha Fort, India. *Journal of Archaeological Science: Reports* 24, pp. 434-444.
- 28) Kumar, S.V. & **Singh, M.R.**, (2019). Salt Weathering of 7th Century CE Granite Monument of Shore Temple, Mahabalipuram – Scientific Investigation and Conservation Strategy. *Heritage*, 2(1), pp.230–253.
- 29) **Singh, M.**, and Mamania, D., (2018). Analysis of Kushan Coins (1-3 Century CE) by Multi-Spectroscopic Techniques. *Applied Spectroscopy*. Under Publication in Sept-Oct 2019 Issue.
- 30) **Singh, M.**, and Kumar, S.V. (2018). Characterization of Ancient Lime Plasters of the Historical Sea Fort of Sindhudurg. *International Journal of Conservation Science*, 9(4), pp.697-708.
- 31) Sharma, D., **Singh, M.** & Dighe, B. (2018). Chromatographic Study on Traditional Natural Preservatives Used for Palm Leaf Manuscripts in India. *Restaurator. International Journal for the Preservation of Library and Archival Material*, 39(4), pp. 249-264.
- 32) **Singh, M.**, and Singh, Meenakshi., 2018. Comparative Limnological and Physico-Chemical Studies of Lonar Crater Lake, India. *Journal of Global Biosciences*, 7(8), pp. 5562-5572.
- 33) Kanth, Aditya., and **Singh, M.**, The formation of a microbial veil on the decorative mural surfaces revealed by multi-spectroscopic examination. In *Conference on Preventive Conservation and Management of Wall Paintings in Historic Buildings*, IGNCA and CATTs, New Delhi, India.
- 34) Sharma, Anjali., and **Singh, M.**, 2018. Analysis and consolidation of painted earthen support layer, Bezeklik, China. In *Conference on Preventive Conservation and Management of Wall Paintings in Historic Buildings*, IGNCA and CATTs, New Delhi, India.

- 35) Dighe, B., and **Singh, M.**, 2018. Carbon-Rich Cell Wall Polysaccharides Of Paddy Husk/Straw As Vegetal Additives In Ancient Decorative Mud Plasters Of Bezeklik, China. In *Conference on Preventive Conservation and Management of Wall Paintings in Historic Buildings*, IGNC A and CATT S, New Delhi, India.
- 36) **Singh, M.R.**, 2018. Microstructural studies of composite Mughal period cannons of Daulatabad Fort, India, by electron backscattered diffraction and scanning electron microscopy. *X-Ray Spectrometry*, pp. 1-9.
- 37) **Singh, M.**, Singh, M.R., Sharma, A. and Dighe, B., 2018. Medieval silver coins of India: Composition and authentication. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, **436**, pp.163-172.
- 38) Kanth, Aditya., **Singh, M.**, and Pandey, Satish., 2018. Optimizing the rigidity of gellan and agar gels for cleaning of Acrylic emulsion painted surfaces. *International Journal of Conservation Science*, **9**(3), pp. 451-462.
- 39) Dighe, B., **Singh, M.R.**, Mani, B.R. and Sahay, B., 2018. Oryza sativa L.(Rice) in the Ancient Earthen Plasters of Painted Fragments from Bezeklik, China. *Studies in Conservation*, pp.1-11.
- 40) Mamania, D., **Singh, M.R.** and Lal, U.S., 2018. Examination and analysis of Indian silver punch-marked coins employing WD-XRF and other noninvasive techniques. *Surface and Interface Analysis*, **50**(10), pp.947-953.
- 41) Sharma, D., Krist, G., **Singh, M.**, And Velayudhan, N.M., 2018. Structural Characterisation Of 18th Century Indian Palm Leaf Manuscripts Of India. *International Journal of Conservation Science*, **9**(2), pp. 257-264.
- 42) **Singh, M.**, Kumar, S.V. and Sabale, P.D., 2018. Chemical and mineralogical investigations of lime plasters of medieval structures of Hampi, India. *International Journal of Architectural Heritage*, pp.1-17.
- 43) **Singh, M.** and Vinodh Kumar, S., 2018. Mineralogical, Chemical, and Thermal Characterizations of Historic Lime Plasters of Thirteenth–Sixteenth-century Daulatabad Fort, India. *Studies in Conservation*, pp.1-15.
- 44) **Singh, M.**, Mamania, D. and Shinde, V., 2018. The scope of hemp (Cannabis sativa L.) use in Historical conservation in India. *Journal of Traditional Knowledge*. **17**(2), pp. 314-321.
- 45) Kanth, Aditya., **Singh, M.**, and Pandey, Satish., 2017. An Explorative Study of cleaning Acrylic Painted surfaces with concentrated polyelectrolytic xanthan Hydrogels. *International Journal of engineering and Science research*. **7**(12), pp. 176-185.
- 46) Koshy, Nevin., Sushalekshmi, S.U., Sharma, Susmita., Joseph, J., Sharma, V., Singh, D.N., Jha, B., and **Singh, M.**, 2018. Characterization of the soil samples from the Lonar Crater, India. *Geotechnical engineering journal of SEAGES and AGSSEA*, **49**(1), pp. 99-105.
- 47) **Singh, M.**, 2017. Mural paintings of Ajanta: Scientific Investigation and preservation. In *UNESCO Expert workshop on Conservation of mural paintings: Access, Research, Preservation*, Asian Art Museum, Berlin.
- 48) **Singh, M.**, and Kumar, Vinod., 2017. Natural Air cooling system in 16th century Mughal's India- Architectural Technology and Characterization. In *ICACMS 2017, Indian Institute of Technology, International conference*, Chennai, India. **3**, pp. 629-638.

- 49) **Singh M.R.**, 2017. Dolomitic plasters in Indian monuments and its characterization. *J His Arch & Anthropol Sci.* **1**(6):237–241.
- 50) Kumar, S.V., And **Singh, M.**, 2017. Multi-Analytical Characterization Of XVII Century Mughal Glaze Tiles From Northern India. *International Journal of Conservation Science*, **8**(3), pp. 389-400.
- 51) **Singh, M.** and Sardesai, M.M., 2016. Cannabis sativa (Cannabaceae) in ancient clay plaster of Ellora Caves, India. *CURRENT SCIENCE*, **110**(5), p.884-891.
- 52) **Singh, M.**, Kumar, S.V., Waghmare, S.A. and Sabale, P.D., 2016. Aragonite–vaterite–calcite: Polymorphs of CaCO₃ in 7th century CE lime plasters of Alampur group of temples, India. *Construction and Building Materials*, **112**, pp.386-397.
- 53) **Singh, M.**, Kumar, S.V. and Waghmare, S., 2016. An analytical and geoarchaeological approach on earthen plaster of 2nd century BCE Karle caves of Western Deccan, India. *Journal of Archaeological Science: Reports*, **9**, pp.522-535.
- 54) **Singh, M.**, Kumar, S.V. and Waghmare, S., 2016. Mud Plaster Wall Paintings of Bhaja Caves: Composition and Performance Characteristics. *Indian Journal of History of Science*, **51**, pp.431-442.
- 55) **Singh, M.**, Kumar, S.V. and Waghmare, S.A., 2016. The composition and technology of the 3–4th century CE decorative earthen plaster of Pithalkhora caves, India. *Journal of Archaeological Science: Reports*, **7**, pp.224-237.
- 56) Kumar, S.V., **Singh, M.**, Waghmare, S.A., Mahajan, N.E. And Sabale, P.D., 2016. Eradication Of Vegetal Growth And Systematic Scientific Conservation Approach Of Ballaleshwar Temple, Trimbakeshwar (India). *International Journal of Conservation Science*, **7**(3), pp. 615-626.
- 57) Kumar, S.V., **Singh, M.**, Wagh, S.W. And Mahajan, N.E., 2015. Polychrome Sculptures Of St. Francis Of Assisi Church, Old Goa: A Challenge In Scientific Conservation. *International Journal of Conservation Science*, **6**, pp. 465-472.
- 58) Kumar, Vinod, S., **Singh, M.**, Mahajan, Anupama, S., Wagh, Sudhir, W., and Mahajan, Nilesh, E., 2015. Scientific conservation of antiquities of Raigad Fort, Maharashtra- A case study. *Heritage and Us*, Year 4, **3**, pp. 46-51.
- 59) **Singh, M.**, Kumar, S.V. and Waghmare, S.A., 2015. Characterization of 6–11th century AD decorative lime plasters of rock cut caves of Ellora. *Construction and Building Materials*, **98**, pp.156-170.
- 60) **Singh, M.** and Arbad, B.R., 2015. Characterization of 4th–5th century AD earthen plaster support layers of Ajanta mural paintings. *Construction and building materials*, **82**, pp.142-154.
- 61) Kumar, Vinod., and **Singh, M.** 2015. A Challenge in Scientific Conservation of Santiniketan Murals. *Heritage and Us*, **4**, pp. 43-47
- 62) **Singh, M.** and Arbad, B.R., 2014. Scientific studies on decorated mud mortar of Ajanta. *Case Studies in Construction Materials*, **1**, pp.138-143.
- 63) **Singh, M.** and Arbad, B.R., 2014. Characterization of traditional mud mortar of the decorated wall surfaces of Ellora caves. *Construction and Building Materials*, **65**, pp.384-395.
- 64) **Singh, M.**, and ARBAD, B.R., 2014. Ancient Indian Painting Recipes And Mural Art Technique At Ajanta. *International Journal of Conservation Science*, **5**(1), pp. 35-50

- 65) **Singh, M.**, Trambke, R.S., and Arbad, B.R., 2014. Potential for New Product Development in Maharashtra with Special Reference to Cultural Monuments. In *Contemporary Tourism Planning*, Eds. Dr.Maduri Sawant &Dr. Rajesh Ragde.
- 66) **Singh, M.**, Waghmare, S. and Kumar, S.V., 2014. Characterization of lime plasters used in 16th century Mughal monument. *Journal of Archaeological Science*, **42**, pp.430-434.
- 67) **Singh, M.**, and Trambake, R.S. 2014. Rituals and Scientific Practice applied in Restoration of Lord Vithhal Idol at Pandharpur. *Heritage and Us*, **4**.
- 68) **Singh, M.**, and Arbad, B.R., 2013, August. Architectural History and Painting Art at Ajanta: Some Salient Features. In *Arts* (Vol. **2**, No. 3, pp. 134-150). Multidisciplinary Digital Publishing Institute.
- 69) **Singh, M.** and Arbad, B.R., 2013. Challenges of Science and Technology in solving Problems connected with conservation of Paintings. *Heritage and Us*, **3**, pp. 36-40.
- 70) **Singh, M.**, and ARBAD, B., 2013. Chemistry Of Preservation Of The Ajanta Murals. *International Journal of Conservation Science*, **4**(2).
- 71) **Singh, M.**, and Arbad, B.R., 2013. On carrying capacity of cave murals of Ajanta. *IJSER*, **4**(2), pp.1-4.
- 72) Ravindran, T.R., Arora, A.K., **Singh, M.** and Ota, S.B., 2013. On□and off□site Raman study of rock□shelter paintings at world□heritage site of Bhimbetka. *Journal of Raman Spectroscopy*, **44**(1), pp.108-113.
- 73) **Singh, M.**, and Arbad, B.R., 2012. Conservation & Restoration Research in 2 nd BC Murals of Ajanta. *International Journal of Scientific and Engineering Research*, **3**(10), pp.1-8.
- 74) **Singh, M.**, 2012. A brief note on Discovery of Ajanta. *Sivasri Perspectives in Indian Archaeology, Art and Culture: 2007-2013*.
- 75) **Singh, M.**, Trambke, R.S., and Gupta, D.A., 2011. Chemical conservation of Hinyana paintings 2nd B.C.E cave no. 10, Ajanta. In *Art, Myths and visual culture of South Asia, Warsaw Indological Studies*, **4**, pp 251-259.
- 76) **Singh, M.**, 2011. Microclimatic condition in relation to conservation of cave no 2 murals of Ajanta. *Current Science***101** (1): 89-94.
- 77) **Singh, M.**, and Trambke, R.S., 2010. The Hinyana Paintings of Ajanta and its Conservation. In *Prof. Dieter Schlingloff Felicitation Series*, **2**, Germany, pp 527 to 533.
- 78) Cacace, C., Giani, E., Giovognoli, A., Nugari, P.M., and **Singh, M.**, 2008. The mural paintings of cave 17 in Ajanta: the environmental study and the geographic information system (GIS) of the collected data. In *ICOM Committee for conservation conference*, **2**, New Delhi, pp. 726 to 734.
- 79) **Singh, M.**, 2008. Paintings Conservation of Ajanta Caves. In *UNESCO Workshop on Periodic Reporting of World heritage sites in India held at Hampi, India*.
- 80) Artioli, D., Coapnna, F., Giovognoli, A., Loele, M., Marcone, A., Mariothini, M., OzinoClaligaris, E., Risotto, L., and **Singh, M.**, 2008. Mural paintings of Ajanta Cave, part II: Non-Destructive investigations and micro analysis on execution technique and state of conservation. In *9th International Seminar on NDT of Art*, Jerusalem, Israel.
- 81) Giovognoli, A., Coapnna, F., Loele, M., Marcone, A., OzinoClaligaris, E., Risotto, L., and **Singh, M.**, 2008. The Mural paintings of the Ajanta caves, part I: Documentation on execution techniques and conservation condition. In *9th International Conference on NDT of Art*, Jerusalem, Israel.

- 82) **Singh, M.**, 2008. Bio-deterioration of painted plaster in India. In *Indo-Belgium workshop organized by the Archaeological Survey of India*, Chennai.
- 83) **Singh, M.**, 2007. Scientific Conservation of paintings and sculptures of Ajanta Cave. In *Indo-Italian conservation seminar on Ajanta*, National Museum, New Delhi, India.
- 84) **Singh, M.**, 2007. Recent Methodology applied in the conservation of Ajanta Cave Paintings & Sculptures. In *Museum Society of Bombay (Previously prince of whale's museum)*, Mumbai, India.
- 85) **Singh, M.**, 2007. Conservation problems of Ajanta cave and its remedial measures. In *International workshop held at NRICPT*, Tokyo, Japan.
- 86) **Singh, M.**, 2006. Scientific Conservation of Ajanta Cave Paintings & Sculptures. In *National Seminar on Ajanta Cave paintings & its Conservation*. Mumbai University, India.
- 87) **Singh, M.**, Chandrabanshi, S., and Gupta, D.A., 1998. Chemical Characterization of Bronze Sculptures of Anjkorwat. IASC, New Delhi, **31**(10).
- 88) Mangiraj, V.R., Trambake, R.S., and **Singh, M.**, 1998. Role of Physico-Chemical parameters in weathering of Lord Vithal Temple at Pandharpur. IASC, New Delhi, **31**: 76-85.
- 89) **Singh, M.**, and Miati, S., 1996. Floating Bricks of Kakatiya Monuments and their conservation. IASC, New Delhi, pp. 140-149.
- 90) **Singh, M.**, and Sharma, R.K., 1995. Chemical Characterization of Bidar Fort (India) Plaster. In *International Colloquium on Conservation, Preservation and Restoration, Traditional Trends and Techniques*, BACRI, Hyderabad, India, pp. 103-110.
- 91) **Singh, M.**, and Ragde, K.G., 1995. Chemical Conservation of Triambakeswar Temple – Problems and Remedies. In *International Colloquium on Conservation, Preservation and Restoration, Traditional Trends and Techniques*, BACRI, Hyderabad, India, pp. 81-86.
- 92) **Singh, M.**, 1995. A Geotechnical Note on Weathering Characteristics of Stones. IASC New Delhi, **28**: 153-160.
- 93) **Singh, M.**, 1993. Studies on weathering of kailasanatha Temple Kancheepuram. *Current Science* **62** (8): 559-565.
- 94) **Singh, M.**, 1993. Analysis and characterization of Charminar lime plaster. *Current Science* **63** (10): 760-764.
- 95) **Singh, M.**, 1992. Chemical analysis of lead coins of the Ikshwaku period (3rd and 4th century AD). *Current Science* **62** (10): 686-690.
- 96) **Singh, M.**, 1991. Studies on lime plaster of Golconda Fort. In *1st International Colloquium on role of chemistry In Archaeology*, BACRI, Hyderabad, India, pp 81-86.

Research Papers communicated for publications:

- 97) Vandana, S., **Singh, M.**, and (2018). Iron Metallurgy in Ancient India-Metallurgical Studies on Excavated Iron Artifacts (600-400 BCE) from Rajghat, Varanasi. *Journal of Mining and Metallurgy, Section B: Metallurgy*, Under Review.
- 98) Singh, V., and **Singh, M.**, (2018). Corrosion characteristics of 17th century Portuguese Cast Iron cannon from Goa, India. *Materials and Corrosion*, Under review.

8. List of Books Published

- 1) **Singh, M.** (2015). Scientific Preservation of Ajanta Murals. New Delhi: Agam kala Prakashan.
- 2) **Singh, M.** (2016). Earthen plaster support for decorative art in India. Germany: Lambert Academic Publishing.
- 3) **Singh, M.** (2017). Historical Lime plaster in India- composition and characterization. Germany: Lambert Academic Publishing.
- 4) **Singh, M.** and Lal, U.S. (2018). Conservation of Ancient Bronzes “A novel Approach”. New Delhi: National Museum Institute.
- 5) **Singh, M.** and Lal, U.S. (2018). Scientific investigations on Ancient Indian Coins and Metals. New Delhi: Agam Kala Prakashan.
- 6) **Singh, M.** and Lal, U.S. (2019). Deterioration and Conservation of Iron objects. New Delhi: National Museum Institute. Under Print.

Patents:

1. Patent application by NRLC entitled: “Anti corrosive compound for high leaded bronzes” is approved.
2. Patent application filled by NRLC entitled: “Almond Shell Ink and its preparation method thereof” is approved.
3. Patent application by NRLC entitled: “Formation of new chemical solution for in-situ brightening of altered and blackened lead pigments in miniature paintings” is under process.
4. Patent application filled by NRLC entitled: “Removal of Bats’ Excreta from Water-Soluble Wall Paintings Using Temporary Hydrophobic Coating”

Other Details

9. Articles appeared in International/National Magazines regarding my work at Ajanta Caves:

Sl. No.	Author(s)	Title of the Article	Name of the Magazine	Year
1.	Jonathan Glancey	The Ajanta Caves: Discovering lost treasure	BBC Culture, 23 rd February 2015	2015
2.	William Dalrymple	Unseen Ajanta: India’s Oldest Art Heritage retrieved from time and Decay.	Outlook, 24 th November 2014	2014
3.	William Dalrymple	Oldest paintings of Indian faces found in Ajanta:	Times of India, 6 th November 2014	2014
4.	William Dalrymple	An exciting discovery	The Hindu, 9 th November 2014	2014
5.	William Dalrymple	Fragile Legacy: The paintings of Ajanta Caves 9 and 10.	Marg: The magazine of Arts, March 2014	2014

6.	William Dalrymple	The Ajanta cave murals: 'nothing less than the birth of Indian art'	The Guardian, 15 th August 2014	2014
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10. Professional Training International:

Training	Year	Institution
15 th International course on Technology of Stone Conservation organized by ICCROM held at Venice, Italy	2003 (For 3 Months)	ICCROM, Venice, Italy

11. Professional Training National:

Training obtained	Year	Institution
4 th basic course in Geology for Chemist held by Geological Survey of India Training Institute, Bihar	1984	Geological Survey of India
4 th orientation course in Chemistry for Chemist held by Geological Survey of India Training Institute, Calcutta	1987	Geological Survey of India

12. Field of specializations:

- I. Conservation of Mural Paintings & Stone Sculptures
- II. Scientific Analysis of the Ancient Objects
- III. Improvement of Methodology used in Conservation of Ancient Objects.
- IV. Synthesis/Preparation of Conservation materials as per Ancient Techniques.

13. Professional Experiences:

37 years in the field of scientific conservation of paintings & monuments and analysis of various materials.

14. Current Position:

Director General, National Research Laboratory for Conservation of Cultural Property (NRLC), Lucknow

15. Projects:

- I. **“Revival of Ancient Hempcrete Technology and Experimental Studies towards various conservation Application of Cannabis sativa (Bhang)”** Under Ministry of Culture, Department of Conservation, National Museum Institute, Janpath, New Delhi. (2018).
- II. **“3D Documentation of Archaeological Objects from Pre-Harappan Site, Kunal, Haryana”** Under Ministry of Culture, Department of Conservation, National Museum Institute, Janpath, New Delhi. (2018)

16. Lectures:

- I. Delivered lecture on **“Bio-deterioration of painted plaster in India”** at School of Biotechnology Vidyanagari, Baramati as a Resource Person in 2008. In UGC sponsored refresher course.
- II. Delivered Lectures in **U.G.C sponsored refresher course** in the Department of Chemistry and academic staff college, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad from 2007 to till date. And also delivered lectures in Chatrapati Shivaji Maharaj Vastu Sangralaya, Mumbai, National Museum, New Delhi, India Habitat Centre, institute of archaeology, New Delhi etc.
- III. Delivered lectures at **Institute of Archaeology, ASI**, New Delhi in special lecture series on scientific conservation six-day course.
- IV. Delivered Lecture on **“Lime Technology”** at Aga Khan Trust, New Delhi and trained various conservators in lime technology. Presented paper at Indian Institution of Technology, Chennai and Indian Institute of technology, Mumbai on technology of lime plaster and Ancient Indian paintings-techniques and conservation issues, respectively.
- V. Presently acting as visiting faculty at Deccan College Post graduate and Research Institute, Pune - **“Heritage site management and Scientific Conservation course”** from the academic year 2016-17 onwards.

17. Other experiences (International collaboration, cultural exchange programme, holding seminars and workshops, exhibitions):

- I. Worked as Co-coordinator for Indo-Italian Conservation programme cave no. 17, Ajanta, India from 2005 to 2008.
 - II. As I/C Director (Science), A.S.I, Dehradun from 26/03/2010 to 15/08/2010, organized **National workshop on Archaeological Science**, 17-18 July 2010, at New Delhi under the chairmanship of the Secretary (culture)/Director General A.S.I and eminent space scientist Prof. Kasturiranjan as guest of honor.
 - III. Carried out extensive scientific conservation work of Lord Vitthal and Rukmani Idol, Pandarpur, Solapur, Goddess Mahalaxmi Idol, Kolhapur and Goddess Saptashruni Devi temple, Vani, Nashik.
18. Documentary of my work on Ajanta caves shown on **Discovery Channel**, Japanese T.V. and German news Paper's.
19. In appreciation to my work on Ajanta conservation, a book written by Prof. Walter Spink, Prof. Emeritus, Michigan University, U.S.A on **“Ajanta: History and Development” Brill publication** Volume Five is dedicated to me.