

ammonia problem was not incidental; it was rooted in his prior interest in the free energies of chemical reactions and a keen awareness of the problem's underlying importance.

Chapter 11 is particularly noteworthy for its in-depth analysis of the seminal article addressing the ammonia problem. Johnson painstakingly deconstructs the scientific arguments and calculations presented by Nernst, Haber, Jost, and Le Rossignol. Through this rigorous examination, he provides an indispensable resource for future historians of physical chemistry. Johnson's narrative not only highlights the intellectual rigour of these scientists but also underscores the intricate process of scientific discovery, where individual insight and collective endeavour converged to solve one of chemistry's great puzzles.

The third part of the volume is perhaps the most intriguing one for scholars working outside the field of the history of science. In Chapters 15 to 22, Johnson develops his theoretical framework, allusively dubbed 'the Haze'. The author makes original use of concepts from social network theory to elaborate his view of scientific discovery as a multi-actor process. Particularly interesting is the notion of brokerage, which models the transfer of ideas and their combination to produce new conceptions.

In conclusion, *Making Ammonia* is a well-written and engaging book that makes a significant contribution to our understanding of the history of the ammonia synthesis. Johnson's book is particularly strong in its exploration of the social and political context in which Fritz Haber worked and provides us with a vivid account of how cultural, technical, and social factors concur in producing a scientific discovery.

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## **Senthil Babu D., *Mathematics and Society: Numbers and Measures in Early Modern South India***

**Oxford: Oxford University Press, 2022. Pp. 384. ISBN 978-8-19-483160-0. ₹1895.00 (hardcover).**

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Senthil Babu D.'s *Mathematics and Society* studies a corpus of Tamil texts from south India, featuring among them the *Kaṇakkatikāram* tradition, to push the boundaries of what scholars have hitherto considered to be appropriate engagement with mathematics. He questions the primacy of the canonical 'Bhata-Bhaskara' tradition of Sanskrit works across the entirety of the subcontinent and instead explores a history of mathematics in early modern south India that pays attention to the practitioners who applied mathematical solutions to everyday problems. His main historiographical intervention – formulated in the introduction – is directed against the overemphasis on the Sanskrit canon and in favour of a more regionalized approach to the study of mathematical traditions. In his own words, he is interested in 'a regional epistemology of numerical practice' (p. 24), which he pursues by looking at different traditions of texts that discuss mathematical problems. A wide variety of sources support this approach, which aims to understand mathematical practices in their social contexts and cultural transmissions, among them Tamil books of arithmetical tables such as the *Ṇcuvāṭi* and account books written on palm leaves.

The monograph is divided into four chapters. The first introduces us to ‘mathematics beyond the canon’ by outlining the corpus and discussing the use of mathematical approaches to measure land, weigh gold, pay wages and deal with other mathematical problems. The second chapter zooms in on the practitioner through the figure of the accountant. Chapter 3 explores the transmission of mathematical knowledge in *tiṇṇai* schools from a holistic perspective, considering the curriculum, the pedagogical framework and the setting in its village environment. Chapter 4 analyses the changes that colonialism brought to the practice, transmission and perception of mathematics over the course of the nineteenth century. A reflective conclusion highlights further areas for future scholarship to explore and elaborates the notion of the different ‘publics’ constituted by the *Kaṇakkatikāram* tradition and the later colonial reshaping of mathematical education. Appendices offer a helpful overview of ‘numbers, weights, and measures in the Tamil system’; the Tamil numerical notation; the *Ponṇilakkam*, *Nellikkam* and *Ṇcuvuṭṭi* tables; and a list of the books studied.

What makes Senthil Babhu’s study innovative and interventionist is that it manages to combine the history of mathematics with the social history of learning, as well as the cultural history of knowledge transmission. Over the last decades, a global field of the premodern history of learning has increasingly turned towards the material culture that cultures of learning produced, especially in the form of written artefacts. Exemplary studies range from Konrad Hirschler’s work on Arabic manuscripts from Ibn ‘Abd al-Hadi’s library in medieval Damascus, to Fallou Ngom’s *Muslims beyond the Arab World: The Odyssey of Ajami and the Muridiyya* (2016), which explores texts and chants about the teachings of Shaykh Ahmadu Bamba (1853–1927) in colonial French West Africa. Those studies share a methodological approach that traces social and cultural practices in learned settings based on the written objects and the scholarly engagements that those learned settings created. The results are a focus on historical practice, which allows researchers to challenge orthodoxies often based on narrative and normative sources.

Challenging the conventional is exactly what Senthil Babu does in the chapter on ‘Mathematics of the practitioner’. He poses the question of how to evaluate the numeracy of ‘labouring caste groups’ who did not have access to the same educational institutions as artisanal and landed groups. He suggests ‘that the history of knowledge in caste societies will have to reorient their central concerns towards the relationship between the mind and the hand in knowledge production’ (p. 86). What follows is a thorough engagement with the figure of the accountant (*kaṇakkuppillai*) to gauge the possibility of exploring a wider circle of social and professional groups involved in land measurement, the assessment of produce and the calculation of taxes as a collaborative process. For example, the *kaṇakkan* as the accountant remained in a higher hierarchical position integrating knowledge acquired from other collaborators such as – and compared with – the *Veṭṭiyān*, who was placed lower in the caste order and was responsible for measuring the land.

The chapter on ‘Memory and mathematics of the *Tiṇṇai* schools’ zooms in on the educational framework and institutional setting of the *tiṇṇai* schools in village communities in the Tamil country. Those institutions did not receive patronage in the same way as, for example, monastic institutions; hence inscriptions are missing. Senthil Babu pieces together the archetypal figure of the *tiṇṇai* schoolteacher, the student, the curriculum and the materials studied in order to overcome the ‘statistical frames’ (p. 126) of previous scholarship, which could not grasp the complexities of practical education in those schools. *Tiṇṇai* schools were restricted to boys from families belonging to ‘cultivating castes’ (p. 131) (but not manual labouring castes). They were taught on the ‘veranda-like space’ (p. 130) of the teacher’s house, whom their parents paid in cash or in

kind. The teacher represented a fully, socially embedded member of the village community, who often also worked as scribe and served the community in other activities. Students transcribed their own textbooks on palm leaves in the process of learning at the *tiṇṇai*, and examples of those individualized books allow Senthil Babu insights into the curriculum.

The *Enṇuvaṭi* constituted ‘the quintessential Tamil multiplication table book’ (p. 152) that students learned by heart. The schools’ pedagogical drive incentivized the acquisition of mathematical knowledge, which was ultimately applicable in the context of manual labour. ‘The curriculum of the *tiṇṇai* school rested upon this process of gaining credibility and legitimacy among the local measuring public’ (p. 138). The concept of the ‘measuring public’ (p. 128) relates to those laypeople who used mathematics in their day-to-day work-related activities.

Senthil Babu’s monograph constitutes an important building block for future inquiries that can further differentiate between regional and transregional traditions of mathematics in South Asia and how they relate to those in other parts of the Indian Ocean world and beyond. At the same time, it is a welcome addition to the reading lists of those interested in the sociocultural complexities of knowledge transmission in early modern south India.

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## **Grant Bollmer, *The Affect Lab: The History and Limits of Measuring Emotion***

**Minneapolis: University of Minnesota Press, 2023. Pp. 290. ISBN 978-1-5179-1546-9. \$28.00 (paperback).**

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Grant Bollmer’s *The Affect Lab* illuminates the challenges associated with attempts to measure emotion over the course of the twentieth century. By applying a method of media archaeology – similar to Foucauldian genealogy – to four extended case studies, Bollmer convincingly demonstrates that emotions and affects are not independent of the tools used to produce them.

Bollmer begins by offering a definition of the Affect Lab: an experimental space ‘in which a technical instrument identifies something moving inside a body, something emotional, something we refer to as the affects’ (p. 1). This definition, however, obscures the variability and the complexity of the work going on in such spaces.

The Affect Lab is not singular. The techniques in question range from William James’s use of the planchette, a spiritualist toy of the sort familiar to anyone who has played with a ouija board; to Paul Ekman’s use of series of photographs to capture universal categories of emotion; to the use of EEG in prisons to measure the empathic capacities of psychopaths. The contexts within which these techniques are employed also vary, in both their background assumptions and their wider aims. As Bollmer writes, ‘The techniques of the Affect Lab can happen and have happened in a range of locations – the university,