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BETWEEN EMULATION AND INNOVATION: UPENDRAKISHORE RAY AND THE AMBIGUITIES OF COLONIAL MODERNITY

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ABSTRACT

Using the example of Upendrakishore Ray (1863-1915), a well-known Bengali artist, writer, technologist and publisher, this essay critiques prevalent theories that portray colonial Indian modernity as a largely derivative discourse. Addressing Ray's globally-recognized contributions to the refinement of technologies for the printing of photographs and paintings, the paper shows howRay's relative lack of resources could not obstruct his innovative approach and investigates why, in spite of his originality, his Western recognition was no more than transient. Turning then to Ray's views on pictorial art, the essay shows how in this area, he merely followed the precepts of Western 'academic' art and failed to attain any originality. Indian engagements with modernity, the essay concludes, were neither exclusively original nor invariably imitative, and we need new theoretical approaches that can accommodate this diversity and unpredictability.

Keywords

Colonial modernity, Upendrakishore Ray, half-tone process, pictorial art, Bengali print-culture, artisanal style

'Modernity for us is like a supermarket of foreign goods, displayed on the shelves: pay up and take away what you like,' Partha Chatterjee has written. 'No one there [in the West] believes that we could be producers of modernity.'[1] For the West, the non-West is the client, the customer, and more than occasionally the pupil, trying (never with complete success) to catch up not only in economic and technological terms but also with regard to rationality, individual autonomy, political democracy, secularism, gender equality, the arts, consumerism and every other feature of modernity. Few non-Western theorists and historians appear to dissent too radically from this black-and-white schematization of Western modernity as the prototype and other modernities as simple, partial and often distorted imitations thereof. This paper seeks to complicate this division by exploring the work of Upendrakishore Ray or Upendrakishore Raychaudhuri (1863-1915) in printing technology, which challenges the simplistic division of 'original' and 'derivative,' and his views on art and painting, which could not be more derivative.[2] The nature and contours of Indian colonial modernity, the paper argues, were far more chaotic, ad hoc and unpredictable than the current theoretical formulations suggest.

Upendrakishore – and his son Sukumar and grandson Satyajit – are iconic figures in Bengal, surpassed in their renown only by the Tagores. Despite their regional fame, however, the pre-Satyajit generations of the Ray family have never stimulated much scholarly discussion. The most noteworthy research on this remarkable family was done by the late Siddhartha Ghosh in the 1980s. In his famous book on the history of photography in Bengal and in pathbreaking essays on Upendrakishore Ray and his brother-in-law Hemendramohan Bose, Ghosh revolutionized our understanding of the Rays' work on visual technologies, consumerism, and advertising.[3] But unequalled as they still are empirically, Ghosh's essays now seem rather thin on historical context and most historians of technology

would find their conceptualization of technological progress to be linear and whiggish. The rest of the Bengali literature on the Rays is concerned almost exclusively with their contributions to children's literature; the ever-expanding scholarly literature on Indian modernity has ignored them altogether. And yet, from the mid-nineteenth to the late-twentieth century, the three generations of the Rays and their collateral branches contributed so prolifically to virtually every aspect of 'our' modernity that a properly detailed history of the family could help reshape our approach to the subject.

Between and Beyond Identities

Over his relatively brief life, Upendrakishore Ray excelled in many fields and his diverse contributions to art, music, literature and technology reflected not merely his individual talents but many of the strengths and contradictions of his age. This paper cannot, of course, offer a comprehensive analysis of all his engagements and focuses only on the two – printing technology and pictorial art – that are most relevant to the question of 'originality' and 'derivation' in Indian modernity.

Upendrakishore's lifelong embrace of different identities could, perhaps, have been predicted from his unusual childhood. He was born in Masua in the district of Mymensingh (now in Bangladesh) to a traditional Hindu family that was *kayastha* by caste and whose members had worked for generations, like many of their caste-mates, as lower-level administrators, clerks and judicial officials in pre-British Bengal.[4] Many of themwere renowned for their Sanskrit as well as Farsi learning and Upendrakishore's father Kalinath Ray (known also as Shyamsundar Munsi) was famed for his multilingual learning and eloquence. Kalinath and his wife Joytara had five sons – Saradaranjan (1858-1925), Kamadaranjan (1863-1915), Muktidaranjan (1867-1934), Kuladaranjan (1873-1950) and Pramadaranjan (1875-1947) – and three

daughters, Giribala, Sarasibala and Mrinalini.[5] In 1868, the five-year-old Kamadaranjan Ray was adopted and renamed Upendrakishore by Harikishore Ray, a then-childless kinsman who, after making a lot of money as a lawyer in British courts, had purchased a large *zamindari* estate and changed his surname to the more aristocratic Raychaudhuri.

We do not know how the young Upendrakishore responded to his abrupt relocation to a different family under a new name, or to his installation as a wealthy landowner's son and heir, but he seems to have played something like a game of identities from this time until quite late in life, taking advantage of the changes sweeping through his life as well as through India and Bengal but refusing to accept the roles that were considered to be 'natural' for somebody of his talents, social class and upbringing. He was a bright student but preferred to spend most of his time drawing or playing his violin and despite being forbidden by his orthodox Hindu adoptive father to associate with Brahmos – supporters of the movement for religious and social reform of Hinduism, founded by Rammohan Roy in the 1820s but radicalized in the 1860s by Keshabchandra Sen and his associates – his closest friend was Gaganchandra Home, a distantly-related Brahmo who had vowed to convert young Upendrakishore to the new faith. But Upendrakishore wasn't going to give in so quickly and Home recalls being teased mercilessly and even being spat on by his great friend on account of being a Brahmo.[6]

After finishing his schooling with distinction at Mymensingh, the sixteen-year-old Upendrakishore Raychaudhuri moved to Calcutta in 1879 with a scholarship for higher study and joined Presidency College, from where he passed his 'First Arts' examination in the second division in 1881. Then, instead of enrolling on the Bachelor of Arts course at Presidency, he moved to the Metropolitan Institution, which had been established by Ishwarchandra Vidyasagar in 1864 as an indigenous –

and cheaper – alternative to Presidency College, graduating in 1884 in the third (i.e., the lowest) division.[7] The move to Metropolitan, not to mention the consistently downward trajctory of his academic performance, are intriguing but unexplained. Manasi Dasgupta, a recent biographer of Upendrakishore, has speculated that Harikishore Raychaudhuri, who owed his fortune to the legal trade and could well have felt that a legal training would help his son and heir be a competent *zamindar*, may have wanted Upendrakishore to study law after completing his BA. Upendrakishore, who was interested more in music and art, probably rebelled at the idea and his opposition could only have been intensified by the company he was keeping in Calcutta.

After arriving in Calcutta, Upendrakishore shared a house on Sitaram Ghosh Street that had become a veritable 'Brahmo fortress.' His old friend Gaganchandra Home lived there with other young Brahmos and Brahmo sympathizers, including Upendrakishore's future brother-in-law, the entrepreneur Hemendramohan Bose and the young schoolmaster Pramadacharan Sen, in whose magazine *Sakha* Upendrakishore would commence his career as a writer for children. The 'leader' of this group was the fiery Brahmo radical Dwarakanath Ganguli (1844-98), who regularly visited the house to discuss politics and religion with the young men. Other Brahmo luminaries such as Sivanath Sastri or Bijoykrishna Goswami were also frequent visitors. This ebullient environment, with its blend of religious dissent and reformist, even radical, politics, seems to have exerted a transformative influence on Upendrakishore. His closeness to Brahmos offended Harikishore Raychaudhuri so much that he made a new will leaving only one-fourth of his estate to Upendrakishore and the rest to his biological son Narendrakishore.[8] He may also have stopped paying for Upendrakishore's studies, explaining why Upendrakishore moved to the cheaper Metropolitan Institution and took up the unusual – and, for

the nineteenth-century Bengali gentry, socially inferior – job of repairing musical instruments for Dwarkin's, a well-known indigenous firm.[9] He also did some musical tutoring and planned to write a book on science for children. Upendrakishore's biographers usually recount these episodes merely to illustrate the teenager's technological and musical genius, but we should also ask *why* he chose to express them in such socially incongruous ways at a time when they would interfere seriously with his studies. Was it, perhaps, his stomach, rather than his irrepressible genius, that drove him to this work?

Whatever the compulsions behind his first steps toward an artisanal life, Upendrakishore soon came to prefer it to that of a landowner.[10] After Harikishore's death in 1883, he refused to return to perform the traditional funerary rites because they offended his developing Brahmo sensibilities and, even more importantly, refused to take charge of the estate. There was no choice but for the fifteen-year-old Narendrakishore (the son born to Harikishore soon after he had adopted Kamadaranjan) to give up his studies and take over as *zamindar*. The next year, Upendrakishore formally converted to Brahmoism and in 1885, married Bidhumukhi, the daughter of Dwarakanath Ganguli, a match that was doubly objectionable from an orthodox Hindu viewpoint because the Gangulis were not only Brahmo but Brahman by caste.[11] The couple moved into Dwarakanath Ganguli's house and Upendrakishore set up in business as an artist and photographer.[12]

'Small Master' and High Technology

Photography was still relatively new in Bengal and although no details are available on Upendrakishore's early business, the fact that he continued in the trade for nearly a decade suggests that he was fairly successful. He then moved to half-tone photography, a complex new technology of photomechanical reproduction enabling

the printing of images without removing their tonal gradations.[13] Until the middle years of the nineteenth century, illustrations had been printed all over the world by means of engraved wood blocks. After the coming of photography, however, much effort went into finding ways of printing photographic images. The half-tone technology, which emerged in the West in the 1880s, provided a means of printing photographed or painted images without destroying their tonal gradations.[14] The half-tone process was born when Frederic Eugene Ives (1856-1937) of Philadelphia realized that in order to print tonally realistic photographs, one needed blocks on which printer's ink could be laid 'thickly in the shadows and more or less thinly in the half-shades, whilst no ink at all should be deposited in the whites or highlights.'[15]

Ives achieved this by converting the different tones of an image into dots by photographing it through a glass screen embossed with a cross-line grid.[16] Since the lighter and the darker parts of the image transmitted different amounts of light, the dots differed in size in accordance with the original tones.[17] When a block was made from this dotted image and printed from, it was not the dots that were reproduced but the continuous tones of the original or a fair approximation of them.[18] Ives's insights were endorsed and built upon by many researchers across the world and demand from newspapers and magazines for printed pictures reached a critical mass by the 1890s. Although half-tone work was quite expensive in the early days – apart from the costly screens, it also needed advanced presses, high-quality printing inks, smooth papers and generally skilled handling – it became so popular that costs came down quite rapidly.[19] Producing a glass screen with lines intersecting one another at right angles – as in graph paper – was the key to successful half-tone photography and the first commercially successful screens were introduced in 1888 by the brothers Louis and Max Levy in Ives's own city Philadelphia.[20] By the time of Queen Victoria's Diamond Jubilee in 1897, one British commentator declared, all of the

major illustrated periodicals had switched to half-tone blocks and wood engravings were virtually passé.[21] The half-tone process was constantly improved and although it faced stiff competition from other, newer techniques of printing images (such as photogravure) from the early twentieth century, it was consigned definitively to history only after the introduction of digital technology towards the end of the century.[22]

Upendrakishore's interest in this developing area is said to have been stimulated by a personal disappointment. His first book for children, a retelling of the Ramayana (*Chheleder Ramayan*), was published in 1897 and the author is said to have been so disappointed by the reproduction of his illustrations by crude wood-engravings that he immediately resolved to find a better way to print images.[23] There may, however, have been another motivation. As Tapati Guha-Thakurta has shown, middle- and upper-class Bengalis often preferred to be photographed at European studios such as Bourne and Shepherd, compelling many indigenous photographers of the late nineteenth century to give up portrait photography and specialize in the production of prints and mythological pictures by lithography.[24] Similar business pressures may also have pushed Upendrakishore away from conventional photography but he aimed much higher in technological – and, as we shall see, cultural – terms than the lithographic trade. His choice, half-tone photography, faced no signficant local competition, not even from Europeans, but could count on significant demand from the expanding print culture of middle-class Bengal.[25] The sheer novelty of half-tone technology meant, however, that Upendrakishore had to be his own teacher and funder. Fortunately for him, his relations with his adoptive family had not been irreparably harmed by his acts of disavowal and although he still refused to take any active role in running the estate, he received some income from his share of the *zamindari*, the management of which he had entrusted to

Narendrakishore.[26] Upendrakishore used his rent income to import the expensive books and equipment he needed to learn the new craft and by July 1897, claimed to be able to produce half-tone blocks 'as very few persons in the world have hitherto produced' and in patterns that were 'simply innumerable.'[27]

A recent study of photomechanical reproduction in Britain argues that in its early days, half-tone technology was used most extensively by popular periodicals seeking to emphasize the immediacy and vibrancy of urban life, consumerism and celebrity culture.[28] In Bengal during the same period, however, the technology found favour in a very different sector. The populist illustrated magazines of Bengal continued to rely on wood-engravings for their images and it was upper-middle-class magazines like Ramananda Chatterji's *Modern Review* or *Probasi* that used the new technology to bring the finest works of art to its readers who had cosmopolitan tastes but no access to the great museums of the world.[29] Of course, the printed reproductions removed the art works from their contexts, reduced (or enlarged) their scale and eliminated that ineffable uniqueness which Walter Benjamin famously called their 'aura.'[30] But that was hardly an issue for Indians who had never had much scope of beholding original paintings or sculptures. Initially, the finest paintings or sculptures of the entire world were reproduced in *Probasi* and the works chosen reflected (as well as created) that 'infatuation with European Classical and Renaissance art' that characterized the aspirational middle classes of the era.[31] Even before he could read properly, Nirad Chaudhuri recalled, he had encountered Raphael's Madonnas on the pages of *Probasi* and late in life, those prints were still imprinted on his mind.[32]

Although Chaudhuri did not mention it, it was not just great Western art that was reproduced in magazines for Bengal's new, self-consciously refined bourgeoisie. Noting that Indians were scandalously ignorant about the life and culture of regions

other than their own, Ramananda Chatterji decided to publish artworks from every part of India. The universal language of art, he thought, would help strengthen the bonds between different subcontinental cultures and engender a feeling of national unity.[33] It was only from the time of the *swadeshi* movement of the early twentieth century that Chatterji's magazines gave up their former eclecticism and came to focus almost exclusively on the paintings of Abanindranath Tagore and the so-called Bengal School.[34] But whatever kind of art that Chatterji wished to highlight, half-tone technology was essential for their reproduction and it was Upendrakishore and his firm who produced most of the blocks for *Probasi* and *Modern Review*, even though, as we shall see later, Upendrakishore was not an admirer of nationalistic art.[35] Half-tone technology in Bengal, in short, was a tool for cultural enhancement and nation-building, not simply the means to entertain, evoke immediacy or encourage consumerism.

Upendrakishore's newly acquired skills were also displayed in his second book *Sekaler Kathha* (Tales of the Past, 1903), an illustrated account of prehistoric animals for children that won much praise not only for its scientific accuracy but also for the quality of its illustrations. The striking frontispiece depicting the Archaeopteryx in colour and the many black-and-white illustrations of dinosaurs had been drawn by the author himself – and not, as he emphasized, lifted from foreign books.[36] Thomas Holland of the Geological Survey of India remarked that Upendrakishore's pictures of dinosaurs were so accurate that they could be used to illustrate science textbooks and Alexander Pedler, a chemist who was now the Bengal Government's Director of Public Instruction, was impressed by the excellence of the printing. Scientific accuracy and good printing aside, the pictures were also praised for their aesthetic qualities by the famous artist Raja Ravi Varma.[37] For Upendrakishore, block-making was a craft rather than an industry and he regarded

himself not merely as the proprietor of his business but as its master craftsman.[38] 'It is very easy to make an indifferent half-tone block,' he once wrote, 'but really quite difficult to make one that would produce a beautiful, smoothly graded picture.' The two kinds of block, he observed, were as different from each other as an educated man was from an unlettered labourer.[39]

Such a situation was already unthinkable in Britain. In the large block-making firms of the late nineteenth century, hordes of anonymous workers laboured under the supervision of foremen who, in turn, reported to managers, who were not expected to have any understanding of the craft itself. Each piece of work was subdivided into separate tasks and executed by multiple workers. This, of course, enhanced productivity: one well-known company produced 60,000 blocks per year, an output no individual craftsman could ever have matched. Nor did those who actually crafted the blocks have any contact with those who had produced the images or commissioned the blocks.[40] Whilst demand for half-tone blocks in Bengal was, of course, nowhere as high as in Britain, illustrated publications *were* proliferating in the early twentieth century and Upendrakishore could have taken full advantage of the expanding market by adopting a more industrial approach. Other than *Probasi* and *Modern Review*, however, he does not seem to have had too many patrons, and is likely to have preferred his business to be small and select.

In the words of Karl Marx, then, Upendrakishore was 'only a hybrid between capitalist and labourer, a "small master."'[41] As long as he could offer a level of technological sophistication that was unavailable in the Bengali market, he could survive as a small master and this, fortunately for him, was the case. The vernacular print industry of Bengal could scarcely afford to have its blocks made overseas and Upendrakishore was the only supplier of half-tone blocks in Calcutta. (Those who *could* afford to get their images printed abroad by other processes putatively superior

to half-tone did do so. For instance, *Rupam*, the organ of the nationalistic Indian Society for Oriental Art, edited by the lawyer-cum-connoisseur-cum propagandist Ordhendro Coomar Gangoly and funded by the Government of Bengal in an effort to counter the political nationalism of the era, had its images printed by photogravure in Europe or Japan.)[42]

Upendrakishore, needless to say, used imported technology to produce his blocks but he was also committed to *improving* that technology with his own insights and innovations. 'The standardizing of half-tone methods in recent years has largely followed the lines indicated by him and many of his suggestions have been adopted in current practice', remarked Ramananda Chatterji in his obituary of Upendrakishore.[43] That claim was an exaggeration but Upendrakishore's international reputation as an expert on half-tone photography was a fact. When Upendrakishore began his investigations into the half-tone process in the mid-1890s, many technical and theoretical issues, as Sukumar Ray was to remark in a tribute to his father, remained to be resolved.[44] The first English book on half-tone (by William Gamble, writing under the pseudonym Julius Verfasser) had come out only in 1894 and experts remained undecided about the underlying physics of the technology for quite some time.[45] Much research was being done on it all over the world but not in academic institutes and laboratories. It was the trade itself that conducted this research and it was published in what were essentially trade journals.[46] Upendrakishore fit right into this mould. Despite his location in colonial Calcutta and his lack of an academic scientific identity, he became a significant figure in the global history of half-tone research within a few years of commencing his solitary exploration of the technology, winning praise in Britain for displaying 'not only a clear grasp of the subject' but for suggesting 'new methods of work.'[47]

These encomia came from William Gamble (1864-1933), a pioneer of the half-tone process in Britain and one of its most influential advocates.[48] After publishing *The Half-Tone Process*, he had founded the *Process Work Year Book*, an annual illustrated review of all photomechanical processes that, after several title changes, became *The Penrose Annual*. It was particularly notable for its state-of-the-art coverage – *Penrose* was discussing colour photography and colour printing as early as in 1899 – and Upendrakishore became a regular contributor to it.[49] One subject of his research was the ideal distance between the ruled screen and the photosensitive plate recording the dotted image. If the screen and the plate were too close, then the dots would not vary significantly in size and the gradation of dots in the original would not be captured. The screen had to be placed at an optimum distance from the plate.[50] There was, however, no theoretical explanation of the different effects produced by different screen distances and no universally agreed method of calculating the correct distance. Upendrakishore designed a simple accessory, which, when attached to the camera and screen, could configure the optimal distance. Of all the methods available for determining the right screen distance, an American handbook of 1907 declared, Upendrakishore Ray's 'automatic screen indicator which, when once set, will indicate all subsequent screen distances,' was 'unique.'[51] When the Penrose Company supplied new cameras to the Photographic and Printing Crafts Department of the Manchester Municipal School of Technology – where Upendrakishore's son Sukumar Ray would later be a student – it equipped one of the cameras with Upendrakishore's device.[52]

But the screen distance was not the only important determinant of the quality of a half-tone image – the use of proper diaphragms (which determined the size of the lens aperture) was every bit as important. Upendrakishore devoted much time and effort to determine how their use could be optimized and by experimenting with

different diaphragms and screen distances, discovered how to split each half-tone dot into four, which led to great improvements in the quality of the printed image.[53] Gamble marvelled at the 'mathematical exactness' of his insights, declaring that the research on diaphragms and the screen indicator constituted 'the best piece of work Mr Ray has done.'[54] Also remarkable was Upendrakishore's modified screen. Although it had become the norm for the lines on the half-tone screen to cross one another at ninety degrees, there was no mathematical rationale for this and, as Gamble remarked, showed how half-tone workers could 'get into a rut, and keep in it, by accepting a thing because "everyone says so," or "everyone uses it."'[55] Upendrakishore suggested that if the lines crossed each other at sixty degrees instead of ninety, then the tonal variations of the original could be captured with greater fidelity.

Unfortunately, Gamble revealed, despite Upendrakishore being the first to propose this valuable modification, 'Mr Arthur Schulze of St Petersburg, forestalled him by obtaining German and British patents on it last year [1903].'[56] Upendrakishore himself merely commented that 'to the craft it matters little who gets the credit for a particular invention,' whilst Gamble pointed out that although Schulze had beaten Upendrakishore to the patent, the sixty-degree screen gave its best results only when used with a diaphragm designed by Upendrakishore.[57] Still, it was Schulze's screen that was soon being hailed, even by the very same American handbook that praised Upendrakishore's screen-distance indicator, for allowing 'fifteen per cent more dots in a given area' and thereby improving the tonal diversity of the printed image.[58]

There have long been rumours, especially in Bengal, that Schulze had plagiarized Upendrakishore's work.[59] There is no solid evidence to support these rumours – or to disprove them definitively. Leaving aside that undecidable question,

it is worth pointing out that even without any plagiarism, simultaneous discoveries and innovations are only to be expected in a rapidly developing and commercially profitable field such as photomechanical reproduction.[60] Quick patenting was essential to establish priority but for somebody in Upendrakishore's location, taking out an international patent was easier said than done. Even in England, Germany or the US, patent law was complex and unsatisfactory at the time, especially for printing processes.[61] (Within India, patenting was not even an option for Upendrakishore because the Indian Patents and Designs Act was promulgated only in 1911.[62]) There is evidence that he did ask William Gamble for assistance with patenting but for reasons that remain unclear, nothing ever happened and Upendrakishore's work was gradually eclipsed.[63] After his death, the Penrose Company's monthly *Process Work and Electrotyping* praised his 'scientific mind' and called him 'quite an original investigator of half-tone problems.'[64] Compare that sentence and its eloquent 'quite' with what the same newsletter had written about him more than a decade ago: 'He is far ahead of European and American workers in originality and this is the more surprising when it is considered how far he is from the hub centres of process work, which has necessitated his dependence on reading and experiment.'[65]

One obviously cannot generalize from the experience of one individual in one highly technical field, but Upendrakishore's encounter with the West suggests certain provisional thoughts about the non-Western – and colonial – innovator's place in metropolitan discourse. Lone researchers in peripheral locations *could* win Western recognition, but only if the field of research was still in an immature state, with unanswered questions of theoretical or practical relevance that could be successfully resolved with relatively few resources. One cannot easily imagine a nineteenth-century Calcutta artisan being feted in London for his pioneering contributions to, say, shipbuilding or the chemistry of dyestuffs. But half-tone technology still had its

mysteries and it was possible for Upendrakishore to elucidate some of them in his workshop without needing a great deal of capital or institutional support. And because of their own professional and commercial interests, Western practitioners were ready to treat his proposals with respect. What Upendrakishore did not have, however, was any real control over the international dissemination of his work. He was reliant on the patronage of the well-connected William Gamble, who was generous with praise and editorial space but could not (or would not) help him formalize his ownership of his innovations. Even if he had helped, Upendrakishore would have needed professional assistance to navigate the complexities of patent laws and it is not at all certain that he could have done so from Calcutta.

The Innovator as Emulator

The fact that Upendrakishore's print-technological innovations were welcomed by metropolitan experts, no matter how transiently, suggests that the story of modernity in India was not a simple saga of import and imitation. But Upendrakishore's own career also warns us not to exaggerate the innovative spirit of Indian modernists. Take his conceptualization of the relationship between Indian art and Western naturalistic art, for instance. As we know from the studies of Partha Mitter and Tapati Guha-Thakurta, painting in the Western 'academic' mode – characterized by anatomical verisimilitude, depth of field, and an avoidance of a 'flat' miniaturist style – became very popular in nineteenth-century India, with Raja Ravi Varma being the most prominent examplar of this trend. Earlier issues of *Probasi* and *Modern Review* carried many examples of Varma's work, printed with Upendrakishore's blocks, and Varma was widely admired for his depiction of Indian subjects in a Western style. This approach, as we also know from the studies of Mitter, Guha-Thakurta and others, was challenged in the early twentieth century by the so-called

Bengal School associated with Abanindranath Tagore and his disciples. Rejecting the Western academic style, they (with the aid of the brilliant polemicist O C Gangoly) called for a revival of traditional Indian techniques emphasizing spirituality and ignoring the naturalist-realist conventions of post-Renaissance Western art. The details of those debates are well-known but it is worth looking briefly at Upendrakishore's stance on the subject.[66]

Upendrakishore, who was himself a painter, asserted in an article in *Modern Review* that 'there can be no other object of study than nature' for the artist, whether European or Indian. Indian art and European art were not comparable to 'two totally different languages,' as Abanindranath and his acolytes were claiming. It was simply that the Indian artist still spoke the language of pictorial art like a child, whilst the European artist spoke the same language as an adult. If the lisping Indian artist worked on improving his 'grammar and rhetoric,' then he would 'eventually learn to talk like a man.'[67] Holding to what Partha Mitter has called 'a unilinear view of artistic evolution,' Upendrakishore scoffed at judging different artistic traditions with different aesthetic criteria: there was only one kind of art and only one set of criteria for assessing its merits.[68] Instead of claiming some kind of spiritual excellence for Indian art, he declared that an Indian who loved his country and its traditions should accept the deficiencies of his national art and strive for its improvement by learning from the West. 'My nationality,' he asserted, 'consists of a legitimate and affectionate pride in all that is noble in our national life and tradition, combined with sincere regret for our shortcomings and eagerness to remove them. It is this nationality that prompts me to advocate the study of European art as a means of improving the Art of my country.'[69] The attitude with which Upendrakishore pursued half-tone technology, in which he learnt from the West whilst, at the same time, added significantly to global knowledge and practice, is entirely absent from his

views on art. When Marie Seton, a British admirer of the Rays and the first biographer of Upendrakishore's grandson, saw Upendrakishore's painting of Seeta, she lamented that Satyajit Ray's grandfather had depicted the heroine of the Ramayana as a 'pale Victorian Miss.'[70] And we know from Ramananda Chatterji's son Kedarnath that even in his own time and his own place, Upendrakishore's artistic prominence was undermined by his refusal to nationalize his style.[71] *Sandesh*, his magazine for children, carried many of his paintings, which, just like Ravi Varma's, portrayed Indian mythological themes with the techniques of Western realistic art. These were popular with their target audience but the place of Upendrakishore in the history of Bengali art remained, at best, a very marginal one.

The theoretical models of colonial modernity that we possess do not allow us to accommodate these wide divergences within the same individual. The temptation to focus on isolated aspects is almost overwhelming. Leave out Upendrakishore's half-tone work and the derivative modernism model works just fine. Focus only on the half-tone work, and one can challenge the Western supermarket model or, should one be so inclined, construct a plaintive nationalist narrative of a great Indian pioneer being denied the enduring global renown he so obviously deserved. But when one examines both, along with other facets of Upendrakishore's career that I have not been able to address such as religious reform or children's literature, then what kind of generalization could one hope to reach? And it is not just Upendrakishore who is hard to fit into our procrustean models, whether nationalist or postcolonial. Similar difficulties would be experienced with many members of the Ray family (including, most notably, Satyajit Ray), not to mention Rabindranath Tagore, the scientist Jagadischandra Bose or even Rammohan Roy. In its time, the postcolonial view that Indians were, at best, shoppers in the Western supermarket of modernity, provided a much-needed corrective to nationalist hagiography. But that

critique is now itself in need of a critique. Colonial modernity, we are now discovering, was often a shopping trip but sometimes not. Not every modernist endeavour was a surrogate for nationalism and the same individual could take a different stance in different contexts. Neither 'colonial modernity' nor the 'nationalist elite' were undifferentiated monoliths. In fact, they were more like those architectural oddities that the Victorians called follies, structures that followed no coherent, uniform style, incorporating a range of often mutually contradictory elements that were put together in highly individualized and eccentric ways.

If we are to do scholarly justice to these complexities, then we must evolve suppler and more finely differentiated theoretical perspectives that retain the incisiveness of postcolonial approaches whilst avoidomg their overgeneralizations, that can explain the originality of colonial Indians whilst rejecting nationalist hero-worship, that can capture sharp differences with the fidelity of a good wood-engraving whilst, like a half-tone block, also capturing the many shades of grey. In other words, we need models that can help us provincialize Europe as well as to globalize India, to analyze the derivativeness of 'our' modernity but also to recognize Indian contributions to 'their' modernity, to comprehend the subalternity of our elites but also to address the work of those small masters who managed, on occasion, to be subjects *of* modernity instead of merely being subjected *to* it. But such a model can be constructed only after we have appreciated the inadequacies of the available ones. The career of Upendrakishore Ray, I would argue, provides us with an ideal starting point for that negative but unavoidable endeavour.

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NOTES

[1] Partha Chatterjee, 'Our Modernity' (1994), in P Chatterjee, *Empire and Nation: Selected Essays* (New York: Columbia University Press, 2010), 136-52, at 151.

[2] For a more comprehensive analysis of Upendrakishore's life and work than can be provided here, see Chandak Sengoopta, *The Rays before Satyajit: Creativity and Modernity in Colonial India* (Delhi: Oxford University Press, 2016).

[3]Siddhartha Ghosh, 'Upendrakishore: Silpi o Karigar,' *Ekshan*, 16, no 6 (1984): 47-144; Siddhartha Ghosh, 'Jantrarasik H Bose,'*Ekshan*, 16, nos 3-4 (1983): 53-170; Siddhartha Ghosh, *Karigari Kalpana o Bangali Udyog* (Calcutta: Dey's, 1988); and Siddhartha Ghosh, *Chhabi-Tola: Bangalir Photography Charcha* (Calcutta: Ananda, 1988).

[4] These 'scribal' classes of pre-colonial India, historian Hayden Bellenoit has remarked, were often regarded as the 'pillars of the citadel of empire.' See Hayden Bellenoit, 'Paper, Pens and Power between Empires in North India, 1750-1850,'*South Asian History and Culture*, 3, no 3 (July 2012): 348-72, at 355. Although the highest posts in government and criminal justice were usually held by Muslims in Mughal times, revenue administrators were almost always Hindu. See S N Mukherjee, 'Class, Caste and Politics in Calcutta, 1815-38,' in Edmund Leach and S N Mukherjee (eds), *Elites in South Asia* (Cambridge: Cambridge University Press, 1970), 33-78, at 39. The scribal vocation was virtually a 'hereditary enterprise' of kayasthas but Brahmans and Vaidyas were also prominent. See Kumkum Chatterjee, 'Scribal Elites in Sultanate and Mughal Bengal,'*Indian Economic and Social History Review*, 47, no 4 (2010): 445-72, esp 447-48 and 455.

[5]Hemantakumar Adhya, *Upendrakishore Raychaudhuri* (Delhi: Sahitya Akademi, 1997), 4.

[6]See Gaganchandra Home, *Jiban-Smriti* (Calcutta: Privately Published, 1929), 3-9. Such stories are not to be heard from Upendrakishore's hagiographers or even his son Sukumar, who merely state that Home had been asked to draw Upendrakishore into the Brahmo fold by a local Brahmo activist, who had been greatly impressed by Upendrakishore and thought that the boy would be a great man one day. See Sukumar Ray, 'Upendrakishore Ray' (1916),

in Satyajit Ray and Partha Basu (eds), *Sukumar Sahityasamagra*, 3 vols (Calcutta: Ananda Publishers, 1989), 3: 77-81, at 78; and Kedarnath Chattopadhyay, 'Satabarshik Sraddhhanjali: Upendrakishore,'*Vishwa Bharati Patrika*, 20, no 2 (1963 [Kartik-Poush 1370BE]): 108-118, at 117.

[7] The 'First Arts' Examination was taken two years after the school-leaving examination. A candidate who had studied for another two academic years after the 'First Arts' at an affiliated institution was eligible to sit for the University's Bachelor of Arts (BA) examination. For details, see *University of Calcutta Calendar*, 1881-82, 33-37. For Upendrakishore's 'First Arts' result, see *ibid*., 1882-83, **95**; and for his BA result, *ibid*., 1884-85, **97** (the lists of graduates were separately paginated with the page numbers in bold). A candidate obtaining between 180-230 marks (out of 500) was placed in the third division; to be placed in the first division, one needed a minimum of 280 marks. See Krishna Chandra Roy, *High Education and the Present Position of the Graduates in Arts and Law of the Calcutta University* (Calcutta: Sanskrit Press Depository, 1882), 10. On the history of the Metropolitan Institution, see Subalchandra Mitra, *Isvar Chandra Vidyasagar: A Story of his Life and Work* (Calcutta: New Bengal Press, 1902), 430-459; Santoshkumar Adhikari, *Vidyasagarer Sesh Swapna: Jatiya Sikshayatan Metropolitan* (Calcutta: Vidyasagar Gabesana Kendra, 1992); Subodh Chandra Sengupta, 'History of the College,' in *Presidency College, Calcutta: Centenary Volume, 1955* (Calcutta: West Bengal Government Press, 1956), 1-35, at 17; and Radharaman Mitra, *Kalikata Darpan*, 2 vols (Calcutta: Subarnarekha, 1980-2004), 2 (2004): 57-60.

[8] Harikishore's widow Rajlakshmi reportedly disregarded the will and divided the estate equally between Upendrakishore and her own son Narendrakishore. The latter, too, agreed to this. See Hitendrakishore Raychaudhuri, *Upendrakishore o Masua Ray Paribarer Galpasalpa* (Calcutta: Firma KLM, 1984), 10-11.

[9] This was reported by his son Sukumar Ray on the basis of Upendrakishore's diary for 1880. The diary is now lost but see Sukumar Ray, 'Upendrakishore Ray' [1916], in Satyajit Ray and

Partha Basu (eds), *Sukumar Sahityasamagra*, 3 vols (Calcutta: Ananda Publishers, 1989), 3: 77-81, at 78. Dwarkin's had been established in 1875 by music-lover and instrument restorer. He had met and befriended Upendrakishore early on and it was, in fact, Upendrakishore who had suggested the name Dwarkin for the business – because, reportedly, he thought that a Western-sounding name would suggest high quality to the Calcutta elite. Upendrakishore gradually became Ghosh's close friend and advisor and provided Dwarkin's with a testimonial in 1889, offering 'every praise for the successful manner in which you have been trying to meet the want of an instrument really suited to the Indian climate.' In 1888, Dwarkin had published Upendrakishore's first book, a 'teach yourself' guide to playing the harmonium, which was followed in 1904 by a similar manual for the violin. In 1894, Upendraksihore had even posed as a model – without his identity being disclosed – in a Dwarkin advertisement. See Jnanprakash Ghosh, 'Dwarkiner Katha', *Desh*, Annual Binodan Number (1980): 143-150, at 145-47; Michael S Kinnear, *The Gramophone Company's First Indian Recordings, 1899-1908* (London: Sangam, 1994), 35-36; Manasi Dasgupta, *Upendrakishore Raychaudhuri (1863-1915)* (Calcutta: Bangiya Sahitya Parishat, 2004), 64; Ghosh, 'Upendrakishore: Silpi o Karigar,' 56, 60; and for the advertisement, *The Hindoo Patriot*, March 17, 1894, 4.

[10] He was always extraordinarily good with his hands and Marie Seton rightly considered this unusual in a boy brought up in a prosperous Bengali household. See Marie Seton, *Portrait of a Director: Satyajit Ray*, expanded edition (Delhi: Penguin, 2003), 22-23. During his college days in Calcutta, he had built a working model of a gyroscope from some bits of wood and a ball and when, later, a plaster death-mask of Rammohan Roy had arrived from England in pieces, it was Upendrakishore who had repaired it with 'extraordinary precision.'See [Ramananda Chatterji), 'The Late Mr U Ray,' *Modern Review*, 19, no 1 (January 1916): 103-105, at 103; and [Ramananda Chatterji], 'Raja Rammohan Roy-er Rajneeti,'*Probasi*, 1, no 3 (Ashar 1308/June=July 1901): 108-112, at 111-12

[http://archiv.ub.uni-heidelberg.de/savifadok/volltexte/2009/946, accessed 17 January 2015].

[11] Upendrakishore's biological mother Joytara, a conventional Hindu, treated Bidhumukhi with warmth and affection but she would never stay under the same roof with Upendrakishore and Bidhumukhi, preferring the household of her orthodox Hindu son, the Sanskritist, mathematician and cricketer Saradaranjan Ray. See Manasi Dasgupta, *Upendrakishore Raychaudhuri (1863-1915)*, 34; Leela Majumdar, *Upendrakishore* (Calcutta: Newscript, 1963), 34; and Leela Majumdar, *Pakdandi* (Calcutta: Ananda, 1986), 162. For a comparable experience, where the parents of a convert accepted him and his Brahmo bride with joy but never ate with them, see Rajanikanta Guha, *Atmacharit* (Calcutta: Jatindranath Roy, 1949), 266-67.

[12] The large house accommodated many tenants who had faced social or family persecution after converting to Brahmoism and was located virtually opposite the temple of the Sadharan Brahmo Samaj. See Radharaman Mitra, *Kalikata Darpan*, 2 vols (Calcutta: Subarnarekha, 1980-2004), 1 (1980): 92-115 and 2 (2003): 24-25. Upendrakishore and Bidhumukhi would live on the first floor of this house for several years and five of their six children – Sukhalata (1886-1969), Sukumar (1887-1923), Punyalata (1889-1974), Subinoy (1891-1945) and Santilata (1893-1919) – were to be born here. The household also accommodated Bidhumukhi's disabled brother Satischandra and, at least for a time, her maternal uncle, the unmarried Brahmo missionary Nabadwipchandra Das (1847-1924). See Adhya, *Upendrakishore Raychaudhuri*, 13; and Majumdar, *Pakdandi*, 100.

[13] As his half-tone business prospered, Upendrakishore's brother Kuladaranjan took over his routine photographic work. See Siddhartha Ghosh, *Chhabi Tola: Bangalir Photography Charcha* (Calcutta: Ananda, 1988), 133.

[14] The expression 'half-tone' was derived from the phrase 'mezzo-tinto,' which was in common use by painters. See John Southward, *Progress in Printing and the Graphic Arts during the Victorian Era* (London: Simpkin, Marshall, Hamilton, Kent & Co., 1897), 77.

[15] Gamble, 'A Wonderful Process,' 87-88.

[16] In the 1850s, the photographic pioneer William Henry Fox Talbot had used layers of muslin or lace as a 'photographic veil' to capture intermediate tones in a photograph; he had even taken out a patent in 1852 for a glass screen that could produce this effect. He does not seem to have pursued the idea and 'the scientific principle and method of breaking up the dots' remained very imperfectly understood until Ives. See William Gamble, 'The History of the Half-Tone Dot,' *Photographic Journal*, new ser., 21, no 6 (February 1897): 126-36, at 127; Carl Hentschel, 'Process Engraving,' *Journal of the Society of Arts*, 48 (April 20, 1900): 461-74, at 463-66; Anne Kelsey Hammond, 'Aesthetic Aspects of the Photomechanical Print,' in Mike Weaver (ed.), *British Photography in the Nineteenth Century: The Fine Art Tradition* (Cambridge: Cambridge University Press, 1989), 163-79, at 165-66; and Josef Maria Eder, *History of Photography* [1945], trans. Edward Epstean (New York: Dover, 1978), 626-38.

[17] Julius Verfasser, *The Half-Tone Process: A Practical Manual of Photo-Engraving in Half-Tone on Zinc and Copper*, 2nd edn (Bradford: Percy Lund, 1896), 12-13.

[18] Later, screens became available in different orders of fineness: from 85-100 lines to the inch for 'rough newspaper printing' to much finer ones (even up to 400 lines per inch) for high-quality work. The finer screens, however, produced good results only when the image was printed on high-quality paper. See N S Amstutz, *Amstutz' Hand-Book of Photoengraving*, 3rd edn (Chicago: Inland Printer, 1907), 137-39; and Estelle Jussim, *Visual Communication and the Graphic Arts: Photographic Technologies in the Nineteenth Century* (New York: R R Bowker, 1983), 69.

[19] See Gerry Beegan, *The Mass Image: A Social History of Photomechanical Reproduction in Victorian London* (Basingstoke: Palgrave, 2008), 78-79; and Southward, *Progress in Printing*, 78.

[20] Gamble, 'A Wonderful Process,' 88-89; Louis E Levy, 'Forty Years of Process Work: Reminiscences,' *Process Work and Electrotyping: Penrose's Monthly*, January 1913, 233-34; and Eder, *History of Photography*, 633-34.

[21] Southward, *Progress in Printing*,21.

[22] Beegan, *The Mass Image*, 37-38, 207-208.

[23] See Siddhartha Ghosh, 'Upendrakishore: Shilpi o Karigar,' *Ekshan*, 16, no 6 (1984): 47-144, at 67-68; and Anathnath Das and Amal Pal (eds), *Upendrakishore Rachanasamagra: 1* (Calcutta: Ananda, 2001), 3-4, 491.

[24] Tapati Guha-Thakurta, *The Making of a New 'Indian' Art: Artists, Aesthetics and Nationalism in Bengal, c.1850-1920* (Cambridge: Cambridge University Press, 1992), 82-83. Lithography came to India in the 1820s and was initially used by the British for the reproduction of maps and charts. It spread quickly into non-official domains and was being used for portraits by mid-century. Colour lithography (chromolithography) was available in India by the 1860s and was extensively used for mythological and religious images. See Jaya Appasamy, "Early Calcutta Lithographs," *Lalit Kala Contemporary*, 31 (April 1981): 13-16.

[25] At that time, the only place in India where half-tone work was done was the Surveyor-General's Department. See 'The Late A Wellesley Turner,' *Process Work and Electrotyping: Penrose & Co's Monthly Circular*, February-March 1907, 9. Later, some Bengali artists and engravers (including the well-known wood-engraver Priyagopal Das) also attempted to produce half-tone blocks, but with little success. See Ghosh, *Karigari Kalpana o Bangali Udyog*, 90-91, 109.

[26] Around 1905, he formalized the division of the estate with Narendrakishore, retaining only the relatively peripheral, less valuable parts of the estate. See Hitendrakishore Raychaudhuri, *Upendrakishore o Masua Ray Paribarer Galpasalpa*, 25-26. Later, he sold parts of his share to pay off debts incurred on his photographic and engraving business. See his undated letter in Ghosh, *Karigari Kalpana o Bangali Udyog*, 93. The remaining portions of the estate continued to be owned by the Rays but seems to have been badly

mismanaged. See Raychaudhuri, *Upendrakishore o Masua Ray Paribarer Galpasalpa*, 89-91.

[27] Siddhartha Ghosh, '*Abol Tabol*: The Making of a Book,' in Abhijit Gupta and Swapan Chakravorty (eds), *Print Areas: Book History in India* (Delhi: Permanent Black, 2004), 242-51, at 243-44.

[28] See Beegan, *The Mass Image*, 6-7, 9, 203-205, 208.

[29] See Guha-Thakurta, *The Making of a New 'Indian' Art*, 86. *Probasi*, over the first three decades of the twentieth century, was the leading general-interest periodical for Bengali *bhadralok* across the entire subcontinent. See Samarpita Mitra, 'Periodical Readership in Early Twentieth Century Bengal: Ramananda Chattopadhyay's *Prabasi*,' *Modern Asian Studies*, 47, no 1 (2013): 204-249, at 215-18, 224, 227, 231, 236; and Guha-Thakurta, *The Making of a New 'Indian' Art*, 213-15, 321. *Pradip*, a magazine Ramananda Chatterji had edited briefly before starting *Probasi*, had been so full of pictures – made from blocks by Upendrakishore – that Rabindranath Tagore had advised Chatterji not to risk bankruptcy by spending so much money on illustrations. See Rabindranath Tagore, 'Samayik Sahitya,' *Bharati*, 22 (1305BE/1898): 762-66, at 766; and Ghosh, *Karigari Kalpana o Bangali Udyog*, 91.

[30] See the famous title essay in Walter Benjamin, *The Work of Art in the Age of Its Technological Reproducibility and Other Writings on Media*, ed. Michael W Jennings *et al.*, trans. Edmund Jephcott *et al.* (Cambridge, MA: Belknap/Harvard University Press, 2008), 19-56, esp. 21-25; and Frances Robertson, *Print Culture: From Steam Press to Ebook* (London: Routledge, 2013), 85.

[31] Guha-Thakurta, *The Making of a New 'Indian' Art*, 68. *Probasi* also provided its readers with translations of European literary classics. See Mitra, 'Periodical Readership in Early Twentieth Century Bengal,' 242-43.

[32] Niradchandra Chaudhuri, *Atmaghati Bangali: Aji Hotey Shatabarsha Agey* (Calcutta: Mitra o Ghosh, 1989), 38.

[33] Editorial, *Modern Review*, January 1907, reprinted in Santa Devi, *Bharat-Muktisadhak Ramananda Chattopadhyay o Ardhasatabdir Bangla* (Calcutta: Dey's Publishing, 2005), 135.

[34] Chatterji turned to his friend Nivedita (the Irishwoman Margaret Noble, who took the name of Nivedita after becoming a disciple of Swami Vivekananda) for assistance in selecting examples of European art and for contributing analytical notes on them. See Ordhendro Coomar Gangopadhyay, *Bharater Silpa o Amar Katha* (Calcutta: A Mukherjee, 1969), 169.

[35] Even before 1908, when *Probasi* and *Modern Review* were printed and published from Allahabad, the half-tone blocks required by the magazines were supplied from Calcutta by Upendrakishore. See Santa Devi, *Bharat-Muktisadhak Ramananda Chattopadhyay*, 210. The first block that Upendrakishore made for *Probasi* was for a picture of Sita by Raja Ravi Varma, which was published in October 1901; in 1903, *Probasi* carried the first three-colour reproduction of a painting in any Indian publication; the painting was again by Ravi Varma and the block by Upendrakishore. See Ghosh, 'Upendrakishore: Silpi o Karigar,' 79-80. *Probasi* (along with its editor and his family) moved from Allahabad to Calcutta in 1908; the magazine was subsequently printed at Hemendramohan Bose's Kuntalin Press. See Mitra, 'Periodical Readership in Early Twentieth Century Bengal,' 220-221.

[36] *Sekaler Katha*, in Anathnath Das and Amal Pal (eds), *Upendrakishore Rachanasamagra: 1* (Calcutta: Ananda, 2001), 155-91, at 157, 166.

[37] See the entry on *Sekaler Kathha* in Gargi Gangopadhyay's website, http://bengalichildrensbooks.org/SekalerKatha.php (accessed 8 November 2011), where Pedler's note is reproduced, along with the full-colour illustration of the Archaeopteryx and the title page of the book. For Varma's comment, see Adhya, *Upendrakishore Raychaudhuri*, 24; and for Holland's praise, Sukumar Ray, 'Upendrakishore Ray' [1916], 80.

[38] In this sense, his grandson was no different. One possible reason for Satyajit Ray's interest in controlling as many dimensions of a film as possible – script, dialogue, casting, camera, lyrics, costumes, music, titles and publicity – was his aspiration to get as far away as possible

from the working methods of the modern film *industry*. Sharmistha Gooptu, *Bengali Cinema: An Other Nation* (Delhi: Roli, 2010) rightly warns us not to exaggerate Ray's distance from the Bengal film industry but for the larger public as well as for Ray himself, the brand-identity of a Ray film was that of a complete work of art shaped by the hands of a single omnicompetent craftsman who, in aesthetic terms, resided far above the banal world of the film industry.

[39] See Upendrakishore Raychaudhuri, 'Half-Tone Chhabi,' *Pradip*, 1, nos 10-11 (Ashwin-Kartik 1305/October-November 1898): 335-38, at 338 (http://archiv.ub.uni-heidelberg.de/savifadok/volltexte/2009/875, accessed 13 May 2014).

[40] See Beegan, *The Mass Image*, 56, 82-93.

[41] Karl Marx, *Capital: A Critique of Political Economy*, vol. 1, translated by Samuel Moore and Edward Aveling, edited by Frederick Engels (London: Lawrence & Wishart, 1970), 308.

[42] See O C Gangoly, 'Indian Society of Oriental Art: Its Early Days,' 99; Gangopadhyay, *Bharater Silpa o Amar Katha*, 154, 159, 298, 466; and on photogravure, Anne Kelsey Hammond, 'Aesthetic Aspects of the Photomechanical Print,' in Mike Weaver (ed.), *British Photography in the Nineteenth Century: The Fine Art Tradition* (Cambridge: Cambridge University Press, 1989), 177-79.

[43] 'The Late Mr U Ray,' 104.

[44] Sukumar Ray, 'Upendrakishore Ray' (1916), 79.

[45] Historian Gerry Beegan remarks that 'practice had preceded theory; process workers knew how the screen worked, even though they didn't know why.' See Beegan, *The Mass Image*, 79; and William Gamble, 'The Last Word on Half-Tone,'*British Journal of Photography*, 51 (June 1904): 501-503, at 501.

[46]Beegan, *The Mass Image*, 79-80.

[47] Gamble, 'A Wonderful Process,' 93-94.

[48] Gamble had first gone into business in partnership with the chemist A W Penrose in 1893 to supply the requirements of photoengravers. See R B Fishenden, 'William Gamble: An

Appreciation' (1933), reprinted in Moran (ed.), *Printing in the 20th Century*, 141-44. In 1894, the Penrose Company became the exclusive agents in Britain for Max Levy's 'epoch-making' screens. See Gamble, 'The History of the Half-Tone Dot,' 130.

[49] Moran (ed.), *Printing in the 20th Century*, 35, 38, 40.

[50] For a discussion of the effects of changing the distance of the screen, see *Photographic Journal*, new ser., 19, no 9 (May 1895): 298-99; and Eder, *History of Photography*, 634.

[51] *Amstutz' Hand-Book of Photoengraving*, 146. On the contemporary influence of this handbook, see 'The Amstutz Handbook of Photo-Engraving,' *Process Work and Electrotyping*, October-November 1907, 9.

[52] [William Gamble], 'A Visit to the Municipal School of Technology, Manchester,'*Penrose's Pictorial Annual* (1903-4): 129-36, at 132. It is not known whether this was done with Upendrakishore's consent or whether he was paid for it.

[53] 'Trade Notes,'*Process Work and Electrotyping: Penrose & Co's Monthly Circular*, June-July 1905, 4-6, at 5.

[54] William Gamble, 'Last Word on Half-Tone,' 503; Gamble, 'The Editor's Notes,'*Penrose's Pictorial Annual: The Process Year-Book for 1904-5*, 2.

[55] William Gamble, 'Last Word on Half-Tone,' 503.

[56] William Gamble, 'Last Word on Half-Tone,' 503.

[57] Upendrakisor Ray, 'The 60°Cross-Line Screen,'*Penrose's Pictorial Annual: The Process Year-Book for 1905-6*, 97-102, at 98; and Gamble, 'The Editor's Notes,'*Penrose's Pictorial Annual: The Process Year-Book for 1904-5*, 2. All of Upendrakishore's papers in *Penrose* have recently been reprinted in Upendrakishore Raychowdhury, *Essays on Half-Tone Photography* (Calcutta: Jadavpur University Press, 2014) but I have used the original versions.

[58] *Amstutz' Hand-Book of Photoengraving*, 107.

[59] Several Rays are supposed to have had their work plagiarized by Westerners. Upendrakishore's brother Muktidaranjan was known to solve mathematical theorems as a

hobby. His niece Leela Majumdar wrote in her memoirs (*Pakdandi*, 115) that he had once sent some of those exercises to a British expert who had sent a routine reply but incorporated Muktidaranjan's equations in the next edition of his own book without any acknowledgement. Yet another incident of this kind happened to Satyajit Ray on his first trip to Britain, but unlike his grandfather or great uncle, he, by his own testimony, stood up for his rights, losing his temper for the first time in his life. See Marie Seton, *Portrait of a Director: Satyajit Ray*, expanded edition (Delhi: Penguin, 2003), 56-57.

[60] For a classic account of scientific simultaneity, see Thomas S Kuhn, 'Energy Conservation as an Example of Simultaneous Discovery,' in Marshall Clagett (ed.), *Critical Problems in the History of Science* (Madison: University of Wisconsin Press, 1959), 321-56. See also Susan E Cozzens, *Social Control and Multiple Discovery in Science: The Opiate Receptor Case* (Albany: State University of New York Press, 1989), esp. 1-44.

[61] For a discussion of the difficulties, see 'A Point in Patent Law,'*Process Work and Electrotyping*, February 1915, 12; and a chartered patent agent's comment on the article in *ibid*., March 1915, 21-22.

[62] Amit Bhattacharyya, *Business, Politics and Technology: Select Themes in the Economic History of Modern India* (Calcutta: Readers Service, 2005), 55-56.

[63] William Gamble, 'The Editor's Notes,' *Penrose's Pictorial Annual: The Process Year-Book for 1904-5*, 2. Later, Upendrakishore became far more careful about patenting his work and when his son Sukumar was training in printing technology in Britain, he sent him the design for a three-colour process camera that he wanted to patent. Unfortunately, as Sukumar reported, virtually every 'possible variation' on that design had already been patented. See Sukumar's letter to his father in *Sukumar Sahityasamagra*, 3: 222.

[64] 'Death of Mr U K Ray,' *Process Work and Electrotyping*, January 1917, 77. See also 'The Late Mr U K Ray,' *Process Work and Electrotyping*, December 1919-February 1920, 122.

[65] 'Trade Notes,' *Process Work and Electrotyping*, June-July 1905, 4-6, at 5.

[66] On these debates, see Partha Mitter, *Art and Nationalism in Colonial India, 1850-1922: Occidental Orientations* (Cambridge: Cambridge University Press, 1994); and Guha-Thakurta, *The Making of a New 'Indian' Art*.

[67] Upendrakisor Ray, 'The Study of Pictorial Art in India,' *Modern Review*, 1, no 6 (June 1907): 544-49, at 545.

[68] Mitter, *Art and Nationalism in Colonial India*, 358-67.

[69] Ray, 'The Study of Pictorial Art in India,' 548.

[70] Seton, *Portrait of a Director: Satyajit Ray*, 30.

[71] Kedarnath Chattopadhyay, 'Satabarshik Sraddhhanjali: Upendrakishore,' 114.