

Historicizing the crisis of scientific misconduct in Indian science

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Abstract

A flurry of discussions about plagiarism and predatory publications in recent times has brought the issue of scientific misconduct in India to the fore. The debate has framed scientific misconduct in India as a recent phenomenon. This article questions that framing, which rests on the current tendency to define and police scientific misconduct as a matter of individual behavior. Without ignoring the role of individuals, this article contextualizes their actions by calling attention to the conduct of the institutions, as well as social and political structures that are historically responsible for governing the practice of science in India since the colonial period. Scientific (mis)conduct, in other words, is here examined as a historical phenomenon borne of the interaction between individuals' aspirations and the systems that impose, measure, and reward scientific output in particular ways. Importantly, historicizing scientific misconduct in this way also underscores scientist-driven initiatives and regulatory interventions that have placed India at the leading edge of reform. With the formal establishment of the Society for Scientific Values in 1986, Indian scientists became the first national community worldwide to monitor research integrity in an institutionally organized way.

Keywords

Scientific misconduct, fraud in science, research integrity, the Society for Scientific Values, India

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Introduction

A flurry of discussions has ensued in India over practices of plagiarism and predatory publications during the last decade, bringing the issue of scientific misconduct there to the fore.¹ In July 2011 the Institute of Mathematical Sciences, Chennai, invited distinguished scientists and administrators to a workshop on “Academic Ethics . . . to discuss various forms of academic misconduct, across disciplines, and look for solutions.”² One speaker, biotechnology professor Nandula Raghuram, expressed the common view: “[t]he situation in Indian science is increasingly reaching a crisis point.”³ Scientific misconduct in India has also been the focus of significant international attention. Jeffrey Beall, who coined the term ‘predatory publishers’, maintains that predatory or counterfeit journals exploit the standard author-pays model prevalent in open-access publishing and that “perhaps nowhere are these abuses more acute than in India.”⁴ These discussions have generated two dominant narratives: (a) a Western narrative that depicts predatory journals and associated practices of scientific misconduct as a largely Indian phenomenon, which threatens to infect the West by promoting unethical behavior by scientists; (b) a national narrative within India that considers scientific misconduct a recent phenomenon. By focusing on plagiarism, falsification, and fabrication in scholarly publications, both these narratives reinforce a definition of scientific misconduct that stresses the individualization of responsibility. Scientific (mis)conduct is hereby viewed through the lens of individual research and publication practices rather than through or in conjunction with an examination of the sociopolitical contexts and institutional structures and practices that explicitly or tacitly govern the behavior of individuals. This article questions these framings and seeks to historicize the currently perceived crisis of scientific misconduct in Indian science.

What constitutes scientific misconduct? As discussed in the introduction to this special issue, it is generally identified in terms of plagiarism (reproducing content or ideas without attribution), falsification (deliberate distortion of data), and fabrication (willful data invention).⁵ However, these terms and categories have multiple historical meanings

1. Padmanabhan Balaram, “Plagiarism: A Spreading Infection,” *Current Science* 88 (2005): 1353–54; Padmanabhan Balaram, “Impactitis and Predatory Open Access,” *Current Science* 102 (2012): 1617–18.
2. The Institute of Mathematical Sciences, “Workshop on Academic Ethics, July 15–16, 2011,” 2011, <<https://www.imsc.res.in/~ethicsmeet/>> (5 November 2019).
3. K. S. Jayaraman, “Growing Scientific Misconduct Causes Concern,” *Nature India*, 18 August 2011, <<http://www.natureasia.com/en/nindia/article/10.1038/nindia.2011.120>> (5 November 2019).
4. Jeffrey Beall, “Predatory Publishers Are Corrupting Open Access,” *Nature News* 489 (2012): 179.
5. See e.g., National Science Foundation, “Responsible Conduct of Research,” *Federal Register* 74 (2009): 42126–8; Pieter J. D. Drenth, “A European Code of Conduct for Research Integrity,” 2010, <http://www.allea.org/Content/ALLEA/Scientific%20Integrity/A%20European%20Code%20of%20Conduct%20for%20Research%20Integrity_final.10.10.pdf> (5 November 2019); Tony Mayer and Nicholas Steneck (eds), *Promoting Research Integrity in a Global Environment* (Singapore: World Scientific Publishing, 2012); Daniele Fanelli, “How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data,” *PLOS ONE* 4 (2009): e5738.

that should be delineated. For example, in the United States between the 1980s and early 1990s, the term ‘fraud’ was replaced by ‘misconduct’. As molecular biologist Howard Schachman notes, “The change to ‘misconduct’ instead of ‘fraud’ was initiated and effected by lawyers and not by scientists. It was because of the legal burden of having to prove intent . . . that counsels for NSF and PHS wanted the change to misconduct.”⁶

In Indian discourse, the term ‘research integrity’ does not feature prominently, while use of the term ‘scientific misconduct’ is relatively common. Prem Nath Tiwari, an active member of India’s Society for Scientific Values (SSV) – the first organization established worldwide to monitor scientific misconduct at the national level – distinguishes two kinds of misconduct: “misconduct in research and publication, and misconduct in management of science. Plagiarism, outright fraud, fabrication of data, the omission of authorship and undue authorship, etc. come under the first group of misconduct. Under the second group come wrong appointments, wrong awards and recognitions, and wrong project funding.”⁷

In this article we borrow this broad definition and situate it historically. We aim to explicate the processes that have marked the history of professional scientific organization and practice in India, which gave rise to Tiwari’s and the SSV’s conception of scientific misconduct. We particularly note that Tiwari’s definitions go beyond the standard attention given to individual researchers’ behavior: the concept of ‘misconduct in management’, in particular, opens up the role of institutions, scientific managers, and funders to scrutiny as well. We follow Tiwari in adopting this dual focus in order to show how India’s scientific community, its historical development, and practices – including the presence and evolving character of misconduct – have been affected by its colonial heritage, postcolonial ambitions, and complexly hierarchical society. India is not unique in this respect, however. Adopting such a dual focus would provide an important analytical vista on any and all national and international contexts where research practices of questionable integrity are often hidden by current definitions and regimes that govern matters of scientific conduct.

Providing such a historical account of scientific practices matters. From a historical perspective, it is critical not to frame the debate surrounding scientific misconduct in terms of the number of instances or scale of scientific misconduct, as scientists often do by pointing out that misconduct accounts for only a small percent of the overall research enterprise globally. The point is that scientific misconduct never goes away, in part because its definition continually evolves and its existence is useful in scientists’ boundary work. A historical account of scientific practices and the contexts that have shaped them reveals continuities and specificities within which ideas about what science is and is not (that is, fraud or misconduct) are framed, but also provides the basis for analyzing how the category of misconduct performs a boundary function within and beyond scientific knowledge production spheres. It further throws light on misconduct as a component of global scientific practices, the environments that sustain it, and its multiple historical meanings.

6. Howard K. Schachman, “What Is Misconduct in Science?,” *Science* 261 (1993): 148–9, p.148.

7. “Editorial,” *SSV News and Views*, January 2006.

We employ a chronological order to analyze scientific misconduct and its historical development in India. The next section identifies historical roots and markers during the colonial era that framed scientific misconduct, while the third section presents an account of the crisis in the 1970s that forcefully brought the issue of misconduct to the surface. The fourth and fifth sections contextualize the formation of the SSV as a scientist-driven response to misconduct. The sixth section briefly contextualizes the current crisis said to center on predatory publications. The last section draws lessons from our analysis of the past and present of scientific misconduct in India.

The colonial era

Despite much contrary historical evidence, scientific misconduct is often discussed as a recent phenomenon, reflecting contemporary concerns with governing scientific output in contexts that prioritize scientometric measurement (citation scores, patents, and the like) and garnering financial support as indicators of success.⁸ As this special issue shows, a longer-term view helps show how current understandings of misconduct are partial and motivated. Recovering this history in countries such as India, however, is complicated by the need to attend to the colonial context in which modern scientific institutions and practices first evolved. We therefore briefly focus here on scientific practices in colonial India to locate the historical roots that contributed to and underpin the systemic presence of scientific misconduct. While current-day literature tends to treat scientific misconduct primarily as a matter of individual behavior, this section underscores that it cannot be understood in isolation from colonial India's emergent science system.

Metropolitan science and misconduct

George Basalla classically argued that metropolitan science might have been based on data and specimens collected in colonial settings, but it was produced in Europe and then diffused to the periphery.⁹ Historians of the *Raj*, however, have clearly demonstrated that settler scientists who traveled from Europe to India pursued their work *in situ* rather than back in Europe.¹⁰ Nonetheless, they rarely acknowledged contributions made by their Indian collaborators or assistants.¹¹ With the establishment of direct colonial rule in 1858, the educational and professional pathways that governed local engagement with Western science were formally controlled by the government, which further dictated the

8. Balaram, "Plagiarism: A Spreading Infection"; Balaram, "Impactitis and Predatory Open Access" (note 1).

9. George Basalla, "The Spread of Western Science," *Science* 156 (1967): 611–22.

10. Vinita Damodaran, "Gender, Race and Science in Twentieth-Century India: E. K. Janaki Ammal and the History of Science," *History of Science* 51 (2013): 283–307.

11. See e.g., Kapil Raj, "Circulation and the Emergence of Modern Mapping: Great Britain and Early Colonial India, 1764–1820," in Claude Markovits, Jacques Pouchepadass and Sanjay Subrahmanyam (eds), *Society and Circulation: Mobile People and Itinerant Cultures in South Asia 1750–1950* (New Delhi: Permanent Black, 2002), pp.23–54.

limits of (recognized) Indians' involvement. Colonial rule, however, depended on the supportive efforts of Indian functionaries, a number of whom adopted the cultural practices it imported, including respect for and engagement with Western science.¹² So too did elements of India's own socioeconomic elite embrace it as offering the most promising route to progress. But while India led the way in the British Empire as home to the first system of engineering schools, which fed its growing number of public works projects with domestically trained engineers, and the sons of its domestic elite received scientific educations at elite universities such as Oxford and Cambridge, this failed to open local scientific institutions and careers to advancement by talent.¹³ Even the most internationally lauded of Indian scientists faced institutional discrimination, based on a widely held view by colonial administrators that Indians "had no aptitude for the exact methods of science."¹⁴

It was in this atmosphere that, for example, Ronald Ross refused to acknowledge the contributions of Kishori Mohan Bandyopadhyay in conducting a long series of key experiments that ultimately led to Ross's 1902 Nobel Prize for discovering the malaria transmission mechanism.¹⁵ This is not to say, however, that Indians passively accepted what they increasingly viewed as an unjust system. With the establishment of the Indian Association for the Cultivation of Science (IACS) in 1876 and other associations that followed, they began organizing themselves to promote more active participation and control in scientific research and education.¹⁶ While no official structures were in place to charge Ross formally with misconduct for ignoring the contributions of Bandyopadhyay, there was sufficient outcry among Bandyopadhyay's supporters for Lord Curzon (Viceroy of India) to arrange that he be awarded King Edward VII's Gold Medal.

One might see Bandyopadhyay's award, however, as the exception that proved the rule of institutionalized discrimination, which framed what was considered (un)acceptable scientific conduct and by whom. But as the following section explores, the challenges Indians faced in gaining recognition and establishing scientific careers were not

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12. Gyan Prakash, *Another Reason: Science and the Imagination of Modern India* (Princeton: Princeton University Press, 1999).
 13. For pre-1858 see Satpal Sangwan, "Science Education in India under Colonial Constraints, 1792–1857," *Oxford Review of Education* 16 (1990): 81–95. For post-1858 see e.g., David Arnold, *Science, Technology and Medicine in Colonial India* (Cambridge: Cambridge University Press, 2000), pp.19–56; Zaheer Baber, "Colonizing Nature: Scientific Knowledge, Colonial Power and the Incorporation of India into the Modern World-System," *British Journal of Sociology* 52 (2001): 37–58, pp.50–2; Zaheer Baber, *The Science of Empire: Scientific Knowledge, Civilization, and Colonial Rule in India* (Albany: SUNY Press, 1996), pp.228–9.
 14. Deepak Kumar, "Racial Discrimination and Science in Nineteenth Century India," *The Indian Economic and Social History Review* 19 (1982): 63–82; Baber, *Science of Empire*, pp.228–9, including quotation from colonial administrator Patrick Geddes (note 13).
 15. Uli Beisel and Christophe Boëte, "The Flying Public Health Tool: Genetically Modified Mosquitoes and Malaria Control," *Science as Culture* 22 (2013): 38–60, p.56; Dhruvajyoti Chattopadhyay, "The Unsung Indian behind Ronald Ross's Success," *Science Reporter* 52 (2015): 46–8.
 16. Sumathi Ramanath, *Indian Association for the Cultivation of Science: Mahendralal Sircar and his Science, Morality and Nationalism* (Ph.D. Dissertation, University of Texas at Dallas, 2018).

only the result of prejudice on the part of transplanted Europeans. India's scientific institutions, including its universities, were quite hierarchical and regionally oriented, which both reflected and fed on the complex character of Indian society more generally.

Indian scientific community and misconduct

Fully professionalized scientific communities comprised of native Indian scientists engaged in basic or fundamental research emerged by the 1920s, by which time Indians were increasingly contributing to the global fund of scientific discovery.¹⁷ Subsequent claims about the existence of a "healthy scientific environment" in India between the late nineteenth and early twentieth century nonetheless call for historical analysis. Looking back on this era, scientists and amateur historians Pushpa Bhargava and Chandana Chakrabarti assert, "By and large . . . our scientific community's commitment to values has progressively decreased since Independence."¹⁸ But as Shiv Visvanathan notes, one of the ironies is that, while the claim that science is about objectivity and truth is often repeated in Indian science, hagiographies are rampant.¹⁹ We focus here on the period from the 1900s to 1950, to probe the then-evolving Indian science system and identify factors that structured social interactions between Indian scientists and the scientific community that either condoned or embedded practices of scientific misconduct.

The organization of the emerging Indian scientific community (actually a conglomeration of regional, disciplinary, and institutional communities) was shaped by hierarchy and authoritarianism, framed on one side by relations with British colonial counterparts and the international community of science, which remained dominated by European institutions and personalities, and on the other side by India's social (caste), gender, religious, and regional divisions.²⁰ While it is certainly important to recognize "the active role that Indians . . . played in the institutionalization of Western science in colonial India," we must also recognize that the colonial relations that had defined the Ross and Bandyopadhyay episode found a variety of corollaries among Indian scientists.²¹

This complex interplay is nicely illustrated by the biography of astrophysicist Meghnad Saha, who was born into a low caste family in East Bengal (present-day Bangladesh) in 1893 but managed to gain election as a Fellow of the Royal Society (FRS) in 1927 and was twice nominated for the Nobel Prize. His contemporary Satyendra Nath Bose (known for his work on Bose–Einstein statistics), who was born into a high caste family in Calcutta, recalled their student days together: "We were like animals those days. . . Meghnad and I sat together in all the same classes and yet I thought

17. Venni V. Krishna, "The Emergence of the Indian Scientific Community," *Sociological Bulletin* 40 (1991): 89–107.

18. Pushpa M. Bhargava and Chandana Chakrabarti, *The Saga of Indian Science Since Independence: In a Nutshell* (Hyderabad: Universities Press, 2003), p.110.

19. Shiv Visvanathan, "The Tragedy of K. S. Krishnan: A Sociological Fable," *Current Science* 75 (1998): 1272–5.

20. Abha Sur, *Dispersed Radiance: Caste, Gender, and Modern Science in India* (New Delhi: Navayana, 2011).

21. Baber, *Science of Empire*, p.237 (note 13).

nothing of the fact that in the Student hostel Meghnad had to eat separately as he was not allowed to eat with us because of his 'low' caste."²² Saha himself recalled how his move to teach and research at the newly established Science College of Calcutta University after graduating – punctuated by a productive research sojourn in London and Berlin in 1920–1 – turned sour because of “the persistent ill will and hostility of CV Raman,” an upper-caste Brahmin who was named Palit Professor of Physics there in 1917 and would go on to win India’s first Nobel Prize in 1930 for the research he led on the scattering of light.²³ It drove Saha to accept a professorship at the more peripheral and less well-equipped Allahabad University and a subsequent career that was accentuated more by organization and administration work than by primary research.

As a young man, Raman had himself experienced discrimination within the British-dominated civil service before opting for an academic career. Having made the choice, however, his research topic, scientific acumen, and social connections led to his receiving nominations for the 1930 Nobel Prize from ten European colleagues, including Louis de Broglie, Ernest Rutherford, and Niels Bohr. For comparison, Saha – whose research on the thermal ionization of elements was regarded by the Nobel Committee as more applied than constituting a discovery – was only nominated for the same prize by two Indians.²⁴ This is not to say that Saha lacked international recognition for his research. Details of his early career, however, were not well known outside of India, leading many to assume that he did his most significant research under the tutelage of Alfred Fowler at Imperial College, London, rather than on his own while teaching in Calcutta. We see, then, a man who – despite becoming FRS and forging a high-profile career as journal editor, institutional organizer, head of what became known as the Saha Institute of Nuclear Physics, and current-day icon of Indian science – felt himself caught between the institutionalized prejudices of India’s caste-bound and regionalist hierarchies on one side and the cultural prejudices of European colleagues on the other.²⁵ That is, the practices of conferring recognition in Indian science were developed during the colonial period, in a context where both British rulers and elite Indians could only conceive of certain kinds of people as capable of doing intellectual work and worthy of receiving credit for it. Though that society nominally disappeared in 1947, it continued to inform practices of credit in Indian science long after.

It might be argued that distinguishing between prejudice and misconduct is more a matter of moral than historical judgment. No matter how one chooses to evaluate this, cases in which individuals were charged with misconduct can certainly be identified

22. Sur, *Dispersed Radiance*, p.234 (note 20). Saha was apparently forced out of his student hostel due to his low social status. Asha Gopinathan, “Influenced by Caste and Gender,” *Science* 335 (2012): 1044.

23. Atri Mukhopadhyay, “From Atoms to Stars: Meghnad Saha (1893–1956),” *Indian Journal of History of Science* 53 (2018): 81–7, p.86.

24. Rajinder Singh and Falk Riess, “C.V. Raman, M.N. Saha and the Nobel Prize for the Year 1930,” *Indian Journal of History of Science* 34 (1999): 61–75. The article interestingly contrasts Raman’s and Saha’s correspondence with Niels Bohr, in which they each broached the subject of receiving a Nobel Prize nomination.

25. Mukhopadhyay, “From Atoms to Stars” (note 23).

– cases that gain added meaning when set within this broader context. Consider the court case filed by the psychologist and philosopher Jadunath Sinha in the High Court of Calcutta against Sarvepalli Radhakrishnan for copyright infringement and “literary piracy.” Radhakrishnan, who later became India’s second president, was then a faculty member of the Calcutta University philosophy department and examiner of Sinha’s thesis. In the summer of 1929, Radhakrishnan responded with a libel suit against Sinha. Although who plagiarized whom remains unclear since the cases were settled out of court, K. Satchidananda Murty and Ashok Vohra argue that this episode was born out of resentment held by intellectuals in Bengal against the appointment of a non-Bengali (Radhakrishnan) to the prestigious chair of philosophy at Calcutta University.²⁶

One can also turn to the career of Jagadish Chandra Bose, first known for his work that undergirded the development of radio communication, for two contrasting cases. The first stems from Bose’s move from the field of physics to plant physiology as part of his experimental project to demonstrate that the response of inorganic matter to electrical stimuli “foreshadows” that seen in plants and animals. In 1902 Bose sought to publish a well-received paper he had delivered at the Linnean Society, which quickly led to a mounting priority dispute with one of his British colleagues at the Royal Society, Augustus Waller, regarding the discovery of “vegetable electricity.” Both publicly and privately, each accused the other of plagiarism and gross misconduct.²⁷

The second case involves Bose, not as (perceived) target, but as either guilty of prejudice and misconduct himself or of fostering misconduct in those who worked under him. As discussed by Ashis Nandy, East Bengali job applicants received preferential treatment from Bose at the research institute he established in Calcutta and named after himself in 1917. Apparently, he only trusted those who hailed from his own native region as sufficiently dedicated to his institute and its goals. So too are we told of Bose’s growing authoritarianism, which cowed underlings who engaged in research to support his views in the field of plant physiology. To quote Nandy, “he began to stretch his experimental results and force his associates to do the same,” to which “nobody publicly protested.”²⁸ Given how controversial Bose’s plant physiology work became, based on his claim that his experiments demonstrated the continuity between inorganic matter, plant, and animal life, some contemporaries sought extra-scientific explanations for his continued power and influence, arguing that he maintained his position not by pursuing the truth but by courting the support of political benefactors.²⁹

But in such a politicized and divided environment, what else might one be expected to do? If we return to the ongoing strife between Raman and Saha, which marked much of Indian science’s faction-ridden institutional history during the 1930s and into the 1940s, the search for and mobilization of alliances both within and beyond the scientific

26. K. Satchidananda Murty and Ashok Vohra, *Radhakrishnan: His Life and Ideas* (Albany: SUNY Press, 1990), pp.30–3.

27. Subrata Dasgupta, “Jagadis Bose, Augustus Waller and the Discovery of ‘Vegetable Electricity’,” *Notes and Records of the Royal Society* 52 (1998): 307–22.

28. Ashis Nandy, *Alternative Sciences: Creativity and Authenticity in Two Indian Scientists* (New Delhi: Oxford University Press, 2001), p.58.

29. *Ibid.*, pp.50–5.

community appear as a recurring leitmotif. As recounted by Robert S. Anderson, this manifested itself in academic appointments, the establishment of three academies of science claiming to represent the national community, and control of India's domestic outlets for scientific publication. The physicist Max Born, who spent time in 1935 with Raman at the Indian Institute of Science in Bangalore, observed this divisive discord first-hand. In a letter he subsequently wrote to Ernest Rutherford, he described a situation in which the personal enmity between Saha and Raman was intimately interwoven with events on a larger, institutional scale, revealing a mix of personal, professional, and regional jealousies that weighed heavily on the practice and progress of Indian science.³⁰

One example, which resonates strongly with this article's advocacy of situating the examination of research integrity in its specific institutional contexts, is the fact that Raman – who had been instrumental in the establishment of the Indian Academy of Sciences in 1934 – took control of its *Proceedings*, using it largely as a publication outlet for his research group and theories advocated by him.³¹ Crucially, this indicates how matters of integrity can actually reach beyond institutional politics and career development to affect the content of disciplinary development, by emphasizing some topics, methods, and interpretations over others.³² Raman would not countenance, for example, content that supported Born's perspective over his when the two became embroiled in a public debate about lattice dynamics (the vibrations of atoms within crystals).³³ This led him to ignore multiple requests from Rudolf Peierls, a former student of Werner Heisenberg and Wolfgang Pauli who played a major role in the Manhattan project, to publicize his mathematical proof supporting Born's theory. Only after the nationally eminent physicist Daulat Singh Kothari intervened did it finally appear in the *Proceedings* of the Indian Academy of Sciences in 1953.³⁴

Though institutional concerns with scientific misconduct and how to police research integrity are of more recent vintage, the episodes analyzed in this section not only confirm the existence of practices that characterize various sorts of misconduct but also point to the historical roots and markers that either condoned or embedded them. Colonial attitudes that crystallized in hierarchical institutions and discriminatory practices under the British, the importation of existing social hierarchies and a culture of authoritarianism into Indian scientific communities, interregional contentions, and the politicization of scientific milieux created a science system in the pre-independence era that framed and facilitated misconduct in both the management and pursuit of science. In the next

30. Max Born to Ernest Rutherford, 22 October 1936, Rutherford Papers, University Library, Cambridge. Quoted in Robert S. Anderson, *Nucleus and Nation: Scientists, International Networks, and Power in India* (Chicago: University of Chicago Press, 2010), pp.72–3.

31. *Ibid.*, p.74.

32. Thomas Kuhn might be said to foreshadow this point by linking scientific content and practice during periods of 'normal science' to the norms embodied in a community's dominant paradigm. Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962).

33. Anderson, *Nucleus and Nation*, pp.74–5 (note 30).

34. Sur, *Dispersed Radiances*, p.167 (note 20).

section, we argue that these historical developments continued to inform scientific practice in post-independence India.

The crisis in the 1970s

The first decades of post-independence India were marked by the fervor of nation-building, as political leaders and policymakers embraced the trope of development and sought the expansion of science and technology organizations. However, the inherited colonial institutional structures and scaling-up of scientific activities soon revealed internal contradictions. By the late 1960s, questions were raised about the image of idyllic scientific practices. On a national scale, political leaders wanted the state's investments to pay off, especially in terms of industrial development. Indira Gandhi directed her ministers to seek more pronounced results along these lines, but also concerned herself with what she viewed as the "undemocratic practices" at work in Indian research laboratories.³⁵ That others shared her concerns is evidenced by a comment made by the distinguished applied statistician P. C. Mahalanobis to Patrick Blackett in 1971: "Indian science is in a state of confusion. . . The immediate future does not look too bright . . . because we still remain *a structured hierarchical system* [emphasis added]."³⁶ In turn, the issue of misconduct also rose to the surface, spurred especially by the suicide of an Indian agricultural scientist, Vinod Shah, and the subsequent formation of the SSV in 1986. Here we map out the crisis of the 1970s that generated commentary and reflection about the very character of India's research culture, including its values, integrity, and ethics.

Protest by suicide

A biographical memoir of Autar Singh Paintal (FRS), founding president of the SSV, hints at how the issue of scientific misconduct attracted his serious attention: "In the mid-nineteen seventies, when various cases of scientific misconduct in India began to be written about in science magazines such as the 'New Scientist', he became acutely concerned about the obviously declining standards of scientific ethics among Indian scientists."³⁷ The reference here is to the case of data falsification committed by geneticist, agricultural scientist, and key figure in India's green revolution, Mankombu Sambasivan Swaminathan. Since October 1967, his research group at the Indian Agricultural Research Institute (IARI), New Delhi, had consistently made false claims about a new strain of dwarf wheat, Sharbati Sonora.³⁸ American and Mexican scientists refuted their claims in 1968 and 1970, but Swaminathan's group reiterated them in a 1971 publication.³⁹ Soon thereafter, Swaminathan was appointed director-general of the Indian Council of Agricultural Research (ICAR) and the entire episode was buried.

35. Anderson, *Nucleus and Nation* (note 30).

36. *Ibid.*, p.361.

37. Ashima Anand, "Autar Singh Paintal (24 September 1925–21 December 2004)," *Biographical Memoirs of Fellows of Indian National Science Academy* 29 (2006): 145–68.

38. "Top Food Scientist Published False Data," *New Scientist*, 7 November 1974.

39. *Ibid.* Swaminathan's group reported these claims in the *Food Industries Journal* (November, 1967) and *Plant Foods for Human Nutrition* (January 1971) published by Pergamon, with

But in May 1972 India's Parliament witnessed a tumultuous discussion over reports about the suicide of an IARI agronomist, Vinod H. Shah, who complained about ICAR promotion policies in his suicide note.⁴⁰ The note further pointed to "unscientific data" and "exaggerated claims" put forth by the ICAR, including the case of the Sharbati Sonora wheat strain.⁴¹ The government's response was to appoint an official inquiry committee whose final report concluded that the claims made regarding Sharbati Sonora were not substantiated; Swaminathan and his group had generated "unscientific data" and made "exaggerated claims."⁴² While Shah's protest by suicide, as *Nature* termed it, thereby brought the IARI case to public attention, Swaminathan's influence succeeded in relegating it to a minor affair.⁴³

Exaggerated claims and the system

What specific conditions gave rise to or sustained practices of exaggerated claim-making at that time? We can begin to answer this question by turning to a seminar organized in the wake of Shah's suicide by the Society for Parliamentary Studies in New Delhi on 3 June 1972, where scientists and science administrators discussed grievances about working conditions in research laboratories and institutions. Recommendations included minimizing departmental promotion committees' discretion in promoting scientists, an upward revision of scientists' meager salaries, and freedom to publish papers in one's own name.⁴⁴ As we have already discussed, the problems to which these recommendations were meant to be a solution have their roots in the colonial era; that is to say, the transition from pre- to post-independence science in India did not entail a radical break in institutional practices.

The seminar proceedings' introduction emphasizes low salary scales, explaining that "over 73 percent of the scientific personnel draw a total pay of less than Rs. 500 a month. This means that they are treated as no better than stenographers and worse than sections officers."⁴⁵ Even though the newly independent nation had limited resources to support research activities, not least as a legacy of colonial rule's rapacity, the disparity in salaries was also inherited from colonial structures. During colonial times native scientists were not only discriminated against in the recruitment and promotion process, but the emoluments they received were less than half of what settler scientists earned.⁴⁶ It remained common for entry-level scientific personnel to receive salaries equivalent to

almost identical content. However, archives or index of these defunct obscure journals are no longer available. See Joseph Hanlon, "Feedback: Top Food Scientist Published False Data," *New Scientist* (7 November 1974): 436–7.

40. "Dr Vinod Shah's Protest by Suicide," *Nature* 237 (1972): 130.

41. "Top Food Scientist Published False Data" (note 38).

42. *Ibid.*

43. "How Not to Run Research Councils (Indian Style)," *Nature* 237 (1972): 123.

44. Jagannath P. Chawla and A. P. Jain (eds), *Whither Indian Science?* (New Delhi: S. Chand, 1973).

45. *Ibid.*, p.ix.

46. Krishna, "The Emergence" (note 17).

those of stenographers. Consequently, even in the 1970s, the only way a scientist could achieve a respectable salary was through promotion.

How were practices of exaggerated claim-making and low salaries linked? A simple answer is the deeply rooted hierarchy and authoritarianism in scientific organizations and culture. Commenting on Shah's suicide, a *Nature* article noted, "Nobody will dispute that younger scientists in Indian laboratories are frequently kept under the thumbs of their more senior colleagues,"⁴⁷ Young scientists were at the mercy of senior researchers, who wielded control over their careers. How did these organizational structures affect research practices? At the June 1972 seminar, R. Vishwanathan argued that: "directors of research institutions should not tag on their names to the work actually done by their associates. . . This *misappropriation of other people's work* [emphasis added] is also one reason why junior scientists think that their future will not be made unless they too can reach the top of the administrative ladder."⁴⁸ Deeply rooted authoritarianism enabled by powerful hierarchies sustained practices of unethical authorship leading to "misappropriation of other people's work," a practice that still continues.⁴⁹

The ICAR inquiry report submitted in 1973, a second important resource of that time, describes these linkages:

There are many junior scientists in the IARI who, rightly or wrongly, feel that they are not free to publish a scientific finding because it does not suit somebody higher up, or that in fact *unscientific data* are being passed on to higher authorities *in return for favours and promises*. The existence of this feeling is most regrettable because it creates the conditions for breeding of *unscientific behaviour and practices* if they do not already exist [emphasis added].⁵⁰

How were such "unscientific behaviour and practices" sustained? In his presentation at the June 1972 seminar, J. C. Maheshwari highlighted how the system of writing confidential reports had proved disastrous for the scientific community. Having the unit or department head write an annual confidential report for each employee, a practice inherited from colonial institutions, was a standard appraisal system in the Indian state bureaucracy. Senior scientists thereby gained enormous control over the careers of entry-level scientists. The seminar proceedings note: "It is significant that one of the allegations of Dr. Shah in his suicide note was that a lot of information fed to the Director-General was tailored to . . . earn good confidential reports from the Directors."⁵¹ The practice of exaggerated claim-making through "tailored information" was therefore closely linked with recruitment and promotion methods as well as the hierarchical organization structure of

47. "How Not to Run Research Councils" (note 43).

48. Chawla and Jain (eds), *Whither Indian Science?*, p.x (note 44).

49. T. S. Gopi Rethinraj and Shoibal Chakravarty, "Unethical Authorship Is Research Misconduct," NIAS Bengaluru, 6 August 2017, <<https://sc-lab.org/pdf/2017-research-misconduct.pdf>> (5 November 2019).

50. Manu L. Kothari, *Self-Immolation of a Scientist: A Memoir to Dr. Vinod H. Shah, M.Sc., Ph.D.* (Ahmedabad: J. H. Shah, 1973), p.250; "Top Food Scientist Published False Data" (note 38).

51. Chawla and Jain (eds), *Whither Indian Science?*, p.xi (note 44).

research institutions. “Unscientific behaviour and practices” of individual scientists were partly an effect produced by a system marked by continuity with pre-independence structures and practices.

Global context and expanse of unscientific practices

Why does this episode indicate a crisis rather than an aberration or problem unique to Indian science? While the case revolves around institutions affiliated with ICAR, many recognized the problem as widespread across scientific institutions in India for at least the previous two decades.⁵² Speaking for himself, K. R. Bhattacharya of the Council of Scientific and Industrial Research (CSIR), the apex body that regulated twenty-three national laboratories, argued, “It is our contention that, while inequity and lack of fair play are truly rampant in the science organisations, they are not formal ‘irregularities’. . . [T]hey are rooted in the very rules and regulations governing the organisations’ personnel policy.”⁵³ Anecdotal evidence from proceedings of the June 1972 seminar further suggests that such experiences were shared across institutions and disciplines.⁵⁴ Since participants and speakers at the seminar represented different disciplines and public institutions and worked at various levels as scientists and administrators, the fact that they all attempted to address practices breeding “unscientific behaviour” signifies the presence of similar issues across research institutions. This is made even more clear by the ICAR inquiry report of 1973, which noted that “unfortunately, the phenomenon is not confined to ICAR and its institutions. Barring minor exceptions, it pervades the entire scientific and academic community in the country.”⁵⁵ Shah’s suicide stirred debate among Indian scientists, revealing contours of the problem and crisis they faced.

The problem that afflicted Indian science was, of course, not unique to India. In the 1970s and 1980s, university after university in the United States and Europe learned about cases involving scientific misconduct.⁵⁶ However, as recorded by the Gore Committee that investigated the matter on behalf of the US House of Representatives in 1981, what was lacking was the scientific community’s acknowledgment of scientific misconduct as a systemic problem that was not “self-correcting” and their sense of public responsibility to root out fraud.⁵⁷ In contrast, the debates and contestations initiated in India in the 1970s

52. K. R. Bhattacharya, “A Rational System of Recruitment and Promotion for Scientific Personnel,” *Economic and Political Weekly* 8 (1973): 31–6.

53. *Ibid.*, p.31.

54. Chawla and Jain (eds), *Whither Indian Science?* (note 44).

55. Kothari, *Self-Immolation of a Scientist*, p.250 (note 50).

56. Paroma Basu, “Where Are They Now?,” *Nature Medicine* 12 (2006): 492–3; Nicholas H. Steneck, “Research Universities and Scientific Misconduct: History, Policies, and the Future,” *The Journal of Higher Education* 65 (1994): 310–30.

57. Steneck, “Research Universities,” p.313 (note 56); Larry Altman and Laurie Melcher, “Fraud in Science,” *British Medical Journal (Clinical Research Ed.)* 286 (1983): 2003–6, 2005; Raju Tamot, Diana Arsenieva and David E. Wright, “The Emergence of the Responsible Conduct of Research (RCR) in PHS Policy and Practice,” *Accountability in Research* 20 (2013): 349–68.

show an earlier acceptance of “unscientific behaviour and practices” as a matter of concern. In the following section, we trace attempts within India to address this issue.

The Society for Scientific Values (SSV)

As mentioned in the section *Metropolitan science and misconduct*, the IACS was established in 1876 to combat unfair treatment of Indians at the hands of the colonial science system and their settler-scientist colleagues. The organization’s history, however, includes its transformation under Raman by the 1920s–30s into a home for precisely the kind of partisan activities that made institutional misconduct in matters of hiring and promotion so pervasive. The crisis in the 1970s engendered commentary and reflection anew among scientists in India, leading to the establishment of a new organization – the first of its kind globally. We elaborate here on the historical processes that led to the formation of the SSV, which initiated and has sustained both a discourse and action against scientific misconduct in India.

Early response and setback

Almost a year before Shah’s suicide, a group of young scientists had unsuccessfully questioned ongoing practices at the IARI. K. R. Bhattacharya, a CSIR scientist, detailed their efforts in an article in *Science Today*, an important resource of that time.

The IARI Branch of the Association of Scientific Workers of India brought out a bulletin called *Young Scientist* in July 1971. (The issue was dated June 1971 and was the first and the last.) In an open challenge ‘Agricultural Research: Claims versus Realities’—the following points were made: (i) Scientific claims should be discussed in scientific journals and forums, and not over publicity media; (ii) Some of the claims of success made by the IARI were tenuous . . . (iv) IARI scientists claimed to have ‘discovered’ Sharbati Sonora, a mutant wheat variety, whose protein and lysine contents were said to be many times that of the normal variety. But the report of the International Maize and Wheat Improvement Centre in Mexico (CIM-MTT News, July-Aug. 1969) questioned the validity of this claim. . . The article was unsigned. Soon the IARI clamped down on the Association with full administrative pressure. Official memos were addressed to each member of the journal’s editorial board in the form of a printed declaration to be filled in by him stating whether he was/was not responsible for the authorship of the said article. Most backed out and the protest as well as the *Young Scientist* floundered.⁵⁸

This excerpt underscores the continued survival of colonially rooted, authoritarian organizational structures. Speaking truth to power had consequences, even in a scientific institution. Concurrently, “unscientific behaviour and practices” ensured favors to those who kowtowed before authorities. The system, in other words, was conducive to sustaining “unscientific behaviour and practices.” Though Parliament intervened, the crisis was relegated to a corner – perhaps due to the turbulent political times in the 1970s, when India was at war, reeling from the oil crisis and experiencing an existential crisis in the form of a state of emergency.

58. Kothari, *Self-Immolation of a Scientist*, pp.257–8 (note 50).

In fact, Indian science in the 1970s was deeply entangled with this political turmoil. Since independence, the country's political leadership had embraced science as a central feature of their modernist vision, calling scientific institutions the state's new 'temples'. Heavy investment in science initially helped the state legitimate its political agendas, creating protected spaces for science while granting it autonomy to police its own affairs.⁵⁹ As attention on the country's vastly impoverished population, inequitable access to resources, and corruption in political, institutional, and business sectors grew in Parliament, the media, and public discussion during the 1970s, increased scrutiny was – by extension – also directed at the opaque workings of Indian science, its institutional settings, and management. As a result, “[n]o longer was ‘Science’ the New Deity, nor could it easily feign a distance from technology. If its character, its contradictions, and its linkages to power were being ruthlessly exposed, its ‘universality’ and purported ‘neutrality’ too came under serious scrutiny.”⁶⁰ In this wider context of the real and perceived crises of Indian society in the 1970s, it is not surprising that some members of the Indian scientific community initiated a debate on “unscientific behaviour and practices.” This ensured that even after the *Young Scientist* bulletin setback, discussions around the crisis did not die down, creating a basis for the formation of the SSV.

Formation of the SSV in the 1980s

In April 1984 *Nature* published a special section on science in India.⁶¹ The report noted that scientists' appointment and promotion were largely influenced by qualifications on paper and publication records, observing that the move from subjective criteria to a seemingly objective assessment was in response to various controversies and court cases. However, as the number of journal publications became an important criterion, “recycling old ideas in new papers is a constant temptation.”⁶² There was, however, no avenue available to question these practices, nor was any regulatory regime introduced. The report concluded, “Out-and-out false claims are commonly suspected but rarely investigated seriously.”⁶³ A section of the Indian scientific community had long been debating this issue and in 1984 came together to establish the SSV. Prem Nath Tiwari, founding secretary, described the backdrop to the society's formation in the early 1980s:

Some of us working in Delhi, concerned with the breach of ethics and norms of teaching, research and management in many scientific institutions of the country formed a group in 1981 to promote integrity, objectivity and ethical value in pursuit of science. . . We were looking for

59. Itty Abraham, *The Making of the Indian Atomic Bomb: Science, Secrecy, and the Postcolonial State* (London: Zed Books, 1998); Chandra Mukerji, *A Fragile Power: Scientists and the State* (Princeton: Princeton University Press, 2014).

60. Radhika Krishnan, “From Machinofacture to Manufacture: Changing Contours of the Science and Technology Discourse in the 1970s and 1980s in India,” *Perspective in Indian Development – New Series* No. 52 (New Delhi: NMML Occasional Paper, 2015).

61. John Maddox and Vera Rich, “Excellence in the Midst of Poverty,” *Nature* 308 (1984): 581–600.

62. *Ibid.*, p.583.

63. *Ibid.*

a well-known scientist of high integrity to lead us. We approached Dr. A. N. Verma, the then Director, NPL who advised us to meet Dr. A. S. Paintal the then Director, Patel Chest Institute, Delhi, a highly reputed scientist known for integrity and outspokenness in scientific matters.⁶⁴

Among the specific cases of ethics breaches hinted at by Tiwari were the IARI cases.⁶⁵ The group's search for a well-known scientist to lead it points to the need to prevent scientists occupying high positions quashing its effort and to avoid a reoccurrence of the *Young Scientist* episode. After Autar Singh Paintal, an FRS and director of a research institution, accepted the leadership position, the group proposed establishing a society at its 1984 meeting. Because India already had three independent science academies, a circular detailing the necessity and justifications for its formation was dispatched to several Indian scientists in order to gauge whether the community would support this new collective.⁶⁶

The circular suggested that underachievement of post-independence Indian science was due to the lack of a healthy scientific environment. But what constitutes a 'healthy scientific environment'? The circular quoted British mathematician Jacob Bronowski:

They do not make wild claims, they do not cheat, they do not try to persuade at any cost, they appeal neither to prejudice nor to authority, they are often frank about their ignorance, their disputes are fairly decorous, they do not confuse what is being argued with race, politics, sex or age, they listen patiently to the young and to the old.⁶⁷

The circular further asserted that, barring exceptions, the set of values that characterizes a healthy scientific environment had not taken root in the Indian scientific community. It was thus quite audacious in claiming that Indian science was plagued by "prejudices, bureaucratic formalisms, dishonesty, propaganda of unsubstantiated research claims, suppression of dissent, showmanship, sycophancy, political manipulation and manoeuvring, etc."⁶⁸

The circular was enthusiastically received, and an interim executive council laid down criteria for enrolling fellows. The criteria stipulated that a prospective member "should have allowed his name to appear as an author in only those publications in which he was actively involved . . . He should never have plagiarised, or made false claims, or indulged in or encouraged any kind of unethical or dishonest activity in science."⁶⁹ These guidelines suggest that the SSV touchstone and metric of honesty were strongly linked to conduct relating to scientific publication. Through community nomination, 107 scientists became founding members. On 18 August 1986, the 'Society for

64. "Dr. A. S. Paintal – A Memoir," *SSV News and Views*, August 2005.

65. "Creating Healthy Environment for Scientific Research," *SSV News and Views*, January 2006.

66. The Society for Scientific Values, "Society for Scientific Values," <<http://scientificvalues.org/society.html>> (5 November 2019).

67. Ibid.

68. Ibid.

69. The Society for Scientific Values, "Society for Scientific Values – Introduction," <<http://scientificvalues.org/intro.html>> (5 November 2019).

Scientific Values' was formally registered under the Societies Registration Act in Delhi. In its April 1987 issue, *Nature* took notice of this extraordinary movement.⁷⁰ As Nandula Raghuram, a founding member of the SSV, notes, "Unlike the scientific community in many Western countries that did not mount an organized response to misconduct till their governments intervened and established offices of research integrity in the 1990s, Indian scientists voluntarily founded SSV way back in 1986."⁷¹ Formation of the SSV was a concrete historical outcome of the crisis in the 1970s. In contrast to self-congratulatory Western narratives about fighting fraud from the forefront, this historical account reveals that India was at the leading edge of reform, well in advance of most Western countries.

The SSV as a repository

The primary objective of the SSV is "to promote integrity, objectivity and ethical values in the pursuit of science."⁷² A central activity of the society is to investigate the cases of scientific misconduct brought to its notice by whistle-blowers and to publicly 'name and shame' those found guilty. Since March 1993, its biannual bulletin and newsletter "News and Views" have provided updates on various cases as well as articles relevant to its objectives. From November 2002, the SSV newsletter and proceedings were made available online. Years before "Retraction Watch" (an American-based blog launched in 2010), the SSV established a similar platform for India.⁷³ It continues to provide a case repository and to examine the evolving issue of scientific misconduct in India.

By opening up discussion on scientific misconduct in India through various documented cases, which helps combat the hagiographical account of scientific practices in India, the SSV became the country's 'court of last resort' in matters involving misconduct.⁷⁴ The first case it took up was against C. N. R. Rao (FRS) for the "use of wrong means to claim priority," which underscored the temporality of publication as one aspect of misconduct.⁷⁵ In coordination with journal editors, Rao's group had expedited the publication of four articles in a frontier research area (high-temperature superconductivity), though manuscripts were actually submitted well after the journals' formal issue dates.

70. K. S. Jayaraman, "Healthy Scientific Environment Promoted by Society in India," *Nature* 326 (1987): 535.

71. Nandula Raghuram, "The Pleasure of Excellence-Led Growth and the Pain of Enforcing Publishing Ethics: The Experience of PMBP," *Physiology and Molecular Biology of Plants* 23 (2017): 1–3.

72. The Society for Scientific Values, "Society for Scientific Values – Aims & Objectives," <<http://scientificvalues.org/aims.html>> (5 November 2019).

73. Retraction Watch, "Home," <<https://retractionwatch.com>> (5 November 2019).

74. Ashima Anand, "Society for Scientific Values: A Movement to Promote Ethics in the Conduct of Science," in Tony Mayer and Nicholas Steneck (eds), *Promoting Research Integrity in a Global Environment* (Singapore: World Scientific, 2012), 177–80.

75. The Society for Scientific Values, "Achievements and Highlights," November 2002, <<http://www.scientificvalues.org/newsnovember2002.html>> (5 November 2019).

As it pursued its domestic agenda, the SSV also gained international recognition and support. Following an interview in *Science* of Australian paleontologist John Talent, who was responsible for uncovering the extensive fraud perpetrated by Vishwa Jit Gupta, a case which he equated with the ‘Piltdown Man’ episode and described as the “greatest paleontological fraud of all time,” Australian scientists urged that investigations be facilitated by “a neutral body such as Society for Scientific Values.”⁷⁶ In the last decade, the society publicly challenged the exoneration of Gopal Kundu by a government-appointed committee in a data falsification case.⁷⁷ It also transparently investigated a case of plagiarism against one of its members, Raghunath Mashelkar.⁷⁸ Because the SSV has no formal regulatory power, however, its concerns have often been neglected. As Raghuram notes: “The biggest problem in Indian science . . . is not that misconduct happens but the manner in which institutional management deals with it. . . Most employers refuse to even respond when contacted, leave alone take action against the person.”⁷⁹ Nonetheless, the SSV has spearheaded public discussion about scientific misconduct over the last three decades, involving both publication and science management misconduct. Not only has the organization forcefully diagnosed the problem, it continues to advocate remedial actions. Thanks to the SSV, scientific misconduct in India is visible.⁸⁰

The current crisis

In light of the historical analysis presented, how does one situate the current crisis? The contemporary debate on scientific misconduct is broadly anchored in recent developments such as the rise of predatory publications. But how did this phenomenon grow to such a scale and how has India provided fertile ground for such publication practices?

The phenomenon is in part a response to what Mario Biagioli and Alexandra Lippman describe as the recent merging of a ‘publish or perish’ culture with practices associated with ‘impact or perish’, characterized by an unreflective adoption of global metrics for science management that substitute the ‘impact’ of individual publications and scholars for a measure of their quality and inform international rankings of institutions.⁸¹ In the last decade, the University Grants Commission (UGC), India’s apex regulator of higher

76. Roger Lewin, “The Case of the ‘Misplaced’ Fossils: A Prominent Australian Scientist Has Examined Two Decades of Work on Ancient Himalayan Geology and Alleges It May Be the Greatest Paleontological Fraud of All Time,” *Science* 244 (1989): 277–9.

77. The Society for Scientific Values, “Case Summary and Final Proceedings of SSV on the Kundu-JBC Case,” 28 April 2007, <<http://www.scientificvalues.org/FinalProceedings.pdf>> (5 November 2019).

78. The Society for Scientific Values, “Dr. R. A. Mashelkar’s Response to SSV’s Queries Regarding Plagiarism in His Book,” 28 March 2007, <<http://scientificvalues.org/Mashelkar.htm>> (5 November 2019).

79. “Coping with Misconduct in Indian Science,” *The Hindu*, 4 September 2007.

80. Felicitas Hesselmann, Verena Graf, Marion Schmidt and Martin Reinhart, “The Visibility of Scientific Misconduct: A Review of the Literature on Retracted Journal Articles,” *Current Sociology* 65 (2017): 814–45.

81. Mario Biagioli and Alexandra Lippman, “Introduction: Metrics and the New Ecologies of Academic Misconduct,” in Mario Biagioli and Alexandra Lippman (eds), *Gaming the*

education, enforced specific new guidelines, stipulating the publication of research articles as a necessary condition for the award of a Ph.D. Simultaneously it introduced an academic performance index (API) score, a publication-based evaluation metric used for the recruitment and promotion of college and university teachers. The majority of Indian universities and colleges, however, lack even the minimal infrastructure needed to conduct research. As Lakhota argues, The gross mismatch between the existing infrastructure and competence on one hand, and what is demanded of the applicants on the other, proved to be an extremely fertile ground for the mushrooming of predatory journals, especially *when all that mattered was the number of papers published by an individual with little consideration for quality* [emphasis original].⁸²

It is not surprising that more than two-thirds of such publications from India originate in such resource-deprived institutions.⁸³ Further, the pressure to speed up the production of research output has also accentuated the temporality of publication and, in turn, associated misconduct. As Kurt notes, the fast turnaround time offered by predatory journals that eliminate rigorous peer-review is an influencing factor for many scholars to publish on these platforms.⁸⁴ Scientific misconduct in the form of publishing in predatory journals might stem from an individual's own choice, but that choice is almost invariably a direct response to regulatory structures enforced by the system.

Biagioli and Lippman argue that the recent rise of 'impact or perish' entails a transition from scientific misconduct as a matter of individual behavior to a situation that involves "groups, networks, or entire institutions."⁸⁵ A primary point of this article is to argue against such claims; scientific (mis)conduct – whether in India or elsewhere – has always been a matter that involves institutions, networks, indeed societies and the politics of states and empires. Individual actors have never stood alone, fully free to accept or violate ahistorical and abstract norms of scientific conduct. Whether one wants to speak of the 'circulation of science' or of the history of science as an 'entangled history' (*histoire croisée*), we need to recognize and trace the ongoing existence of misconduct as an integrated element of these complex circumstances and translations across time and space. That the funding of scientific research in India has a longer-term history worth noting, for example, is thus hardly surprising. In colonial times, universities' mandate and emphasis was on teaching and research funding was scarce.⁸⁶ After independence,

Metrics: Misconduct and Manipulation in Academic Research (Cambridge, MA: MIT Press, 2020), pp.1–24.

82. Subhash C. Lakhota, "Mis-Conceived and Mis-Implemented Academic Assessment Rules Underlie the Scourge of Predatory Journals and Conferences," *Proceedings of the Indian National Science Academy* 94 (2017): 513–15.
83. G. S. Seethapathy, J. U. Santhosh Kumar and A. S. Hareesha, "India's Scientific Publication in Predatory Journals: Need for Regulating Quality of Indian Science and Education," *Current Science* 111 (2016): 1759.
84. Serhat Kurt, "Why Do Authors Publish in Predatory Journals?," *Learned Publishing* 31 (2018): 141–7.
85. Biagioli and Lippman, "Introduction," p.9 (note 81).
86. Krishna, "The Emergence" (note 17).

government policies, in consultation with elite scientists, favored the establishment of new standalone research institutions or national laboratories that continue to absorb the major share of research resources. Management of various state universities by regional governments further politicized matters and strengthened interregional tensions. Rather than address these problems effectively, the current regime that governs university appointments and promotions through quantitative measuring devices has heightened tensions and pressures, feeding a perverse system that prioritizes rising in international rankings of university performance over examining what is at stake in India's domestic hierarchies. It makes sense that such an environment provided fertile ground for the appearance of predatory publications.

Nevertheless, it is necessary to hold the dominant Western narrative that predatory journals are a largely Indian phenomenon that threatens to infect the West up to scrutiny. Although the companies operating these dubious publication portals are predominantly based in South Asia, Africa, and Turkey, at least a quarter are hosted in the West. Further, a recent investigation by global media organizations revealed that since 2013, some 400,000 scientists from across the world have published their articles with five of the world's largest predatory publishers alone.⁸⁷ As reported by one of the largest such India-based publishers: "Europe has 40 per cent of our business, US has 7–8 per cent, China has nine."⁸⁸ Consequently, the market for 'predatory', 'pseudo-', or 'fake' science is an active co-production of scientists from across the globe, sustained and maintained by large revenues contributed by willfully participating scientists working outside India.

The phenomenon of predatory journals should thus be understood from a global perspective as an aspect of the deepening transnational character of the scientific enterprise. With the incorporation of scientometric indicators as a clever marketing tool by the established scientific publication industry, its parallel effects on ways in which individual scientists are evaluated by their organizations also became visible. In today's globalized R&D system, academic institutions themselves are now integrated into the global competitive economy of university rankings. As a consequence, just as researchers in the West are subjected to rising publication pressure, policymakers in China and India are attempting to raise their universities to meet 'global standards'. This has created a new market, leading to the question of whether it might be more appropriate to speak of 'commodity' journals established to meet the needs of this new market, rather than of 'predatory' journals. Following liberalization in the 1990s, India's economy is now heavily driven by the commodified service sector and has become a major contributor to the world services export industry. Seeing such journals through that lens allows us not just to place their emergence in the context of rising publication pressure but also to connect them to the (not unrelated) rise of neoliberalism.

87. International Consortium of Investigative Journalists, "New Global Investigation Tackles Poisonous Effects of 'Fake Science'," 20 July 2018, < <https://www.icij.org/blog/2018/07/new-international-investigation-tackles-fake-science-and-its-poisonous-effects/> > (5 November 2019).

88. "Fake Science: Face behind Biggest of All – '40 Countries, Million Articles'," *The Indian Express*, 22 July 2018.

Discussion and conclusions

This article has sought to historicize what is currently recognized as a crisis of scientific misconduct in Indian science. From a historical perspective, it is crucial not to frame today's debate in terms of the number of instances or scale of scientific misconduct but to focus on its evolving existence through time and to ask how that frames contemporary scientific practices and enterprise. As discussions throughout this special issue reiterate, scientific misconduct is an undeniable component of modern science, which is not limited to any specific discipline, region, or time period. Historicizing scientific misconduct in Indian science, however, underscores certain contextually bound continuities and specificities, drawn from a recognition that it has constituted part of India's engagement with science since colonial times. This presents the historian with a dilemma, however, since these practices have not always been identified by uniform terminology. Historically a variety of enunciations took on meaning at different times in India, from 'literary piracy' in 1929 to 'fake science' in 2018. While the term 'scientific misconduct' has gained currency in the past few decades, the term 'research integrity' does not prominently feature in the Indian discourse. How does one navigate between today's standard vocabulary and the thicket of actors' categories?

What makes charting a responsible course both challenging and important is that the terms now used carry definitions that shape the field of inquiry in interesting ways, highlighting practices of individuals while obscuring those relating to institutional interests, science management, funding sources and criteria, evaluation methods, and the like. As the controversial social scientist Brian Martin argues, "A narrow definition of scientific fraud is convenient to the groups in society – scientific elites, and powerful government and corporate interests – that have the dominant influence on priorities in science. . . [T]he denunciation of fraud helps to paint the rest of scientific behaviour as blameless."⁸⁹

As stated in this article's introduction, we have adopted the definition posed by the SSV's founding secretary, Prem Nath Tiwari, leading us to focus on both "misconduct in research and publication, and misconduct in management of science."⁹⁰ Accordingly, the issue of scientific misconduct in India – and, by extension, around the world – must also refer to the structures within which individual scientists function and commit misconduct or fraud. In a shift away from the individualization of responsibility, scientific misconduct is hereby understood as an interplay between individuals' aspirations and the systems that impose, measure, and reward scientific practice and output in particular ways.

Notwithstanding the long-term presence of scientific misconduct in Indian science, historical accounts also indicate that India has long been at the leading edge of reform, going back at least to the establishment of the IACS in 1876. It was only in the late 1970s

89. Brian Martin, "Scientific Fraud and the Power Structure of Science," *Prometheus* 10 (1992): 83–98.

90. *SSV News and Views*, "Editorial" (note 7).

that misconduct in science was acknowledged as an issue of concern globally. But by 1971 Indian scientists had already initiated a debate on the issue, followed by interventions by India's Parliament. These historical processes resulted in the formation of the SSV, a scientist-driven move to address the issue, which was well in advance of most Western countries. After much furor and debate, the UGC has recently initiated a roll-back of the steps that contributed to the growth of predatory publications.⁹¹ The recent regulatory measures it introduced to curb predatory journals also stand as novel interventions that have yet to be replicated in the West.⁹² Notwithstanding the debate about these interventions' efficacy and adequacy, efforts toward arresting the issue have not been absent in India. It remains to be seen whether such reforms herald a transformation in India and abroad toward a system that manages scientific output for the combined sake of truth-seeking and public welfare, or if control of the system through the individualization of responsibility and blame remains the standard.


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91. "New Evaluation System Introduced for College Teachers," *BusinessLine*, 13 June 2018; Gayathri Vaidyanathan, "No Paper, No PhD? India Rethinks Graduate Student Policy," *Nature*, 31 May 2019.

92. Press Information Bureau Govt. of India, *Various Steps Taken to Curb the Problem of Predatory and Sub-Standard Journals* (New Delhi: Govt. of India, 2018); Shekhar Chandra, "India Cracks down on Plagiarism at Universities," *Nature*, 9 August 2018.