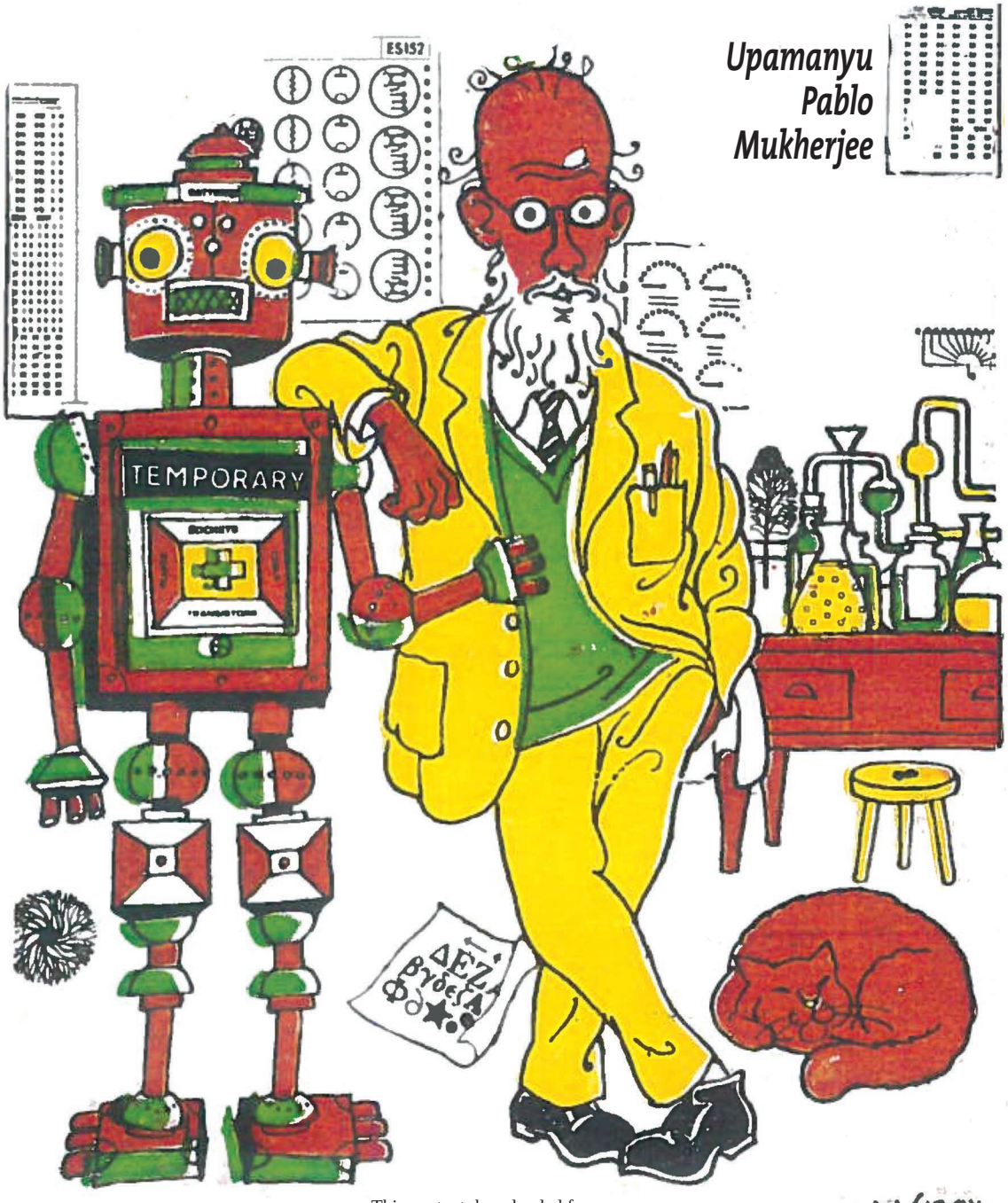
FINAL FRONTIERS

Science Fiction & Techno-Science in Non-Aligned India

Upamanyu Pablo Mukherjee



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Science Fiction and Techno-Science in Non-Aligned India

UPAMANYU PABLO MUKHERJEE

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For Levi, the unbowed.

Acknowledgements

My Indian friends, especially if they are Bengali, usually fall about laughing when I tell them I have spent most of the past four years writing this book. The idea of *researching* about Professor Shonku or Ghana-da merely adds to their conviction that I rarely do any serious work. They are, of course, more or less right about this. Nevertheless, my hope is to persuade a few readers of this book that Indian science fiction, particularly of the kind written during the tumultuous decades immediately after the partition of the sub-continent, has interesting things to say about the relationship between science, technology, literary cultures and (colonial and post-colonial) modernity as such.

Such a claim, resting as it does on the analysis of fiction usually deemed as being too popular to be fit subjects of academic work, cannot be put forward without the help, sympathy and support of institutions, colleagues, friends and family. At my department in Warwick University, I have been sustained as ever by the conversations, shared labour and camaraderie of the members of the WReC collective. The writing and teaching on science fiction done by Graeme Macdonald, Stephen Shapiro, Nick Lawrence and Sharae Deckard, in particular, made me believe it may be possible and indeed necessary to venture beyond the Euro–American segments of the genre. Neil Lazarus, Rashmi Varma, Thomas Docherty, Dan Katz, Peter Mack and Paulo de Medeiros offered an unending supply of wise counsel and much-needed coffee. Maureen Freely as the outgoing Head of Department, and Emma Mason, as the incoming one, between them made sure that I got enough research leave to finish writing the manuscript. The all-star administrative team at our office ensured that I could, more or less, write in peace once that leave came through. Sarah Hodges from 'History-land' convened Warwick's 'Another India' forum with typically irrepressible energy and compelled me to present some early versions of my arguments. I am truly grateful to all of them.

Outside Warwick, a number of national and international scholars indulged me with their time and generous invitations to contribute to their projects. Rhys Williams at King's College, London, Elleke Boehmer at Oxford, Anindita Banerjee at Cornell, Sonja Fritzsche at Michigan State University and Bodhisattva Chattopadhyay at Oslo University, were all kind enough to make space for me in their workshops, lecture series and edited books and journals. Santu Bag of the Bengali science fiction webzine *Kalpabiswa* warmly responded to my questions regarding Adrish Bardhan and, unprompted, shared with me the old issues of *Ashchorjo!* that he and his colleagues are digitizing. With such gestures do kindred fans recognize each other. Swapan and Bhaswati Chakravorty went, as usual, way beyond all calls of duty to help me with my random requests for navigating the potentially tricky process of securing relevant permissions to reproduce illustrations. Moved by their promptings, Subir Mitra, the Managing Director of Ananda Publishers, dispatched the necessary permissions without any delay. The long-suffering librarians of the Bodleian Library, Oxford, continued to deal with my gloomy presence with sunny fortitude.

To misquote C. L. R. James, what do they know of scholarship who only scholarship know? I could not have written a single word of this book without the lessons in everyday existence doled out to me with unfailing patience and solidarity by a legion of friends and family spread across the world. My earliest exposure to the works of Satyajit Ray, Premendra Mitra and others came during the numerous trips to the dingy bookshops and cinema halls of Kolkata with my family. My parents, and especially my mother, made sure for years that I had every issue of *pujabarshikis* – the annual festive numbers of magazines for children and young adults – which teleported me to the world of an eccentric bearded scientist and a rake-thin teller of tall-tales. I remember spending countless tropical evenings with a large gang of siblings and cousins – these kinship groups are not always separately caegorized in Bengal – swapping such stories. Most of these brothers and sisters are now respectably middle-aged, but their eyes still light up at the mention of a classic issue of *Sandesh.* My sister, Kamalika Mukherjee, managed to conjure up some digital copies of this magical magazine for me and also hunted down the Bengali editions of Ray and Mitra. My brother, Uddalak Mukherjee, shared with me his writings on Leela Majumdar and other touchstones of our childhood as well as his enthusiasm for Japanese post-apocalyptic sci-fi. Bhumika Dogra Mukherjee generously shared with me with her astonishing reserves of energy. The Hilton tribe, the Maggie Arms and the Missing Bean crew, my cricket and football team-mates made life in 'Brexit Britain' liveable. Tithi, Shayari

and Bill together wove the strongest possible trans-Atlantic lifeline. After I reached the last line of this book, I thought of one person and one group of people. The person is Eliza, who continues with her unflagging efforts to 'unionize' life itself. The group is made up of the teachers and students in Britain and the US who triggered the strike wave in 2018 against the ongoing destruction of education. Both refuse to believe that the present darkness is the only possible horizon of our times.

Introduction: Science, fiction and the non-aligned world

Back to future

In December 2014, the magazine *India Today* reported on two forthcoming sessions of the annual Indian Science Congress in Mumbai – 'Vedic Mythology about Aviation' and 'Ancient Science Through Sanskrit'. The first featured Captain Anand J. Bodas, a former aircraft pilot, whose paper on 'ancient Indian aviation technology' argued that 'In those days, aeroplanes were huge in size and could move left, right, as well as backwards, unlike modern planes which only fly forward' (*India Today* 2014, n.p.). Citing an allegedly Vedic manuscript as his source, Bodas further argued that these aircrafts were capable of inter-planetary travel, and that it was the passage of time and the colonization of India by successive waves of foreign invaders that had corroded the national memory of such achievements. The report further noted that since the election of the Bharatiya Janata Party (BJP) – the authoritarian Hindu organization – as the country's governing power, such claims regarding Indian antiquity had become common. Recent examples included the head of the Indian Council for Historical Research, Y. Sudershan Rao, arguing that since narrative fiction was a relatively new literary–cultural practice, Indian epics such as *Ramayana* and *Mahabharata* should be properly understood as records of strictly historical facts. Another Indian historian, Dinanath Batra, thought that ancient Indians invented cars as well as inter-planetary aircrafts. Finally, the Indian Prime Minister, Narendra Modi himself cited the example of the elephant-headed god Ganesha to argue that plastic surgery existed in pre-historic India.

With such stellar sessions, the Indian Science Congress of January 2015 attracted much attention. The Calcutta-based newspaper *Telegraph* interviewed an aerospace scientist, Professor H. S. Mukunda, who revealed that Bodas was merely recycling a canard that was at least

four decades old (Jayan 2015, n.p.). It turned out that in the 1970s, Mukunda and a team of scientists and Sanskrit scholars had already analysed *Vyamanika Shastra*, the allegedly antique manuscript that was the source of Bodas's paper, and found that it was written by a modern spiritualist called G. R. Josyar who claimed that it had been dictated to him by his spiritual guide, Pandit Subbaraya Shastri.

Apart from their undoubtedly high entertainment value, these episodes raise some questions pertinent to our arguments below. Granted, the experts making claims for the scientific and technological prowess of pre-historic inhabitants of the Indian sub-continent are in many cases appointed directly by the BJP government to wage what it sees as a culture war to cleanse all traces of 'foreign elements' from the country – chief among which are 'secularism' and 'leftism'. Yet, note that their stories aim to establish the always already *modern* characteristics of India, not to offer a rejection of them. What does this tell us about the role of ideas and practices of science and technology in the formation of post-colonial (and colonial) India? Much of the efforts of India's contemporary Hindu ideologues are directed against what they see as the legacies of the country's first prime minister, Jawaharlal Nehru, whom they portray as a thoroughly 'Westernized' figure, and whose vision of a secular, socialist republic as essentially antithetical to India itself.[1] Science and technology were key to this Nehruvian vision of post-colonial India. But consider Nehru's declarations about ancient India to a gathering of scientists in 1958: 'Whether you go through the *Upanishads* or whether you go through Buddha's words, as reported, always it is a scientific approach, never unscientific. Buddha never asked anyone to accept a single word, if I may say so, just without understanding it, without experimenting and feeling it [….] The whole basis of the Vedas is an experiment, a mental scientific approach' (Singh 1988, 179). Admittedly light on claims about antique space travel, Nehru's submissions about the historically consistent scientific tradition of India, and therefore the invariant modernity of the country, have wholeheartedly been adopted by his opponents and enemies. On this, there is little difference between the famously cosmopolitan and internationalist political leader and his ultra-nationalist, religious fundamentalist successors. I am not interested in arguing (incorrectly, in my view) that this convergence on matters of science, technology and modernity implies a larger congruence between the morally and ethically polarized positions on the Indian political spectrum. I am,

[1] For an account of *Hindutva* critique of Nehru and 'Nehruvian' vision of India see Guha 2005 and Vanaik 2017.

however, interested in what this means for Indian post-colonial culture and, in particular, for popular literary–cultural forms.

This brings me to a second, related question regarding the relationship between fiction and science in post-colonial India. The composition and transmission history of the 'vedic' manuscript, *Vyamanika Shastra*, as discussed by Professor Mukunda (Jayan 2015) raises not only the interesting issue of literary forgery but also the generic specificities of such fakes. The English translation of the text published in 1973 contained a series of illustrations and diagram that would have been immediately familiar to fans of *Star Trek* or of the many UFO narratives that entered global popular imagination long before the Cold War, even if it was precisely during these years that they reached the heights of their mythic powers. The evidence for ancient Indian science and technology, in other words, is distinctly science fictional not only in form (the visual representation of this technology can only appear as 'alien' to our contemporary historical consciousness) but also in terms of the particular generic effects as classically formulated by Darko Suvin – the dialectical interplay of cognition and estrangement triggered by the presence of the literary device of a *novum* in the narrative that is at once radically different from the known world and 'not impossible from the cognitive norms of the author's epoch' (Suvin 1979, viii). If the manufactured antiquarianism of the sanskrit language of the text and the illustrations of the vedic spaceships solicit (albeit a distinctly un-Brechtian) *Verfremdungseffekt* in the contemporary reader, the discussions of the vehicles' physical and operational properties and the technical manuals regarding their manufacture and maintenance tug her back to the world of plausibility and cognition. Perhaps the success of this science fictional effect is precisely what propelled Captain Bodas to the hallowed gathering of national and international scientists in Mumbai.

What then is the relationship between science fiction, science and technology and the post-colonial nation's claim to modernity? This is one of the fundamental problems I want to address here. Given the titular presence of science granted to the genre, it is surprising how infrequently the complex traffic between literary and scientific histories and practices have been studied at any length. This is particularly evident in the case of non-European or post-colonial science fiction. It is not an accident that the very decades when Jawaharlal Nehru designated science as one of the keystones of his nation-building exercise were also the ones that inaugurated what we should think of as the first wave of post-colonial Indian science fiction. Written largely in Bengali, Marathi and other regional Indian languages, this literature tested out not merely the tenets

of 'Nehruvian science', but also the assumptions about modernity coded into its policies and practices. But science was not only a core element of Nehru's domestic strategy. It played an equally dominant role in his aspirations about India's 'non-aligned' role in an international arena defined by the bi-polar Cold War world (dis-)order. This internationally politicized role of science was also the matter with which the writers of Indian science fiction of the era – Premendra Mitra, Satyajit Ray and Adrish Bardhan among them – crafted their stories. What I want to do here, in other words, is to tell the (necessarily partial) story of post-colonial Indian science fiction's location at the confluence of 'Nehruvian' science policy and (inter-)national political strategy. At this point, a caveat may be in order. Although writing literary histories of Indian (and other non-European/American science fiction) is an urgent task, I make absolutely no claims of doing so here. I also make no arguments whatsoever regarding Bengali science fiction's primacy in the development of the genre in India or south Asia. What I *am* interested in is how certain kinds of Indian science fictional writing framed the inter-related problems of science, modernity and modernization at a simultaneously national and international register. The fact that I have largely confined myself to Bengali writing has to do entirely with the limitations of my own expertise. It would indeed be extremely interesting to compare such writing to, say, the Hindi fiction of Ambika Dutt Vyas, Devikanandan Khatri and Durga Prasad Khatri; the Assamese fiction of Hari Prasad Barua, Kumudeswar Barthkur and Saurabh Kumar Chaliha; the Marathi fiction of N. B. Ranade and Jayant Vishnu Narlikar. Such comparisons could well reveal the regional variations, un-evenness and mutations within both the literary sub-field of Indian science fiction *and* the larger process of the modernization of India. But, unsurprisingly, this falls out of the scope of this study and awaits the work of scholars far more able than myself.

The three-world problem

Such considerations of the relationship between science fiction, post-colonial politics and techno-scientific culture are, by definition, not *sui generis* but built on the work of those who have tussled productively and in critical solidarity, with Suvin's foundational thesis. The 'Suvin event' may indeed have inaugurated the academic studies of the genre in the 1970s, but one of the (presumably) unwanted consequences of Suvin's own analytical perspective was a standardization of generic

features derived from the study of a fraction of the genre's (European and North American) content.[2] Once this perspective is broadened to include the tri-continental science fictional productions of Latin America, Africa and Asia-Pacific, it becomes obvious that the critical assumptions about the genre would have to be revised in the light of the diversities, complexities and contradictions of the world it inhabited and reflected upon. What may be the most appropriate designation for this world – 'post-colonial', 'global' or a third designation that is quite distinct, but one that might nonetheless attempt to distil some of the insights generated by the other two while also critically expanding their scope?

A glance at the titles of the essays published over the past two decades in *Science Fiction Studies*, perhaps still the premier scholarly organ in the field, leaves us in no doubts about its 'post-colonial turn'.[3] Arguably, this follows on from the journal's pronounced interventions on imperialism and colonialism throughout the Cold War era.[4] The recent years have also seen a number of monographs take decolonization, colonialism and imperialism as the primary contexts of science fiction's emergence in the world republic of letters.[5] What are the basic assumptions in this literature regarding science fiction's post-coloniality?

First, there is the existence of a long and rich tradition of non-European science fictional texts that have been relatively invisible to European scholars. Surveying the case of Aoteaora/New Zealand, Dominic Alessio suggests that despite featuring Samuel Butler, Anthony Trollope and seminal nineteenth-century space adventures such as *The Great Romance* in its literary history, the region has until very recently not attracted much critical attention precisely because of its colonial past and perceived cultural dependency (Alessio 2011, 258–9). Comparing Hugo Gernsbeck's retrospective invention of a European and North American science fiction

[2] The term is used by Mark Bould to describe the publication of Suvin's essay on the poetics of the science fiction genre and his founding of the journal *Science Fiction Studies* with R. D. Mullen in 1972 and 1973 respectively. See Mark Bould and China Mieville 2009, 18.

[3] From a long list of distinguished publications, I am thinking here particularly of Elizabeth M. Ginway 2005, Rachel Haywood Ferreira 2007, Brian Attebery 2005, Mark Bould 2007 and Joan Gordon 2016.

[4] The Vietnam war and the nuclear arms race in particular provided opportunities for critics to evaluate the relationship between contemporary imperialism/colonialism to the genre. See for example, Albert L. Berger 1978, D. H. Dowling 1986, Rafael Nudelman 1989 and Bruce H. Franklin 1990.

[5] Among these are Ericka Hoagland and Reema Sarwal 2010, Patricia Kerslake 2007, Jessica Langer 2011, Ralph Pordzik 2001 and John Reider 2008.

canon in the 1920s to Latin America, Rachel Heywood Ferreira finds a four or even five decades' delay in the initiation of such a process there (Ferreira 2007, 432). Once again, it is Latin America's colonial past and neo-colonial present and the consequent cultural (semi-)peripherality that Ferreira offers as an explanation for this belated process of canon formation.

Second, these non-European/North American science fiction traditions are understood as ontologically different to their counterparts in the global North. This ontological difference is then in turn shown to demand concomitantly different critical protocols for their analyses. Elizabeth Ginway's observations in this regard is paradigmatic: 'Science Fiction written in the Third World requires critical tools different from those typically applied to European and Anglo-American sf, because the shift in geographical and cultural contexts can force a reinterpretation of the genre's basic premises' (Ginway 2005, 467). Once *difference* is accepted as the presiding (and perhaps the only) frame for comparison between Euro-American and post-colonial science fiction, it leads not only to the quest for alternative interpretations but to a vision of incommensurable worlds altogether. Joan Gordon's overview of the features of Indian science fiction captures this slide with commendable accuracy:

> India's very rich tradition begins not with Mary Shelley or Jules Verne, for instance, but perhaps with the Ramayana (circa sixth-century BCE). It has different definitions and aesthetic principles, a different relationship to fantasy, and a canon that includes Jagadish Chandra Bose and Satyajit Ray rather than Isaac Asimov and Arthur C. Clarke. Its science may be Ayurvedic as well as Newtonian, with triggering events revolving around historical traumas that are different from the Western tradition or from the Chinese. Far from estranging, this alternative history becomes increasingly normalized and familiar the more deeply one considers it. And it demonstrates that there are many alternative histories of science fiction, all equally true. (Gordon 2016, 433)

Third, generic, formal and stylistic unevenness and hybridity are taken as the most distinctive markers of such different or alternative post-colonial science fiction. Typically, these are said to be the result of contact between residual pre-colonial non-literary cultural forms and their post-colonial literary counterparts. Thus, Delphi Carstens and Robert Mer see in contemporary African science fiction the presence of an archaic, mythic mode that is the result of the grafting of myths, magic and oral

story-telling practices on to a literary form (Carstens and Mee 2009, 80–2). This readily recalls Alessio's discussion of the function of Maori myths and Pacific tradition of tall-tales in contemporary science fiction from Aotearoa/New Zealand (Alessio 2011, 266–7), Suparno Banerjee's suggestion of the fusion of indigenous Indian melodramatic theatrical tropes with those of Western 'hard SF' in Bollywood films (Banerjee 2014, 19), and Anwesha Marty's tracing of sanskritic *rasa* mode in the Bengali science fiction of Premendra Roy (Maity 2016, 459–1). In all these readings, the formation of a world literary genre is understood to happen via the adaptation and re-tooling of 'local' forms and styles. This process is then presented as the specific creative gesture of the post-colonial science fiction authors.

Fourth, science and technology are understood as comprising the chief thematic concerns of post-colonial science fiction, where the colonial history and epistemological assumptions of those domains of knowledge are brought into critical dialogue with various indigenous epistemological modes. Bodhisattva Chattopadhyay has parsed the Bengali term of science fiction, *kalpavigyan,* to show that it dramatizes precisely this relationship, which then serves to question scientistic claims of paramountcy among modern knowledge practices (Chattopadhyay 2016, 437). Claire Chambers has made a similar argument regarding post-colonial anglophone writing by taking the example of Amitav Ghosh's novel *Calcutta Chromosome*, in which she sees a problematization of the 'universalist claims of Western science' and the widely accepted notion of the scientist as a heroic individual ushering in epistemological revolutions (Chambers 2003, 58).

Finally, race has emerged both as a significant thematic concern of post-colonial science fiction, as well as a powerful critical tool in excavating the genre's genesis. Much of the work on the intersections between race and science fiction has been the result of the recognition of first the colonial, and then the imperial, nature of the US, particularly in relation to the role played by African slaves and workers in the political and economic transformations of that country. 'Afro-futurism', in particular, has emerged as a name for a distinctive literary and cultural mode that explores African-American concerns in the context of contemporary techno-science (Yaszek 2006, 42). As Mark Bould shows, at its sharpest, such 'Afro-futurist' fiction and criticism have been able to skewer the propaganda about multiculturalism on which much of the US self-image rested during the Cold War era (Bould 2007, 177). Further, the recognition of this mode has enabled the detection of a rich tradition of nineteenth-century African-American authors including Martin Delany, Charles Chesnutt and Edward Johnson who 'shared

interest in representing the changing relations of science and society as they specifically pertained to African American history – including, of course, the history of the future' (Yaszek 2006, 44). This foregrounding of race as a thematic problem and analytical tool has of course been taken up well beyond the US context. Brian Attebery's interpretation of aboriginality in Australian science fiction not only demonstrates the genre's interrogation of race relations in that country, but also the racialized modes of scientific and technological developments as such (Attebery 2005, 387–8).

Useful and salutary as this 'post-colonial' turn has been in expanding the creative and critical horizons of science fiction, it has offered predominantly two senses of the 'post-colonial' world. The first is the chronological sense denoting the end of formal Euro-American colonial and imperial rule, while fully acknowledging the new and evolving modes of global domination by those same powers. The second is the perspectival sense usually associated with academic post-colonial studies, one in which it is *both* 'writing as that which critically or subversively scrutinizes the colonial relationship [….] that sets out in one way or another to resist colonialist perspective' *and* a 'condition in which colonized peoples seek to take their place, forcibly or otherwise, as historical agents in an increasingly globalized world' (Boehmer 2005, 3). It is not so much that the world is 'post-colonial' (with or without the hyphen), but it is more that the latter names it as a condition as well as a particular way of interpreting it.

Is 'global', as implied in Boehmer's definition above, then, an appropriate name for the world in which science fiction makes its home? Such indeed seem to be the inclination of the editor of a recent special issue of *Science Fiction Studies*. Briefly surveying the history of the term 'globalization', he notes that the term's various inter-related meanings since the 1960s have all more or less settled around a notion 'of the expansion and intensification of social relations and consciousness across world-time and world-space' (Higgins 2012, 370). Against this, the various authors of this issue understand 'globalization as a specific development in the unfolding of capitalist world markets that creates differential regimes of political, economic, and cultural interconnection in an increasingly internationalized global context [….] a process linked to the imperial expansion of global capitalism in both colonial and post/neo-colonial contexts' (Higgins 2012, 370). Thus, along with this discussion of the historical and material conditions that give birth to the 'post-colonial' conditions and perspective (as well as to science fiction) comes debates about the processes of modernization that unfold across time and space and their formative relationship to popular literatures and cultures.

Considering the contradictions of these processes, Istvan Csicsery-Ronay, Jr. understands 'global' science fiction as the archive of narratives that seduces a readership into enjoying fiction about 'whatever conjunction of intellectual and technological tools is effective for asserting instrumental political power on the global stage' (Csicsery-Ronay 2012, 489).

Now, compare Csicsery-Ronay's understanding of 'global' science fiction to that proposed in the pages of the same journal a little over a decade ago. While globalization then was still understood as 'American-style market-capitalist hegemony', the attention had then fallen on 'how many national traditions we have ignored; how many important writers, even in the heart of Europe, we have neither translated nor read; how many "classics" we have forgotten' (Anon. 1999, 1). Instead of educating the readers in the pleasures of globalization, the essays in these earlier twin issues of the journal proposed that a number of the 'national' science fiction traditions operated precisely on the principle of subjecting that hegemonic concept to scrutiny. Be it Karel Čapek in the case of Czechoslovakia (Kinyon 1999, 379–400), Lao She in China (Huss 2000, 93) or Kobo Abe in Japan (Tatsumi 2000, 106–17), these 'national' traditions were understood to have become 'global' precisely by opening up 'globalization' and its constitutive elements such as modernization and 'development' to critical reflections. To put it another way, in a world fractured into seemingly incommensurable parts by the economic and political logic of capitalism, the imaginative work performed by 'global' science fiction was understood as offering to the readers a fleeting glimpse of a totality where the actually existing relationship between these parts become ineluctable. For Eric D. Smith, it is precisely because colonialism and imperialism are specifically political modes of the globalization of capital that science fiction should be thought of as a global genre: 'Born in the imperialist collusion of cultural identities and taking as its formal and thematic substance the spatial dislocations that inhere in the imperial situation, science fiction would seem the ideal instrument with which to engage critically the transition from the postcolonial to that of globalization' (Smith 2012, 4). Thus the world of science fiction turns out to be 'global' or 'globalized' and there is much to commend in these discussions that see modern capitalism as the historical horizon of the genre. But at this point, two further questions arise that seem to fall outside the scope of this particular critical paradigm. One, *when* did this world come into being? Smith seems to imply a temporal sequence ('transition from') where 'post-colonial' happens before 'globalization'. But how can this be maintained if colonialism and imperialism are co-eval with capitalism's assumption of a global form? Two, *how* does science fiction, critically or otherwise, register this world?

Many of the assumptions of science fiction's 'global' characteristics have been derived from earlier discussions about the genre's utopic impulses. Raymond Williams's careful examination of the relationship between what for him are two distinct modes – utopic and science fictional – have had a decisive influence here. Williams suggests that of the four types of the utopic mode, it is only two – those about 'willed transformation' and about 'technological transformation' – that properly engage with the problem of science, whether 'applied' or in the more general sense of 'scientific spirit' (Williams 1978, 204–5). For him, the central problem of such writing is that of modelling large-scale social transformations, a problem that was named Utopia in Thomas More's foundational text. As such, Williams concludes that the genre flourishes in two kinds of historical situation – either at the moment of the consolidation and confidence of a rising class or class fraction when it knows 'down to detail, that it can replace the existing order'; or at the point of their decline when the collective despair at the loss of power and status is channelled into frantic imaginative search for alternative worlds where such catastrophes can be halted or reversed. The two dominant strains within science fiction correspond to these socio-historical moments: 'The systematic mode is a response to tyranny or disintegration; the heuristic mode, by contrast, seems to be primarily a response to a constrained reformism' (Williams 1978, 208).

Williams's thoughts provide an immediately convincing answer to the first question I raised above in relation to the periodization of 'global' science fiction. When was 'global' science fiction? It seems long before the formation of 'globalization' as conventionally understood today, and almost as soon as capital's imperative towards accumulation began obliterating the boundaries of late feudal states.[6] It is the class dynamics of a historical system of production characterized above all by periodic crises of accumulation that is captured in this literature of transitions and transformations. This thesis is bolstered by bibliographical scholars like Lyman Tower Sargent who have tracked the thematic changes in utopian fiction from the sixteenth to the nineteenth century – from those in the relationship between religious and secular authorities, men and women, science and knowledge, legislative and judiciary powers and, finally, in a great flowering between 1800 and 1887, between 'political economy' and social justice (Sargent 1976, 276–8). The cross-pollination of science fiction and utopia seems to have grown apace with the enlargement of the

[6] A classical analysis regarding the relationship between globalization of capital and imperialism can be found in Brenner 2006, 83–5.

capitalist world. And the more concretely this world was realized, the more indispensable became the critical function of science fiction not because they provided bullet-proof blue-prints of alternative ways of life, but rather because they dramatized the struggles to bring such blue-prints into being and the material and ideological blockades against them (Moylan 1982, 163).

What of the second, related question regarding the way in which such texts achieve their effect? Here too, scholarship on utopia as such and utopic science fiction provides a compelling case. If the dialectical interplay between cognition and estrangement is fundamental to the genre's critically negative work, this is achieved primarily by its re-combination or re-tooling of narrative codes in such a way that hitherto distinct and distant representational language are brought into a shocking proximity. Recall here Jameson's discussion of this strategy already visible in More:

> Greece, the medieval, the Incas, Protestantism: these are the four crucial elements of More's Utopian text, the four raw materials of its representation. Utopia is a synthesis of these four codes or representational languages, these four ideologemes, but only on condition it be understood that they do not fold back into it without a trace, but retain the dissonances between their distinct identities and origins, revealing the constant effort of a process that seeks to combine them without effacing all traces of what it wishes to unify in the first place. (Jameson 2005, 25)

These formal or generic discontinuities are what lends utopic science fiction texts their open and processual character. The works of Joanna Russ, Ursula LeGuin and Marge Piercy recall More's across the span of four centuries in their experimental registers where such discontinuities assist in the reversal of realist principles that usually accord primacy to plot and character over setting (Moylan 1982, 45). This attention to the formal strategies of utopic science fictional narratives echo what we heard in the discussions regarding the genre's 'unevenness' and 'hybridity' after the 'post-colonial' turn. But whereas there these were largely descriptive terms, here they gain in their analytical focus because of the attention paid to the historical logic of their production. For the interplay of discontinuous narrative codes and language, far from being random, achieve their effect precisely because they distil within them distinct historical modes of production whose co-eval existence is made startlingly apparent to the reader precisely when s/he had assumed the obsolescence of one and the permanence of the other (Moylan 1982,

43, Jameson 2005, xii–xiii). In this sense, utopic science fiction behaves exactly like a time-machine that enables its reader to momentarily become a Benjaminian angel of history, unable to defer the knowledge of the unfailing relations between the past, present and the possible futures because of the remorseless image of totality tattooed on her inner eyelids by the text.

We may now begin to propose a third designation for a science fiction distinct from 'post-colonial' and 'global' without dismissing the insights offered by these terms. If we enumerate what have thus far emerged as the key markers of the genre – the capacity for a dissonant combination of narrative codes and language, the efflorescence during moments of transition and crises over the long history of capitalism's global entrenchment, the modelling (in either utopic or dystopic modes) of the limits and possibilities of resolutions to such crises, the foregrounding of one of the principle modes of modernization – techno-science – as a thematic problem and thereby opening up assumptions about modernity to interrogation – they all seem to meet the definition of 'world literature' thrown up by recent energetic critical exchanges.[7] There is no need to reproduce the details of this already decade-long disciplinary debate, but some of the key points relevant to our discussion here may be noted immediately. First, there is no longer any need to think of the relationship between Euro-American and non-European science fiction in terms of dependency or belatedness. Rather, we can think of the latter being in accordance to a general tendency in literary and cultural forms of the modern world to re-functionalize, in Franco Moretti's channelling of Roberto Schwarz's thoughts, 'foreign form, local material – *and local form* [….] foreign *plots*, local *characters*, and then, local *narrative voice*' (Moretti 2000, 65). Second, it is this re-functionalization or re-combination of local and non-local literary and cultural forms that gives the genre its dissonant register and triggers the interplay of cognition and estrangement. Third, this formal registration is precisely what signals the genre's coming into being through uneven processes of modernization. Put in terms of the Warwick Research Collective (WReC), much of both European and non-European science fiction can be understood as a 'world literary' genre:

> We are chiefly interested in the literary registration and encoding of modernity as a social logic. We are operating therefore with a preliminary tripartite conceptualization – modern world-system/

[7] See, in particular, Franco Moretti 2000 and 2003; Prendergast 2004; Casanova 2004; Apter 2013; WReC 2015 and Cheah 2016.

> modernity/world-literature – in terms of which the latter is understood in the broadest sense as the literature of the modern capitalist world-system. We understand capitalism to be the substrate of world-literature [….] and we understand modernity to constitute world-literature's subject and form – modernity is both what world-literature indexes or is 'about' and what gives world-literature its distinguishing formal characteristics. (WReC 2015, 15)

Finally, like other world literary genres, science fiction's imaginative registration of the modern world it inhabits includes perceptions of the systemic political and economic relationship *between* the nation-states as well as those *within* them. An important corollary of this is not all science fictional texts in the long history of the genre have been 'world literary', although they always have had the potential to be so. As Immanuel Wallerstein reminds us, a world system is not always the same as the world in its entirety (Wallerstein 2011, 15). This therefore has spatio-temporal implications for 'world literature' and world literary genres such as science fiction, in so far as it has limiting functions to our questions of *when* and *where* the genre flourishes. But at least since the nineteenth century, with nearly every inhabited and inhabitable earthly space becoming subsumed under nation-statist and capitalist (whether of 'free market' or 'state' varieties) logic, science fiction has acquired a 'world literary' dimension. This is certainly so in the case of the mid-twentieth century Indian literature we will look at here. To proceed with this understanding of the writings of Premendra Mitra, Satyajit Ray and others is emphatically not a matter of being on-trend with the latest academic literary theories, the fortunes of which obey the logic of cultural and academic capitalism's own periodic crises of accumulation.[8] Rather, it is directed by the writings themselves, which constantly demand a widening, deepening and finessing of the act of interpretation itself. If this sounds like a rather grandiose claim for writing that is usually thought of as juvenile, popular, para-or even sub-literary, the test of such claims should begin by filling in some details of the corner of the world it inhabits.

[8] For a discussion of cultural and academic capitalism see Bourdieu 1984 and 1988; Guillory 1993; Slaughter and Leslie 1997.

Non-aligned science

As in the case of science fiction criticism, the analyses of the cultures and practices of science that has gained academic reputation for over at least half a century now under the name 'science studies' has experienced its own 'post-colonial turn'. Interestingly enough, unlike some of the work in the former category, the latter has been alive to the historical and material conditions of its object of analyses. Warwick Anderson's call for a 'post-colonial science studies' is explicit in this regard:

> A postcolonial perspective suggests fresh ways to study the changing political economies of capitalism and science, the mutual reorganization of the global and the local, the increasing transnational traffic of people, practices, technologies, and contemporary contests over 'intellectual property' [....] We hope that a closer engagement of science studies with post-colonial studies will allow us to question technoscience differently, find more heterogeneous sources, and reveal more fully the patterns of local transactions that give rise to global, or universalist, claims. (Anderson 2002, 643)

Although Anderson is subsequently a little too quick to adopt some of the familiar slogans of literary post-colonial studies, such as 'alternative modernities', 'provincializing reason' and 'hybridization', without considering how they might trouble his analytical commitment to the 'political economies of capitalism', he does emphasize the need to hold the 'metropole and the post-colony in the same analytic frame' (Anderson 2002, 643).

An essential element of this perspective is a rigorous interrogation of the diffusionist models of economic development or modernization that assumes the gradual spread of a networked system of science, technology and capitalism from a Euro-American core to various global peripheries. Instead, it is the uneven growth and distribution of this system that is now understood as its defining feature. Sandra Harding suggests that the emergence of this challenge to hitherto normative understanding of modern 'development' became possible only with the inauguration of a particular political formation – that of the 'non-aligned' Third-World nations during the era of the Cold War. Specifically, it was when the political and intellectual leaders of the former colonies began to formulate their own strategies regarding science and technology that the 'epistemological underdevelopment' of modern Europe and America – that is, the poverty of the understanding of the history and conditions of forms of knowledge associated with these zones – became

evident (Harding 2011, 3). This counter-intuitive thought is related to another one – that 'modernization' and 'Westernization' are not identical processes since the former always takes distinctive non-European local and regional forms (Harding 2011, 9). The heuristic power of such shifting paradigms for Third-World nationalism may be readily granted. But one of the most enduring results of these interrogations has been the revelation regarding the centrality of techno-scientific development to *all* ideologies of modernity as such. Asian, African and Latin American thinkers may have succeeded in questioning its Euro-American origins, but its status as a social good and even as a desired 'end of history' remained largely unchallenged:

> Even those who opposed the prevailing capitalist strategies were obliged to couch their critique in terms of the need for development [….] Development had achieved the status of a certainty in the social imaginary [….] The fact that most people's condition not only did not improve but deteriorated with the passing of time did not seem to bother most experts. Reality, in sum, had been colonized by the development discourse. (Escobar 2011, 271)

A second key outcome of the 'post-colonial turn' in science studies has been the exposure of the astonishing extent to which modern science and technology have been driven by the logic of militarization long before, albeit especially during, the Cold War. Eighty per cent or more of the US federal science budget between 1945 and 1957 was devoted to projects related to 'national security' issues, and remained at comparable levels in the following decades (Sarewitz 2011, 404). The model of the research university where both the theoretical and applied versions of techno-science are developed with direct funding and subsidies from the national defence departments was of course most visible in the US, but hardly confined there:

> The scientific–military nexus entrained – and sustained – all sectors of the post-War research enterprise. From the perspective of those who designed and built this enterprise, the important functional distinction in science was not between basic and applied, but between classified and unclassified. The knowledge-production process was viewed not in terms of particular disciplines of basic science, but specific outcomes of military needs. (Sarewitz 2011, 404)

The most visible products of this nexus of security/defence and techno-science, of course, were the nuclear bomb and space race – both of

which entered science fiction as indispensable thematic matters. Instead of demarcating a before-and-after stage in the political dispensation of the late-modern world (say, first colonial and then post-colonial), Hiroshima and the proliferation of nuclear weapons that followed can be thought of as events that conjugated – that is both changed and preserved – Euro-American global power (Hecht 2002, 693). For instance, the scientists and technicians who went from Europe and the US to the former colonies in Africa to extract and process raw minerals such as uranium needed for the making of nuclear weapons, often did so with some awareness of the social and cultural implications of the declarations of independence of their former colonies and the corresponding requirement for themselves to behave differently from their predecessors. But the very scientific processes they instigated and supervised, preserved and even invigorated those very power relations that formal independence at least in theory sought to eliminate (Hecht 2002, 694–718). Much of the energies of the Third-World leaders were devoted to neutralizing such colonialism by other means. In the same way, the synchronicity of the space race and the great decolonization movements of the mid-twentieth century showed how the former was in many ways an attempt to preserve the shadow of empire precisely at the moment it seemed to be fading from all corners of earth. The wholesale importation of the classic colonial and imperial adventure tropes into Cold War space programmes served to figure space not only as the final frontier, but as a potentially unlimited one that could accommodate an endlessly expanding horizon of racist and imperialist masculinities (Redfield 2002, 795–6). Again, one of the major challenges of the Third-World national techno-scientific policies was to decide on what terms they could or should engage with such neo-colonial star wars.

The third major consequence of the arrival of the post-colonial sensibilities in science studies is the comparative evaluation of science with adjacent modes of knowledge and the attendant questioning of the former's claims of epistemological supremacy. As we saw in the examples of the current vogue for 'vedic science' in India (as well as in its Nehruvian variants) this does not necessarily involve the rejection of 'science' and its 'others', but an abrupt yoking of them in such a manner that their conceptual limits become startlingly visible. The Hindu supremacists who dominate the Indian state and nation today do not renounce science, technology or modernity, but rather argue that India was always already scientific, technological and modern (those glorious days of antiquarian space travel!). Banu Subramaniam sees in this a figure of thought that she calls an 'archaic modernity' that is above all evidence of the modern colonial and imperial entanglements with science and technology in the

sub-continent (Subramaniam 2000, 73–4).[9] Since under such conditions where science, secularism and the 'modern West' were bundled together on one side of the civilizational ledger and superstition, religion and oriental primitivism on the other, the *ressentiment* of a post-colonial nationalism (in stark contrast to an *anti*-colonial one) is expressed in the aggressive adaptation of the former set of positions to enhance rather than negate the claims of the latter.

But the adjacencies of colonial and pre-colonial modes of knowledge – whether scientific or not – need not be the exclusive prerogative of a regressive and reactionary nationalism. It can also produce a more historically nuanced model of a differentiated field of knowledge. By showing how European, Jain and Buddhist philosophies all share a common view of scientific practice as 'a well-ordered epistemic culture facilitating the production of public knowledge', Janardan Ganeri and others have argued for a 'polycentric history' of global science (Ganeri 2013, 350). Indeed, such a perspective goes beyond demonstrating the common philosophical bases of European and non-European sciences to suggest that they are alike in their methods and practices also. Since detailed studies of their skills, processes and instruments show that far from being the product of considered European or Enlightenment rationality, scientific practices everywhere are always 'contingent, negotiated and situated', Kapil Raj thinks we should see science as a field defined by 'circulation, flow, mutation and reconfiguration' (Raj 2013, 344). While always attentive to the interferences run by unequal power distribution, such circulatory model of science acknowledges the agency (albeit of different kinds) of all those involved in the production of knowledge.[10]

These insights are useful in understanding how science and technology were perceived in south Asia and other parts of the world during the crucial decolonizing decades of the mid-twentieth century. The ideologies of modern development, the militarization of science and the location of scientific practices in a polycentric, uneven, field of knowledge, were all essential components of the thinking of India's first prime minister Jawaharlal Nehru, who saw the cultivation of a scientific culture as one of the pre-conditions of fulfilling the dreams of India's emergence as an independent global power. In the fullest account we have thus far of 'Nehruvian science', David Arnold has identified five key features. First,

[9] See also Subramaniam 2019 for further discussions about the entanglements between practices of science, Hindu nationalism and 'developmental' imperatives.

[10] For further discussion of the importance of studies of actually existing scientific practices in India see Phalkey 2013, 330–6.

it was a programme of socio-cultural changes covering issues ranging from hunger and poverty to insanitary habits. Second, it was a 'state science' – 'conducted for the people but at the direction and discretion of the state'. Third, it was committed to building institutions. Fourth, it was both nationalist and internationalist in scope – a 'vehicle for the nonaligned movement in which Nehru was so pivotal a figure'. Finally, it was a historiographic project – 'a systematic attempt to rewrite the history of science in (and for) India in ways that illustrated the long history of science in India and its formative role within Indian civilization' (Arnold 2013, 366–8). Arnold properly cautions both against designating as 'Nehruvian' all aspects of Indian scientific culture, as well as limiting it to the three decades during which Nehru presided over the country. 'Nehruvian science' began long before the 1940s, especially, as Robert Anderson notes, in the institution-building work of scientists like Meghnad Saha whose emphasis on planned development and popularization of science through the publication and circulation of journals would be endorsed and adapted by the prime minister. Even before Saha, one can trace these impulses to nineteenth-century nationalists such as Mahendra Lal Sircar who advocated the construction of an advanced research institute in Calcutta in 1869, Rajendra Lal Mitra who dedicated himself to translating techno-scientific terms into Bengali in 1877, Prafulla Chandra Roy who established the pioneering Bengal Chemical and Pharmaceuticals factory in 1893 and Asutosh Mukherjee who was instrumental in securing Saha's academic career.[11] However, that Nehru used his political capital and power to secure unprecedented centrality to science and technology in the social and cultural life of India is probably undeniable.

This is not to say that Nehru ever held consistent positions regarding the key aspects of science and technology – 'development', militarization and relative epistemological values of science and other kinds of knowledge – at any point during his life. But the fluctuation and contradictions in his thinking show precisely the historical contingency of post-colonial science and its inevitably politicized conditions. These were particularly sharp in his struggles to understand science both as a marker of modernity and as an embodiment of its antinomies. In the letters to his daughter Indira (who would one day succeed him as

[11] For an outline of the centrality of science and technology in the Indian nationalist movement, see essays by Uma Dasgupta, Arun Kumar Biswas and Pratik Chakrabarti in Dasgupta 2011. For a thorough account of Nehru's intense but often tumultuous relationship with Meghnad Saha, see Robert S. Anderson 2010, especially 160–3 and 239–42.

the prime minister of the country) written from a British jail in the 1930s, Nehru expressed both his enthusiasm for the 'miraculous' work of contemporary scientists and bemoaned the 'mad race' for innovations that made their work obsolete long before their effects could be properly assessed (Singh 1988, 3–7). He was already alive to the dubious effects of the division of labour in the practice of science:

> Tens of thousands of investigators work away continuously, each experimenting in his particular department, each burrowing away in his own patch, and adding tiny bit by bit to the mountain of knowledge. The field of knowledge is so vast that each worker has to be a specialist in his own line. Often he is unaware of other departments of knowledge [….] It becomes difficult for him to take a wise view of the whole field of human activity. He is not cultured in the old sense of the word. (Singh 1988, 8–9)

Nearly two decades later with the coming of independence Nehru would commit himself to building research laboratories, the kinds of spaces that housed and bred exactly such specialists. But his early misgivings about science's paramountcy in the field of knowledge would remain throughout his life. Typically, as we have seen before, they would be expressed in his comparisons between science and religion, the latter often coded as 'tradition' or 'conservatism' in his speeches and writings. Sometimes, as in the case of his contrasting of *Ayurvedic* and modern medicine to a gathering of health ministers in 1950, these categories would be presented as irreconcilably opposed on the grounds of rationality (Singh 1988, 84). At others, he would stress the complementarity of both:

> Perhaps there is no real conflict between true religion and science, but if so, religion must put on the garb of science and approach all its problems through the spirit of science. A purely secular philosophy of life may be considered enough by most of us. Why should we trouble ourselves about matters beyond our ken when the problems of the world insistently demand solution? And yet that secular philosophy itself must have some background, some objective, other than merely material well-being. It must essentially have spiritual values and certain standards of behaviour, and, when we consider these, immediately we enter into the realm of what has been called religion. (Singh 1988, 23)

We have seen before how these attempts at folding science and religion together would later mutate into the claims about scientific Hinduism.

But unlike these latter-day saints, Nehru rightly thought of these considerations as effects of the radically compressed experience of modernization, mid-wived by colonialism, in India:

> Because, in the final analysis, In India we are trying to jump a few centuries – a few centuries of not only living conditions but to some extent of mental outlook. […] In fact, one finds this often even among, if I may say so with all respect, intellectual people. One is surprised that although they function in a different – in a more modern way, If I may use the word – still the old habits of functioning in a rut remains at the back of their minds. (Singh 1988, 228)

This is precisely what Subramaniam alludes to in her formula of 'archaic modernity'.

The historical correlative of such intellectual development was most painfully evident for Nehru in what he called 'a strange mal-development' of India, which he memorably likened to the monstrous figure of a man five-feet tall lumbered with arms four-feet long (Singh 1988, 113). This alleged disfigurement was often debated within his own party, the Indian National Congress, in terms of the proper way to industrialize where a 'Gandhian' line was seen as running counter to Nehru's emphasis on centrally planned industrial growth.[12] Nehru himself always denied, as in his letter to Aldous Huxley, that this was a valid premise for such a debate. He admitted that while Gandhi favoured decentralized, small-scale industries, they were entirely in agreement about the crucial function industrialization had to play in India (Singh 1988, 16). But for him industrialization needed more than anything the development of human capital and this is where the cultivation of a public scientific culture became crucial. In a cabinet secretarial paper written months before the declaration of independence, he estimated that India was using less than 1 per cent of what he called 'scientific manpower' (Singh 1988, 49). In 1952, he would rebuke those who thought development could be magically provided by the state:

[12] These debates about the right way to industrialize were not confined to Indian political parties. Indian scientists, especially key figures like Meghnad Saha, Shanti Bhatnagar and Homi Bhabha, saw the issue as central to India's sovereignty and their complex relationship to Nehru was determined to a large extent by the different positions they took on this. See Anderson 2010, 16, 81, 87–9, 130.

> Industrialization is important, no doubt, but I have sometimes got the idea that many of our business magnates – owners of factories and industries etc. – think of industrialization as some mechanical process like putting some penny in the slot machine – you put money in one end and industrialization comes out of the other end [….] Money has some importance in this life, but I think it is terribly overrated and the sooner we realize that, the better. One wants money to do things. You cannot, unless you have got the right men, the right competence and the right way to do many things. (Singh 1988, 102)

It was a core function of 'Nehruvian science' to produce such 'right men'. Nehru was fond of recounting an anecdote about his visit to the giant Damodar Valley dam project, when he claimed he had rebuked an enthusiastic engineer for failing to explain to the illiterate labourers what it was they were toiling to build. The famous scientific policy resolution that he championed in the Indian parliament aimed to 'foster, promote and sustain, by all appropriate means, the cultivation of science, and scientific research in all its aspects' both to produce the appropriate scientific and technical personnel and to 'secure for the people of the country all the benefits that can accrue from the acquisition and application of scientific knowledge' (Singh 1988, 158). Nehru saw techno-science driven development as primarily an organizational issue. The better the state was able to organize a scientific culture, the more sustained the nation's development would be. As Escobar has shown, the pervasive grip of the idea of 'development' on the social imagination, even or particularly of, the leaders of the Third World, meant that its normative status was not seriously challenged. But Nehru's private letters to his daughter provide evidence for his early doubts about any pre-ordained ability of modern science to deliver development and these remained alive despite his energetic public declarations to the contrary.

Perhaps the most contested aspect of 'Nehruvian science' was its militarization, and especially, its commitment to nuclear weaponization. As Robert Anderson has so thoroughly demonstrated, India was unusual in so far as long before independence it already possessed a scientific community with an advanced theoretical knowledge of nuclear energy, as well as sensitive information about the secret weapons programme of both the global superpowers emerging from the rubble of a world war (Anderson 2010, 1–2). Arguably, much of India's programme for building scientific institutions after independence had its origins in the institutional and personal networks built by these scientists within and outside

the country from the 1930s onward. Nehru himself had been inducted into this network by the late 1930s when he accepted the invitation of Meghnad Saha (spurred on by the intermediary urgings of Rabindranath Tagore) to become the chairman of the national planning committee of science and culture – a body charged with building feasible models of scientifically planned development of an independent country in the future (Anderson 2010, 84). Saha extended the invitation to Nehru on the grounds that other than Gandhi, no one else commanded the same kind of political capital in India as he ('first in war, first in peace'). But it was precisely Nehru's political acumen that would be challenged by the Janus-faced nature of nuclear power – at once a potential source of energy required for peaceful nation-building and the pre-eminent weapon of the Cold War world.

Saha had himself eloquently articulated this problem in a series of essays he wrote in the wake of the Manhattan Project and the decimation of Japan. On the one hand, he was full of praise for the process of planning and building nuclear weapons because it could work as model for a well-functioning 'state science'. If a team of well-chosen scientists was selected for studying a problem in an objective way, and directed to find out the remedy, and if sufficient funds and power be placed in its hands to execute plans, it can be trusted to solve problems of reconstruction that baffle the professional politician (Anderson 2010, 128). On the other hand, such heroic labour could clearly result in appalling crimes against humanity – 'No greater vile or criminal application of a great and magnificent scientific discovery could have ever possibly been made. This has rudely shaken the conscience of the scientists today and they are gradually becoming alive to their responsibility' (Anderson 2010, 128). Perhaps so. But scientific consciences were easily over-ridden by the calculus of local, regional and global political imperatives, and this was where someone like Nehru was called upon to make difficult decisions.

India's commitment to nuclear power posed two over-riding challenges to Nehru's declared intentions regarding the kind of society he wanted to build. Could the secrecy required for nuclear research be squared with the transparent and accountable democracy he said he wanted to build? And how could India set a course for a non-violent foreign policy that was non-aligned to the Cold War superpowers if the government was involved in the international trade of fissile material and transfer of weapons technology? The question of secrecy was a particularly knotty one for Nehru the parliamentarian. When pressed by his colleagues, such as the minister of finance, C. D. Deshmukh, about the spiralling cost of the Atomic Energy Commission, he claimed to know nothing about how the organization worked, but at the same time provided him

with summaries of the reports of the meetings as well as the details of the budget for the nuclear programme (Anderson 2010, 200). Later, he admitted that secrecy and science did not go well together, but it was the unfortunate result of how the great powers compelled India to behave: 'Those other countries are more advanced than we are, and if we have any association with them in regard to this work, they want us to keep it secret, even if we do not' (Anderson 2010, 200). He repeated this line in the tumultuous passage of the Atomic Energy Bill through the Indian parliament in 1948:

> We have, therefore, ourselves proceeded somewhat cautiously, that is to say, in the sense that research work cannot be as public as normal scientific research work ought to be. Firstly, because if we did that may be the advantage of our research would go to others before even we reaped it, and secondly it would become impossible for us to cooperate with any other country which is prepared to cooperate with us in this matter, because it will not be prepared for their own research to become public. Therefore, this Bill lays down that this work should be done in privacy and in secrecy. (Singh 1988, 60–1)

But it was clear from the outrage of many of his colleagues that nuclear toxicity had a tendency to contaminate democratic practices.

Nehru's defence of secrecy on the grounds of India's entanglement with global superpower politics thus raised profound questions about his much-vaunted non-violent, non-aligned foreign policy. He had been struck by the possibility of developing an international alliance between former colonies in the legendary Brussels congress of 1923 and had outlined the principles of such a strategy in the Asian Relations conference that he convened amidst the gathering clouds of the disastrous partition of India in 1947 (Brecher 1998, 341–2; Edwardes 1971, 109; Gopal 1975 vol. 1, 544–5). His most explicit statements about the non-aligned movement, of course, came at the Bandung conference of Asian and African nations in 1955 – an event he did much to convene and that is now commonly accepted as the landmark moment in the formation of the Third World:

> We are not, I hope, yes-men sitting here to say yes to this country or that, saying yes even to one another. I hope we are not. We are great countries of the world who like having freedom, if I may say so, without dictation. Well, if there is anything that Asia wants to tell the world, it is this: there is going to be no dictation in the

> future; no "yes-men" in Asia, I hope, nor in Africa. But in the future we shall only co-operate as equals; there is no friendship when nations are not equal, when one has to obey the other and one dominates the other. (*Asian-African Conference 1955,* 8–9)

Benjamin Zachariah has argued that such strategic vision was also intimately related to Nehru's attempts to chart a middle course between the left and right wings of his own party in his search for domestic stability (Zachariah 2004, 140). His nuclear policy turned out to be the reactor where the collision between international and national forces and the imperatives of a 'scientific state' became brilliantly luminous. As the secret shipment of uranium oxide from Canada (in exchange for promises of access to India's thorium deposits) organized as early as 1947 by Homi Bhabha shows, Nehru's quest for a moral leadership of a peaceful Third World was always going to be an ambiguous affair (Anderson 2010, 192–3). He could loftily assert, on being presented plans for the growth of the Indian Army, 'We don't need a defence plan [….] scrap the Army. The police are good enough to meet our security needs' (Anderson 2010, 206). He could embed the principles of nuclear technology transfer for exclusively peaceful purposes as well as proposals for an international atomic energy agency in the 'Final Communique' of the Bandung conference (*Selected Documents* 1955, 29–30). But he could not gainsay the fact that his commitment to nuclear power meant that 'Nehruvian science' in India would always carry a distinctly militant edge.[13]

News from the semi-periphery

This confluence of 'Nehruvian science', post-colonial nation-building and Third-World internationalism was a formative condition of the fiction of Ray, Mitra and Bardhan. But it will be obvious from my remarks above that I do not want to argue for any radical alterity of Indian science fiction. The idea of a 'one but unequal' world literary system carries with it the commitment of paying attention to both the singularity and relationality of literary and cultural forms at the same time. Thus, what I have called 'non-aligned Indian science fiction' here bears striking family resemblance to other kinds of writing from zones primarily outside western Europe and North America (as well

[13] On the various ambiguities in Nehru's non-violent non-aligned policy see Zachariah 2004, 155–9.

as to certain 'underdeveloped' segments within them). With these it shares certain key features – a seemingly belated and sudden emergence of a group of authors experimenting with the genre; the group's creative struggles with the weight of a foreign canon or 'selective tradition' (Milner 2012, 22–40); the formation of a print-cultural network of adequate density within which their work circulated; the intersection of literary and audio-visual media key to the sensibility of the authors; their critical interrogation of the boundaries between science and adjacent modes of knowledge (often coded as 'magic'); their engagement with the issues of national development – economic and cultural (usually designated as 'modernization'); their corresponding engagement with the international world order dominated by colonial, imperial or neo-colonial powers.

Andrea Bell comments on the absence for a long time of any coherent science fictional tradition at a continental scale in Latin America, and then a sudden efflorescence of it in the 1960s (Bell 1999, 441). Similar observations have been made regarding Japanese science fiction by Tatsumi, who observes that even when compared to the genre's rapid formation in the US (over three decades from the 'Jazz Age' to the 1950s), the Japanese case gives the impression of greater chronotopic compression, springing from the ground zero of space adventures to 'new wave' all within a single decade (Tatsumi 2000, 105). Rachel Heywood Ferreira sees the nineteenth century and not the 1960s as the time when Latin American science fiction came into its own, and to that extent differs from Bell's genealogy. But she usefully identifies the creative struggle of Latin American writers with the 'North' in order to establish a distinctive regional literary and cultural tradition as one of the primary drivers of this process (Ferreira 2007, 432). Much of this struggle for national or regional cultural autonomy understandably took and continues to take the form of a simultaneous importing and adaptation of works from the established 'selective traditions'. Liang Qi Chao and Lu Xun, two of the greatest figures of modern Chinese culture, imparted to Chinese science fiction a decisive impulse when they began translating Jules Verne's fiction at the beginning of the twentieth century while also writing pioneering science fiction texts themselves (Song 2013, 15). They both did so in the belief that 'science fiction would help the spread of modern knowledge in China, emancipate people's minds and bring positive developments to a declining civilization that was being surpassed by the industrialized Western nations' (Song 2013, 15). Exactly the same pattern is evident in the case of Latin America in the nineteenth century, when science fiction was seen as a part of a wider scientific culture, the establishment of which would free the

nations of the region of their dependence on the colonial and imperial 'North' (Ferreira 2007, 433–4).

But as we have seen, if science was held to be the key to the modernization of the post-colonial nations, it was also subject to penetrating (and often fictional) criticisms by being assessed in comparison to adjacent or competing forms of knowledge. In the case of African and Oceanic science fiction, this was often expressed in terms of what has been called 'archaic' or 'mythic' modes and styles. As such, these kinds of writing have the virtue of focusing our attention on the prolonged generic border wars between science fiction and fantasy as well as on the historically contested and contingent nature of science and technology themselves. If both the propositions – 'any sufficiently advanced technology is indistinguishable from magic' and 'any sufficiently rigorously defined magic is indistinguishable from science' – are true (Milner 2012, 103), then they perhaps ought to be joined by a third – any rigorous division between science and magic may in the final instance be essentially ideological in nature. If the literary style that challenges such a division can be neither realist or modernist, a third, more appropriate designation for it, might take the form of something like Michael Lowy's 'critical irrealism' (Lowy 2007, 193–206) instead of the alternatives considered by Milner in his useful discussion (Milner 2012, 26–30). Lowy does not include science fiction in his discussion of 'critical irrealism' but it is worth recalling his definition to see how closely it describes the work of Third-World science fiction:

> The term 'critical irrealism' can be applied to oeuvres that do not follow the rules governing the 'accurate representation of life as it really is' but that are nevertheless critical of social reality. The critical viewpoint of these works of art is often related to the dream of another, imaginary world, either idealized or terrifying, one opposed to the grey, prosaic, disenchanted reality of modern, meaning capitalist, society. Even when it takes the superficial form of a flight from reality, critical irrealism can contain a powerful implicit negative critique, challenging the philistine bourgeois order. (Lowy 2007, 196)

Whether marketed as elite or popular cultural commodity, such writing is usually sustained by a print-media network made up of magazines, journals and small presses. There have been many Gernsbackian formations in the Third World that have not, until recently, received any sustained critical or historical attention. This is despite the fact that magazines like Argentina's *Más Allá* had a

continental reach with a circulation of 20,000 issues per month, and its 48 consecutive numbers have acquired mythic status since its demise (Heywood Ferreira 2016, 209). In the Indian sub-continent, and restricting for the moment our discussion to one of India's 122 major languages, Bengali, magazines like *Sandesh, Ashchorjo!* and the various *puja* annuals published by presses like *Deb Sahitya Kutir* where science fiction found a congenial home had lower geographical span, although the sheer volume of Bengali-language readers means that they were probably numerically comparable to the legendary *Amazing Stories* and other American pulp magazines. Here, we will also do well to remember Milner's salutary caveat against overemphasizing the 'literariness' of twentieth-century science fiction writing. If it is indeed the 'concentration of interest in science and technology' that distinguishes the genre, Milner sees this persisting 'within the novel and the short story, but [is] also redeployed into various theatrical, film, radio and television genres of the dramatic mode' (Milner 2012, 12). Among the writers we will look at below Ray is regarded as probably the leading *auteur* of modern Indian cinema who also did pioneering work in photography and print design, and Mitra also was an accomplished film director and scriptwriter. While any sustained discussion of the relationship between their cinema or photography and writing is outside the scope of our enquiries, a fuller analysis of Indian science fiction in the twentieth century awaits the mapping of the genre across multiple media of the period.

But these family resemblances between Indian and other Third-World science fiction should not blind us to the fact that they also shared some of the most basic features with their counterparts produced in the core Euro-American zones such as the key role also played there by magazines and small presses, the relative importance of the short story form and distribution of the genre throughout a multimediascape. The axioms proposed by Milner regarding the *general* structure of the field of science fiction – the contested boundaries of the genre's 'selective tradition' and the membranous nature of that boundary between the genre and the modernist 'literary canon that permits a restricted movement between the two (Milner 2012, 39–67) – also holds true for the more limited sub-field of Indian science fiction. The striking and simultaneous differences between the two emerge around the ways in which they registered the process of modernization and the distribution of the political power in the Cold War era. Should we think of these differences as being those between the literatures of a 'core' and 'semi-periphery', or is it more useful to think of these in terms of the distinctions between that of a 'core' and 'periphery'?

These terms have entered into science fiction criticism recently and most notably through the work of Milner who has been interested in testing out Franco Moretti's model of 'world literature' that we have already encountered above. As I remarked in relation to that discussion, understanding science fiction as a world literary genre seems exactly right to me. But exactly what kind of world literary genre is it? For Milner, the difference between a semi-peripheral and peripheral science fictional literary culture is basically that the former substantially contribute to the overall global reach of the genre and the latter cannot (Milner 2012, 166). Therefore, in his view, the science fictional semi-peripheries comprise mostly of Europe, inter-war North America and post-war Japan, while the peripheries emerged in 'those cultures that have received texts from and even to some extent imitated the Franco-British and American-Japanese cores, but did not independently contribute to the development of the global selective tradition' (Milner 2012, 166). These turn out to be early nineteenth-century Japan and early twentieth-century Poland. Where does that leave the substantial body of Third-World writing?

It seems to me what is at stake here is not only a matter of extending our range of reference to the long tradition of tri-continental science fiction. It may be that Milner's understanding of the tripartite division of the world system has absorbed from some of the ambiguities embedded in both Wallerstein's political–economic and Moretti's literary models. As originally articulated by Wallerstein, the 'semi-periphery' is both a spatial unit and a specific economic work performed by a particular class that dominates this zone:

> The semiperiphery, however, is not an artifice of statistical cutting points, nor is it a residual category. The semiperiphery is a necessary structural element in a world-economy. These areas play a role parallel to that played, *mutatis mutandis*, by middle trading groups in an empire. They are collection points of vital skills that are often politically unpopular. (Wallerstein 2011, 231)

We should note here in passing that this zone is not necessarily identical with national boundaries. As such, it can operate both within and beyond nations. Moretti's initial attempt to import this systemic model into literary theory altogether neglected this crucial unit. Subsequently, he sought to correct this oversight but at the cost of emphasizing the spatial aspect of this unit over the specifications regarding class and modes of work: 'By reducing the literary world system to core and periphery, I erased from the picture the transitional area (the semi-periphery) where cultures move in and out of the core; as a consequence, I also

understated the fact that in many (and perhaps most) instances, material and intellectual hegemony are indeed very close, but not quite identical (Moretti 2003, 77).

Yes, 'cultures move in and out' but of course they do not do so by themselves or by some divine fiat. Who or what are the agents of such cultures in transition? We are reduced to guessing here, although one could argue that Moretti's other work leaves us in no doubt as to the identity of such agents.[14] In Milner's usage, on the other hand, the specificities of space and class have receded. But subsequently, it turns out that 'cultures' mean more or less *national* cultures, hence his references to Russian, German, Japanese, Polish and other semi-peripheral science fiction. In so doing, he misses the chance to explore how Wallerstein's original tripartite structure allows us to bring the national, local/regional and international levels *together* in a relational field of analysis. Milner's Bourdieusian framework enables him to be scrupulous in his attention to the role played by the bourgeois artists and public in the formation and distribution of science fictional literature across the world. But his equation of 'semi-peripheries' with *national* cultures means that only certain *national* bourgeoisie can be thought to possess what Wallerstein calls 'vital skills' of creatively mediating between the (cultural) capital of the core zones and the raw (fictional) materials extracted from the peripheries. In this scheme, the rest of the 'middle groups' in the world system, all located outside Europe, can only engage in baldly imitative and not creative work that does not allow them to make any contribution to science fiction's worldly life.

In contrast, my proposal here is that Indian science fiction of the mid-twentieth century, like its other Third World and even certain European counterparts, is semi-peripheral in nature. It is so both in terms of the space it inhabited and the specific kinds of literary labour that produced it. As we shall see below, Mitra, Ray and others not only benefitted from the network of press and book trade in cities like Calcutta or Pune, but folded into their writing their own semi-peripheral formations, mediating between the marginal areas of the Bengal or Maharashtra and their adjacent regions and the core zones towards the north and west of the country, where economic and political powers in post-colonial India were and are located. At the same time, these writer's affiliation with the *bhadralok* or genteel bourgeoisie conferred on them

[14] For Moretti's appreciation of the intermediary role played by the 'middle trading groups' in the formation of world literatures, see his *The Bourgeois: Between Literature and History* 2013 and *The Way of the World: The Bildungsroman in European Culture* 1987.

certain kinds of cultural capital that in turn enabled them to engage to varying degrees in creative adaptation of 'foreign form' through 'local themes' and 'local voices' that was very far from sterile adaptations of Anglo-French or American exemplars of the genre. To that extent, they continued the Bengali (and, to a lesser extent, Marathi) bourgeoisie's claims of being the 'sentinels of [Indian] culture' from the colonial to the post-colonial eras (Bhattacharya 2005, Sartori 2008).

Among this group, it is undoubtedly Ray's writing that is best known internationally, thanks to his reputation as one of modern cinema's foremost *auteurs*. What is perhaps less familiar is his location in a particular Bengali social milieu that in many respects illuminated the limits and possibilities of semi-peripheral cultures. One of the central contradictions of nineteenth- and twentieth-century colonial capitalism in India was the simultaneous underdevelopment of the economic capacities of the indigenous middle classes (particularly in Bengal), and the overdevelopment of their cultural resources. Thus, any serious survey of this class frequently reveals the pairing of the cult of the relatively modest white-collar jobs in the colonial administrative machine (*chakri*) along with the furiously energetic cultural activities ranging from religious reforms to striking literary innovations. Accordingly, it was in this latter sphere that the *bhadralok* men's capacities of combining 'foreign form' with 'local matter' and 'local voice' acquired its most distinctive dimensions.

Even amongst this peculiar formation, the Ray family shone bright because of its striking felicities with the various cultural modes and technologies. Prominent members of the reformist *Bramho* society, which was often at loggerheads with orthodox Hindus, the Ray men were also unusual *bhadraloks* in so far they did not produce 'lawyers, doctors, clerks' and merely one government functionary (Sengoopta 2016, 16–17). Instead, at least until the 1920s, they may be best understood in terms of what Marx once called 'small masters' – small-scale (in this case, cultural) entrepreneurs who *both* owned the means of production *and* fully expended labour in producing commodities, which in the case of the Rays was printing and print-block manufacturing. Satyajit's grandfather Upendrakishore was a musician and a photographer whose experiments with half-tone print production earned the astonished notice of British technical journals: 'He is far ahead of European and American workers in originality and this is 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 (Sengoopta 2016, 211). This capacity to leapfrog the creative capabilities of core zones, not despite but because of the economic underdevelopment, we

can take as one of the signatures of semi-peripheral cultures. From this productively contradictory position, Upendrakishore could argue that contemporary Indian and European art had their own specificities but were related in their attempts to register a singular world (Sengoopta 2016, 259). And since a nation's capacity to fully inhabit this singular world rested in large measure on developing its children's sensibility, Upendraksihore in 1913 founded the magazine *Sandesh*, which aimed to offer a delicious confection of 'archeology to science, from biographies to mythological tales, from translations of European literature to original stories, plays, and riddles' to its young readers (Sengoopta 2016, 224). This was the magazine that Satyajit would inherit after more than four decades and publish his Professor Shonku stories in.

True to his 'small masterly' affiliations, Upendrakishore wrote, illustrated and printed *Sandesh* by himself. In his memoirs, Satyajit would write of roaming as a child in the press and the printing workshop spread over two floors of his grandfather's house, entranced by the various paper samples that had come all the way from Germany (Ray 1998, 9). This scale of production process meant that *Sandesh* had a print-run of 3,000 copies and its cheap price meant that it rarely met the cost of producing it (Sengoopta 2016, 225). On Upendrakishore's death in 1915, the editorial duties passed to his mercurial son Sukumar, Satyajit's father. Sukumar Ray would die tragically young, within eight years of taking over *Sandesh,* but in his custody the magazine changed from being primarily aimed at children to one catering for young adults (*kishore* in Bengali). Sukumar's own distinctive sensibility could be seen in the larger space devoted to poetry that often show-cased his 'nonsense language games' that combined the 'irrational substance of colonial reality, and the rational response to it' (Sengoopta 2016, 324). Indeed, Sukumar's 'nonsense' poetry and drama is arguably among the most successful examples of the creative fusion of 'foreign forms' and 'local themes/matters' not only in the Ray family, but in world literature as such. In the poems of the *Abol Tabol* collection or a play like *Haw-Jaw-Baw-Raw-Law* can be glimpsed the exemplary use of Edward Lear or Lewis Carroll's prototypes in the making of a 'counter discourse' to the colonial ideology of development (Sengoopta 2016, 332). Much of Satyajit's own science fiction absorbed his father's sensibilities.

Like his father and grandfather before him, Satyajit Ray's cultural formation showed a marked openness to the world. His youthful artistic preferences (Gainsborough, Landseer, Reynolds, Rodin, Cezanne, Giorgione), literary taste (Christie, Conan Doyle, Woodhouse) and fascination with the various Hollywood genres are sometimes seen as indications of his 'europhilia' (Sengoopta 2016, 324–6). But, like

Upendrakishore, he was interested in both the specificity of Indian art forms and the characteristics they shared with their European counterparts – the hallmarks of a properly comparative and worldly, not to say internationalist, sensibility (Robinson 1989, 51). This could be seen in all his artistic work – from the early calligraphic designs he incorporated into advertisement campaigns, his typographical innovations, his films and his fiction. Ray was also unusually perceptive about precisely what I have called a moment ago the signature of semi-peripherality – the relationship between economic underdevelopment and cultural advancement. Of all the films he watched during his brief sojourn in Europe, it was De Sica's *Bicycle Thieves* that had the most decisive influence on him, and the reasons he offered for this are revealing: 'I came out of the theatre my mind fully made up. I would become a film-maker [….] I would make my film exactly as De Sica had made his: working with non-professional actors, using modest resources, and shooting on actual locations.' The village which Bibhutibhushan Bandopadhyay had so lovingly described in his novels would be a living backdrop to Ray's *Apu* trilogy just as the outskirts of Rome were for De Sica's film (Robinson 1989, 72). Perhaps nowhere else is this creative privilege conferred by economic constraint or 'backwardness' better expressed than in the famous 'Dance of the Ghosts' episode in *Goopy Gayen, Bagha Bayen* (1969) – a fantasy adventure that left American and European critics bewildered (Robinson 1989, 182). Ray himself thought of the six-and-a-half-minute sequence as 'a most abstract, avant-garde affair which I haven't the faintest idea how people are going to react to' (Robinson 1989, 186). In it, four kinds of ghosts appear to the travel-weary Goopy and Bagha and through 'a long series of visual and aural cuts' seem to offer a kind of compressed history of colonial class-formation through their dance movements (Robinson 1989, 187). Despite Ray's own misgivings about the effectiveness of the avant-gardist register, the discrepancy between the film's success in Bengal (and India) and its critical reception in Europe and America points to, as Keya Ganguly has correctly emphasized, the kind of impoverished thinking about modernism that presumes the diffusion of the style from Paris, London and New York to the rest of the world (Ganguly 2010, 13–15). Ray's films and his writings suggest modernism's (and modernist avant-garde's) multiple international points of emergence in anti-colonial struggles as well as trenchant critiques of capitalist modernization by Third-World intellectuals (Ganguly 2010, 3). Seen thus, Ray's cinema and his science fiction, despite his own tendency to think of the latter as 'mere entertainment', should be properly understood as related parts of a total artistic project.

If Ray's science fiction has been relatively eclipsed by his cinema, at least among his international audiences, those written by Mitra and others like Adrish Bardhan are even less familiar to them.[15] Yet, they share some striking similarities with Ray's formation as an artist of the semi-peripheral world. Mitra, for example, was firmly embedded in the avant-gardist (*ati-adhunik* in Bengali) literary magazine culture of 1920s Calcutta. Emerging as a notable poet, short-story writer and essayist in pioneering publications such as *Kallol* and *Kali-Kalam,* Mitra saw his milieu in distinctly worldly and internationalist terms:

> We are not equals, of course, to Knut Hamsun or Maxim Gorky, but let it be known that it is certainly they whom we have learnt our lessons of life from [….] But don't think this writing would emerge only if we copy a Hamsun's manner or make use of a Gorky's ink. They won't. The true writing comes forth from one's deep realization of life. (Bandyopadhyaya 1999, 13–14)

His fellow writers were entirely in agreement, and the pages of *Kallol* contained essays not just on Hamsun and Gorky, but on Zola, Maupassant, Mann, Whitman and Benavente. We should also note in passing that the contours of the world literary space as seen from Bengal relegated Anglo-American writing to a much more realistic, provincial, proportion in contrast to the view from Bloomsbury. Mitra had direct experience of life in the peripheries of Calcutta, spending much of his youth and adult life in towns such as Mirzapore, Naihati, Ghatshila and Jhajha, but this did not prevent him from developing a reading habit that included Dickens, Verne and Chesterton alongside Bengali writers like Sharatchandra Chattopadhyaya (Bandyopadhyaya 1999, 7). From the 1930s, he became a regular contributor to a number of children's and young-adult's magazines such as *Rangmashal*, *Mouchak* and *Ramdhanu* that tried to emulate the example of *Sandesh* in informing, educating and entertaining the future citizens of an independent India. Like Ray, Mitra ranged well beyond his literary activities. Around the same time he started writing in *Rangmashal,* Mitra also made his debut as a script-writer in the romantic comedy film *Pathe Bhule,* and went on to have a distinguished career both as writer and director. In the 1950s he worked

[15] Such recognition is now being accorded to them by contemporary Indian science fiction writers such as Vandana Singh, who do command international attention by writing in English, and who identify Mitra's Ghana-da stories exercising decisive influence on their own work. See Kurtz 2016, 536–7.

as a producer and consultant for the Indian state-owned radio station, Akashbani (Bandyopadhyaya 1999, 22–7). Mitra's poetry has often been noted for its engagement with Whitman, and his science fictional writing with Wells and Capek (Bandyopadhyaya 1999, 75–6). In his Ghana-da stories we will see how such engagements can be understood as semi-peripheral transformations of a world literary genre.

Younger than Ray and Mitra, Adrish Bardhan was in a sense the most Gernsbackian of the figures under consideration here. He is best known as the inventor of the Bengali term for science fiction – *kalpabigyan* – and as the editor of the first Bengali science fiction magazine *Ashchorjo!* (Wonder!) in 1962. Bodhisattva Chattopadhyay's entry in the *Encyclopaedia of Science Fiction* suggests that the magazine specialized in *bigyanbhittik galpo* or 'science-based stories', one of the three constitutive modes he sees operating in Indian science fiction (the other two are named as *bigyannirbhor galpo or* 'science-dependent stories' and *bigyan-rahasya* or 'science-mysteries') (Chattopadhyay 2015, n.p.). These distinctions are useful in so far as they help Chattopadyay sustain his argument regarding *kalpabigyan* – that unlike its Euro-American counterparts, it is better understood as a narrative mode where the diachronic transformation of science through contact with adjacent fields of knowledge is dramatized (Chattopadhyay 2015, n.p.). My emphasis below will fall not so much on any fundamental difference between Indian and Euro-American science fiction, but in equal parts on the formal and thematic innovations in this literature and the semi-peripheral conditions that enabled, if not compelled, such moves. Like Ray and Mitra, Bardhan was interested in Conan Doyle and Jules Verne and was a prolific translator of their works (in particular of the Sherlock Holmes canon). His own science fiction is stamped with parody and satire that critically scrutinizes, among other things, the ideologies of development and the Cold War global order. The main vehicle for such scrutiny is the central figure of the scientist himself, described by Bardhan as an unkempt, dentally challenged old man whose name would immediately signal the absurd quality of his scientific work – Professor Nut-Boltu-Chakra. Most of Bardhan's own writing, as opposed to his editorial and translational work, came after Nehru's death and some decisive alterations in the characters of both 'Nehruvian science' and the non-aligned movement. As such, we will be paying a rather fleeting attention to his work in comparison to the writing to Mitra and Ray. Yet, as a figure bridging the writers of the classically Nehruvian generation to those of the post-Nehruvian dispensation, he remains a key point of reference. In our readings, therefore, we will compare his sensibilities to those of his predecessors but also in relation to his contemporaries such as the Marathi writer and scientist

J. V. Narlikar and Vandana Singh, the cosmopolitan scientist and writer from Delhi who is also an academic in the US. It is far from accidental, for instance, that comic-heroic scientist figures who are often the targets of ironic undercutting of authority are common to the works of Mitra, Ray and Bardhan as well as to that of the later writers. They work as the key device around which some of the central concerns of 'Nehruvian non-aligned science' – space, weapons, aliens and above all the development of the world – are staged and interrogated. We now turn to the exploration of such devices and aliens after this long but necessary preamble.

Chapter One

Laboratory lives

Bodies of evidence

Ghana-da entered the world in 1945 as a deceptively mundane witness to the long and complex chain of historical events that had climaxed in a world-wide conflagration:

> It is impossible to guess his age from his tall, dry, bony appearance. He could be anywhere between thirty-five and fifty-five. If asked, he would say with a faint smile – 'It is hard to keep track of one's birthdays while travelling the world, but…' and then begin to tell us of his experiences during the Sepoy Mutiny or the first Russo-Japanese War. So we have given up trying to guess how old Ghana-da really is. We believe that there are not many places he has not been over the past two hundred years, nor are there many historic events in which he has failed to take part during that period. (Mitra 2000 vol. 1, 21)[1]

The ironic narrator's perspective – unable to wholly believe or entirely dismiss Ghana-da's tall-tales – is key not only to the Suvinian interplay of cognition and estrangement in Mitra's fiction, but also to the formation of one of the most important elements of such a process – a critical imagination that Bodhisattva Chattopadhyay calls 'wonder' (Chattopadhyay 2016, 435–7). I want to pay attention here to the importance of a particular kind of location in Indian science fiction of the Nehruvian era that is key to this narrative production of critical imagination – the wondrous space of the laboratory in which certain models of truth and knowledge are both produced and tested. This is

[1] All citations from Mitra's Ghana-da stories here are my translations from the volumes edited by Dasgupta 2000.

not an entirely whimsical choice that denies the importance of other kinds of locations that also appear in this literature – 'modern' urban buildings and libraries, 'primitive' forests, caves, submarine worlds, off-world planets, inter-galactic spaces, etc. But I do want to suggest that the laboratory in such narratives provide us with vital clues regarding the social functions of these other spaces. That is, the laboratory is a kind of primal scene that produces certain readerly predispositions regarding the interpretation of the location of the characters and the actions they perform. Such interpretations then allow us a glimpse of the networked relationships between humans and the world they inhabit. At various points in these narratives, different kinds of spaces behave like they *are* laboratories, and characters moving in and through them behave like they are in one. At others, laboratories strongly take on the various qualities usually associated with these adjacent locations and, in this manner each are irradiated by history just as the historical processes are operationalized by them.[2]

Consider what follows the first description of Ghana-da above in the story *'Mosha'* ('Mosquito' 1945). Having barged into a conversation in the living room of the men's hostel at 72 Banamali Naskar Lane about the eradication of mosquitos, our hero embarks on a tale about his adventures on the remote Sakhalin island on the eve of the Second World War. In what will emerge as a formulaic device designed to enhance his mock heroism, Ghana-da features in his own narration as a scientific entrepreneur with extensive technical and financial expertise as well as notable innovative flair. In Sakhalin, for example, his allegedly vast mineralogical knowledge has landed him the job as a manager of an unnamed company engaged in extractive activities that are carried out by a band of wretched Chinese labourers under his supervision. He is assisted in his task by an American colleague and scientist. The action begins with the disappearance of Tan Lin, one of the aforementioned labourers, and the manhunt led by Ghana-d that takes him to the lair of a rogue Japanese scientist. Mitra's Nehruvian perspective on the Cold War world is fairly obvious here – India's new bid of power and prestige is led by a scientific hero who mediates between a recently vanquished imperial power (Japan – *'Mosha'* was published in 1945 but the action of the story takes place during the earlier period of the Japanese occupation of China) and a newly hegemonic one (the US). The ideological contest

[2] The social character and function of laboratories have become something of a critical commonplace after the pioneering work of Latour and Woolger 1986. But such understandings of scientific spaces were not entirely absent before their work. See, for example, Swatez 1970 and Lynch 1985.

for the legitimization of these rivals is staged through their tussle over the body of the Chinese labourer which recalls the traumatized modern history of his nation – the subject of numerous such rivalries between imperial states throughout the nineteenth- and twentieth-centuries. Such contests call not only for the appropriate degree of Tan Lin's abjection, but *where* they take place – which turns out precisely to be a laboratory in the middle of the northern wilderness of China:

> We peered cautiously through the window into a large, well-lit room. It was a bit like a museum, with a giant glass table in the middle. We could not see what was on the table [….] The next morning, Mr Nishimara showed us around his laboratory. It was clear to us, looking at the various sections of the room, that he was no ordinary entomologist. Every inch of the enormous space was covered with chemical and electronic equipments designed not only to observe insects, but also to raise and nurture them. (Mitra 2000 vol. 1, 26–7)

It is in this space, well-equipped with modern technological wonders, that Ghana-da discovers the tortured and dying body of Tan Lin. He has been used in a deadly experiment by the rogue scientist Nishimara, who gloatingly reveals that instead of eradicating malaria, his research aimed to convert mosquitos into lethal biological weapons. In effect, Tan Lin and his numerous other compatriots have been coerced into becoming yet another, perhaps the most wondrous, instruments housed in Nishimara's laboratory. The narrative *denouement* arrives when a mosquito – a product of the successful experiment – escapes during the confrontation between the desperate heroes and Nishimara's black African-American bodyguard (we shall look at the importance of such racialized figures in Nehruvian science fiction below) and administers its deadly bites to its creator. The story thus secures the claims of the surviving Indian and American scientist-entrepreneurs to steer the post-war world away from deviant uses of scientific knowledge.

At one level, Mitra's story is a remarkable early registration of criminal uses of science in the Second World War. Specifically, Nishimara's use of the absconding Chinese worker in his laboratory experiments recalls the activities of the infamous Unit 731 of the Japanese imperial army stationed in Harbin in north-eastern China. There, under the supervision of Surgeon-General Shiro Ishii, around 3,000 men, women and children were subjected to live vivisection, infected with a variety of diseases, frozen to death in frost-bite experiments and used as targets for chemical

and biological weapons.[3] Literature after Auschwitz or Harbin may necessarily be barbaric, as Adorno suggested (in contrast to the misquotation usually attributed to him about the impossibility of poetry after death camps), but one way it seeks to open its own barbarism to critical inquiry has indeed been to deploy deliberately misplaced narrative modes such as the comic-ironic in the depiction of this fallen world. Such, at any rate, seems to be Mitra's wager here. For what precedes the hero's pantomime escape from the Japanese laboratory is the rogue scientist's confession about the symbiotic relationship between science and power:

> With his high-pitched laughter, Nishimara began to explain: 'You find it unbelievable? Not to worry, the evidence will soon be forthcoming. You remember me telling you about altering the chemical composition of the mosquito saliva? I have done it. I have experimented during each stage of the mosquito's life-cycle, from larva to the fully grown amphibious insect – and have succeeded in turning its saliva into a corrosive poison. What you heard last night was the scream of one of my test subjects. You can see the state Tan Lin is in. Now it is your turn.' At a sign from Nishimara, the bodyguard pinned down Mr Martin. As he walked towards him, Nishimara continued, 'There is just one poisonous mosquito in this tube. But it can easily dispatch twenty of you. You are from the mecca of modern science, the USA. I am therefore giving you first the honour of sacrificing your life to science. When I press this tube against your skin, its lid will open and the mosquito will waste no time in biting you.' (Mitra 2000 vol. 1, 29)

The scientists themselves are always offered by Mitra as (inter-)national-allegorical figures and the struggle between them is shot through with the sense of ironic vengeance directed against the prevailing world order. The joint Indo-American suppression of the dangerous desires against such an order, framed by the tall-tale form, acts as the negative imprint of what cannot be said in Mitra's story – that, historically, Shiro Ishii and other criminal scientists of Harbin were given amnesty by the Americans after the war in exchange for the data on biological weapons they possessed as the result of their experiments; that they were co-opted as advisors to the US biological weapons programme; that the official

[3] Most of the literature on Unit 731 is Russian and Chinese. Among the useful English-language treatments are Sheldon H. Harris 1994, Walter E. Grunden 2005 and Robert Peaty 1947. For an overview of the archival material and eye-witness testimonies, also see Keiichi 2005, 1–9.

name for Ishii's program in China was 'Epidemic Prevention and Water Purification Department'. But none of these literary manoeuvres would be possible without the particular charge carried by the laboratory, which is essentially a space where diverse kinds of knowledge are produced and tested by wondrous devices. What enabled the laboratory to become this kind of narrative device during the years of 'Nehruvian science' and non-alignment?

Modern temples

Laboratories were at the centre of Nehru's vision of India's post-colonial sovereignty. The eight-fold increase in the national science budget within a decade from 1948 that Nehru oversaw meant, as David Arnold has argued, that Indian scientists had 'to accept the logic of funding resources controlled by the state and state-driven science policy' (Arnold 2013, 367–8). Nehru's government had inherited a number of colonial scientific institutions such as the Council for Scientific and Industrial Research (CSIR), and developed others such as the Atomic Energy Commission (AEC), that were modelled on their British and American counterparts. There was little ambiguity about nationalist character of these institutions and the scientific work that they were designed to undertake – Nehru himself thought of the chain of laboratories being built across the country as 'temples of science built for the service of our motherland' (Arnold 2013, 368). But equally importantly for Nehru, such spaces were designed to foster collaborative work and overcome what he saw as the disadvantages inherent to modern specialist research culture that corralled scientists into isolated silos of knowledge – a danger about which, as we have seen before, he had already warned his daughter in 1933 (Singh 1988, 8–9). He hoped that it was such collaborative work that would imbue Indian science with a progressive character. Nehru acknowledged that such social responsibility often made contradictory demands on individual scientists who might feel they would have to be both 'completely neutral, passionless, just observing, recording, drawing conclusions from those records', and full of 'passion, wanting something, aiming at something, at social improvement' (Singh 1988, 88). But in the final instance, the imperatives of the nation over-rode the pleasures of the lone researcher:

> So far as science is concerned we must give it a free hand to grow unattached and not tied to any particular problem [….] Nevertheless, I want to tell the scientists, that the burden of today

> is a great burden and we have to meet that burden as brave men and not think of other things but try and solve it in so far as we can; whether it is the burden of providing food to our millions or whether it is the burden of providing something else they lack. (Indian National Congress 1951a, 2)

Of course, such emphasis on the nationalist, collaborative and social character of scientific work and of institutions such as laboratories long preceded, as we have seen, Nehru's career as India's first prime minister. By the mid-nineteenth century, Indian public figures as diverse as Syed Ahmed Khan, Swami Vivekananda, Rajendralal Mitra and Bankim Chatterjee, were all emphasizing the importance of science and technology for the revival of India (Dasgupta 2011, xii–xlv). Nor was the heroic labour of building nationalist scientific institutions a Nehruvian novelty. Mahendralal Sircar's Indian Association for the Cultivation of Sciences was founded in 1876 precisely to instil a nationalist scientific culture:

> We want an institution which shall be for the instruction of the masses, where lectures on scientific subjects will be systematically delivered and not only illustrative experiments performed by the lecturers, but the audience should be invited and taught to perform themselves. And we wish that the Institution be entirely under native management control […] that we may begin to learn the value of self-reliance. (Biswas 2011, 71)

Behind Sircar's initiative lay Ram Mohun Roy's famous 1823 letter to Lord Amherst where he named 'Mathematics, Natural Philosophy, Chemistry and Anatomy with other useful sciences' as essential tools for developing a modern and progressive India (Biswas 2010, 71).

We should keep in mind that, under colonial conditions, *nationalist* science was often conceived of in opposition to *state* science – the latter being closely associated with the patronage by and interests of the British ruling class. Closer to Nehru's own time, an important institution-builder like Asutosh Mookerjee mildly upbraided Meghnad Saha – a scientist with whom Nehru would go on to have a long and complicated relationship – for applying to the British High Commissioner for research funds. In Mookerjee's view, Saha should have come to him and his own university first on both moral and ethical grounds (Dasgupta 2011, lv). This discomfort with the state's close relationship with scientific institutions – not least because of some of their colonial imprints – persisted *after* independence and proved to be a major obstacle

to Nehru's attempts to realize his science and technology policies. The other thing to remember is that even under colonialism, such ideas of nationalist science were challenged by some of the most eminent Indian scientists themselves. Prafulla Chandra Ray warned in 1923 how such nationalism (and therefore nationalist science) in India could easily take on a communal and sectarian character:

> 'Our country, right or wrong' was the watchword of an Englishman when he plunged his country into a war of frightful consequences […] the word 'national' therefore has to be used as cautiously as possible. But unfortunately this is not the case. An influential section of the Hindus use the term as synonymous with a reversion to the good old days of the Vedas or at least of the Ramayana and the Mahabharata, while to the Muslim it recalls to his memory the pristine glories of Islam. Ask any average educated Hindu or Muslim as to what he means by 'national' and you will be treated to a jargon of confused ideas. But this medievalism, this narrow nationalism, this weak harkening back unto the past will not do. (Dasgupta 2011, lvi)

Others like Jagadish Chandra Bose warned Nehru that his Indian nationalist movement would mean nothing to ordinary Indians unless they felt they had a stake in it, that 'their life is worth living' (Dasgupta 2011, lvii). Thus, one of the major tasks of Indian laboratories in the mid-twentieth century was to suture the gap between the citizen, the state and the nation. They were nothing if not deeply socialized spaces from their foundation.

Permeated by an overtly nationalist ethos they may have been, but Indian laboratories and other research sites were not necessarily *socialist* in character. Indeed, private entrepreneurship played a significant role in the formation of Indian scientific culture from very early on. An iconic organization like the Bengal Chemical and Pharmaceuticals Works (BCPW) was animated by a rejection of the Indian romance with *chakri* or salaried colonial 'clerkdom' in favour of the commercial and entrepreneurial application of science (Chakrabarti 2011, 121–2). Such entrepreneurship often took on a regional or caste-chauvinist form. Prafulla Chandra Ray, the presiding spirit of BCPW, scoffed at the 'lure of an insignificant number of coveted prizes' that held Bengali graduates with science degrees spell-bound, while Marwari and Gujrati communities of Calcutta monopolized trade and commerce (Chakrabarti 2011, 122). He hoped that entrepreneurial scientists, conjuring marvellous inventions in their laboratories, would be at

the vanguard of breaking such regional monopolies over wealth in independent India. The great Bengali comic writer Rajshekhar Bose thought that the upper-caste Hindu men who dominated the scientifically educated middle-class had a historic aversion to commercial activities. Bose proposed that scientific institutions should therefore be devoted to affecting a cultural transformation that would imbue profit-making with a sense of prestige – 'young men should realise that although it is good to know how to produce a commodity, it is very often more profitable to know how to sell it' (Chakrabarti 2011, 123).

Such contradictions between the social and the private entrepreneurial missions of Indian scientists and institutions also marked the decades after 1947. It can be seen, schematically and no doubt simplistically, in the differences that plagued the leading scientists whom Nehru had gathered around him in order to be build a 'laboratory state', such as Meghnad Saha, Shanti Bhatnagar and Homi Bhabha (Anderson 2010, 20). Bhatnagar and Bhabha saw industrial and commercial entrepreneurship as indispensable parts of science's nation-building mission, while Saha vehemently disagreed. A decade before independence, Bhatnagar was already writing about how the Second World War provided India with a 'tremendous scope … to make a really substantial contribution to the war effort by organizing a planned cohesion of labour and industry' (Anderson 2010, 92). He lavished public praise on the giant Indian business houses such as the Tatas and Birlas for their wartime profiteering and was duly rewarded when the Tata metallurgy laboratory in Jamshedpur was handed over to him for conversion into a national research institute. In Anderson's judgment, in the absence of international political leverage and a poor industrial base, Bhatnagar saw co-operation with big business as key to national development. Through it, he hoped to build 'a whole chain of related laboratories, all dedicated to building new industries, discovering new processes and products, protected by a vigorous patent regime' (Anderson 2010, 130). Homi Bhabha came to very similar conclusions in 1944. Writing to the chairperson of the Tata Trusts, J. R. D. Tata, he stressed the importance of establishing centres for fundamental research that would also solve 'the problems of immediate practical application to industry' (Anderson 2010, 104–5). To Tata's proposals of funding such a centre, he attached two conditions – the recruitment of exceptional researchers and freedom from state interference and control of research.[4] Saha, on the other hand, saw private enterprise as the main obstacle to national progress. Not

[4] In addition to Anderson's important study, see also the recent work by Chowdhury 2016 on Homi Bhabha and Naik 2017.

only did he emerge as a formidable critic of independent India's energy and nuclear programmes for this reason, he also consistently opposed Nehru's involvement of business leaders and industrialists in large dam projects, oil exploration and other key government initiatives. As a parliamentarian, he often used the floor to publicly air his grievances, as he did after Nehru appointed two businessmen to the massive Damodar Valley project: 'It is wrong to hand over the administration of the fertilizer factory to a body of private industrialists, who had no share in its conception or erection, and who will now try to use it for their own benefit' (Anderson 2010, 232). Saha was equally scathing, as a glance at the Indian parliamentary records of 1955 reveals, about the licensing system that Nehru's government had developed for attracting foreign capital – something he dubbed the 'license-permit raj' (Anderson 2010, 236). His interventions often struck home, as an exasperated Nehru complained in a letter: 'After making a strong attack on everything that Government has done and running it down, you were good enough to compare us to Chiang Kai-Shek and his failure. It seemed to me that your criticism was not only unjustified but completely lacking in objectivity and therefore most unscientific' (Anderson 2010, 240). This twinned and conflicting pressures of entrepreneurship and building a progressive and equitable society acted as a formative force in the Indian laboratories, national or otherwise, during the Nehru era. It would provide science fiction with a fertile representational problem.

Such contradictions were of course not unique to post-colonial India. It was also evident in the reorganization of scientific research in the US during the Cold War (Sarewitz 2011, 404–5). But the context of post-colonial nation-building meant that the nature of scientific knowledge and facts as well as the spaces and institutions that produced them were immediately revealed to be socio-politically determined. This had consequences for what was understood as science in Nehru's India. In their landmark study of how scientific facts are established in laboratories, Bruno Latour and Steve Woolger show how the

> material organisation of laboratory spaces are essential to this process. First, laboratories are sites of inscription – vast amounts of textual and diagrammatic paperwork produced by any item of apparatus or particular configuration of such items which can transform a material substance into a figure or diagram which is directly usable by one of the members of the office space [….] An important consequence of this notion of inscription device is that inscriptions are regarded as having a direct relationship to the original substance. (Latour and Woolger 1986, 51)

Second, laboratories are sites of conversation and exchanges – both formal and informal – between participants that are in effect acts of negotiation about various competing meanings of their work:

> Firstly, conversational material exhibits quite clearly how a myriad of different type of interests and preoccupations are intermeshed in scientists' discussions. Secondly, we have presented evidence to indicate the extreme difficulty of identifying purely descriptive, technical, or theoretical discussions. Thirdly, we have suggested that the mysterious thought process employed by scientists in their setting is not strikingly different from those techniques employed to muddle through in daily life encounters. (Latour and Woolger 1986, 166)

Finally, laboratories are sites that are linked to mechanisms of credibility and distinction such as funding, budget, pay-offs, peer reviews etc., that emphasize the cost of producing facts and relatedly, 'their epistemological stability or believability – something this expensive to produce must be true or made valid' (Latour and Woolger 1986, 238). For Latour and Woolgar, the interplay between these three processes – literary inscription, conversational negotiations and mechanisms of credibility and distinction – results in the simultaneous *disappearance* of the social character of scientific fact and its *re-appearance* as an explanation for the success or failure of scientific processes (Latour and Woolger 1986, 23). This is not to say that Latour and Woolgar offer a relativist argument about the non-existence of facts or the epistemological equality between their various different categories. Rather, facts or 'reality', they suggest, is 'the consequence of scientific work rather than its cause' (Latour and Woolger 1986, 182). Rather than being produced by analogical reasoning, it is a construction – 'the slow, practical craftwork by which inscriptions are superimposed and accounts backed up or dismissed' – that emerges as responsible for what is accepted as scientific fact and knowledge (Latour and Woolger 1986, 236).

Latour and Woolgar conducted their fieldwork in a US laboratory. In the much more 'underdeveloped' setting of Nehru's India, both the socialization of science and the everyday nature of knowledge production were even more visible. Consider Anderson's description of the celebration of a Bengali festival in Calcutta's Saha Institute in 1968. Housed in a ramshackle building, the institute was intimately linked to its neighbourhood. While consulting a copy of *Nature* in the library Anderson recalls gazing into the bedroom of an adjacent house 'that leaned more and more crazily against the institute' and its elderly, snoring occupant.

Thus, the laboratory and research centre was 'completely open to the world' (Anderson 2010, 294). Experiments were conducted to the tune of 'the whoops of family life or mourning of death. The Metallic clunk of the bell of the thin *rickshawallah* [….] Sometimes one could hear the hammers of the cobbler […] mending a scientist's pretty slippers while she attended a seminar' (Anderson 2010, 294). There appeared to be no pronounced spatial division of the laboratory between scientists, technicians and support staff such as the noted by Latour and Woolgar in the US, but the invisible lines of caste- and class-hierarchies were strong with very little interaction between high-ranking officials and low-paid workers. A partial exception proved to be the festival day of *Visvakarma* – a deity of engineers and architects – in September 1968, when the mechanics of the institute's workshop invited a Hindu priest to bless their machines and the space was transformed by incense, flowers and the presence of their families. This scene was then furthered altered momentarily when

> Suddenly, the director, registrar, and a few senior professors entered as a procession, without warning. Benches were cleared for them to sit down, amidst the machines. The director exchanged greetings with familiar workers, while the priest and his assistant continued the *puja*, unaffected [….] the priest had now stood up to sprinkle "water from the Ganges river" onto all of us. There was giggling among the gathering about the coming of the rains. Everyone relaxed. I turned to see that the director and his party had just as suddenly gone, having stayed about six minutes. (Anderson 2010, 296–7)

The intimate coexistence of science and religion, seemingly the most striking aspect of Anderson's visit, in fact serves to underline a more fundamental structure of the laboratory space – the dynamics of power, consent and coercion between social groups who are engaged in scientific labour within it. What Anderson immediately noted was the relative absence of any scientists in the little party that accompanied the director to the workshop. The festival took place while a confrontation was brewing between the scientists and the administrators about the financial condition and governance of the institute. Scientists by and large stayed away from the *puja* not only because they had internalized the logic of 'rank and salary distinctions', but also because they were anxious not to dilute their social accreditation or distinction as pre-eminent producers of scientific knowledge by hanging out with technicians and machinists. By maintaining such distinctions and prestige, they hoped to strengthen their bargaining power with the administrators (Anderson 2010, 297).

The 'open-ness' of this particular laboratory to a variety of social cross-currents was fairly typical of such spaces (and remain so in many ways) in Nehru's India. Although Anderson does contrast his experience in Calcutta with that of the Tata Institute in Bombay in the same year, the difference between the two seem to be of degree rather than of kind (Anderson 2010, 298–304). The social differentiation of laboratories have of course been among their core feature from at least the early modern period and not only in the context of non-European science. Steven Shapin's meticulous investigations into Robert Boyle's laboratories have revealed *both* the collaborative work between technicians, domestic servants and 'gentlemen scientists' such as Boyle in the production of scientific knowledge *and* the unequal process of the authorization of such knowledge, with the aforementioned scientist located at the apex of a well-entrenched hierarchy (Shapin 1994, 369–83). But the professionalization of science over the long duration of modernity in Europe, a duration sustained by the interlocking of capitalism and colonialism, enabled it to gradually disguise the social and historically contingent nature of scientific knowledge. This was in contrast with the non-metropolitan laboratories located in the former colonies, where such professionalization occurred over a far more compressed period and was hence less complete. The latter resembled more what Kapil Raj has called 'open air' sites where the credibility and civility of gentlemen scientists was constantly exposed to 'the thorny question of the "other's" civility', and therefore also of the credibility, of 'indigenous interlocutors on whose linguistic means and testimony much new knowledge and associated material practices depended' (Raj 2007, 103). Such was also the case in the Nehruvian laboratories, where the co-existence of science and religion, scientists and technicians, administrators and politicians, machines and neighbours, experiments and siesta, all served to interrogate the nationalist (and internationalist) missions that had been assigned to scientific knowledge itself. Unsurprisingly, science fiction proved to be an ideal form of such interrogations.

Test subjects

Nehru's India is sometimes referred to as a 'laboratory state'. As Anderson points out, this term should be understood in a couple of ways. First, that Indian scientists often thought of the state as their experimental subject, one that could be developed through a trial-and-error process and planning; second, that the state in turn was committed to incorporating scientists in the delivery to its citizens of some of basic amenities such

Figure 1: 'Shonku's laboratory life', *Byomjatrir Diary* by Satyajit Ray (2003).

as shelter, food, healthcare, security and infrastructure (Anderson 2010, 20). But as we have seen with Latour and others, laboratories are marked by a fundamental contradiction. On the one hand, they are committed to the production of a special kind of knowledge, sometimes also called 'facts', which appear as epistemologically stable, constant over time and universally valid. On such 'facts' state policies often rest. On the other hand, the processes through which these 'facts' are produced – inscription, negotiation, accreditation, authorization – all reveal their contingent, unstable and above all historical, political and social determinations. In the laboratories of the science fiction of the Nehru years, this contradiction was fully expressed.

Such representations have also left lasting legacies for Indian science fiction long after the Nehru era. Novels like Amitav Ghosh's *The Calcutta Chromosome* (1995) contain memorable depictions of the role played by colonial laboratories in the production of knowledge. In particular, Ghosh's emphasis on the productive role played by religious and other non-scientific practices in the artful construction of scientific facts has been seen as 'a radical alternative to the hegemony of 'Western scientific knowledge' (Chambers 2003, 64). In addition, Ghosh's understanding that colonialism often treated entire societies as laboratories is particularly useful since it allows him to present

> the tropics as the hot, fertile, colonial spaces in which the 'human' is hypothesized, tested, and re-mapped and in the sense of the tropes or figures that serve as lab equipment. Storytelling itself, the process of finding things out, is a central actant in *The Calcutta Chromosome* [….] What might be called the postcolonial human has been defined through stories (tropically), like the debates over mass murder and enslavement that asked whether the naked creatures 'discovered' in the brave new world even counted as human. (Nelson 2003, 247)

If such fiction excavates the colonial origins of 'facts' about human subjects and citizens, its Nehruvian counterpart fleshes out further a genealogy by focusing on the post-colonial stages that revealed the continued production of such vital, but contested social and political categories.

As we have seen above, Mitra's Ghana-da series began precisely by revealing the geo-political logic of experiments with the human subject in the mid-twentieth century. Nishimara's unspeakable treatment of Tan Lin's body immediately strips the latter of any designation as a human and converts him into nothing more than one of the scientist's 'test subjects' (Mitra 2000 vol. 1, 29). The same move involves converting a

non-human species – the mosquito – into a weaponized life-form and thus furthers the erasure of the always porous boundaries between biological species and their mechanical counterparts. The (inter-)national allegorical dimension at play here works obviously to outline the threat of a rogue Asian imperial power to the established world order. At first reading then, it would appear that the successful disruption and termination of such experiments by the combined prowess of the enterprising Bengali and American scientists secures the stability of this order and quells any challenges to it. But subsequently, it is revealed that Ghana-da's adventures should be properly understood as experiments themselves in so far as the negation of the attempted Japanese construction of 'scientific facts' regarding species boundaries, epidemiology and bio-weapons can take place only at the cost of leaving a key step in that process unchanged – namely, the assumption of an unbridgeable gap between the 'test subjects' and any conception of rights and attributes that may otherwise have made them recognizable as human beings or citizens. Seen thus, Ghana-da's tale smuggles back into its mock-heroic edifice the very world view that had sustained the Japanese scientist's criminal enterprise. The world order that it defends turns out to be not so different from the rogue attempts to disturb it. This is also the 'wonder' produced by Mitra's tale that Ghana-da's readers must struggle to come to terms with.

For it is not only over and through the abject body of Tan Lin – who appears first as a labourer absconding from a dubious extractive enterprise, and then as the tortured victim of a bio-weapons programme – that the life and humanity of the Bengali and the American are established. Nishimara initially chooses Martin as Tan Lin's successor in his ghastly experiment both because the latter is from the 'mecca of modern science, the USA' and because the intimate physical process involved – the pressing of the same test-tube containing the mosquito that killed the Chinese, on Martin's skin – erased those markers constitutive of the American's humanity, gender and race, that had hitherto distinguished him from Tan Lin. The real threat of the Japanese experiment is not only the weaponization of a non-human species, but the morbid equilibrium that such a weapon achieves between the different civilizational values assigned to 'white' and 'yellow' races. We should note, however, that in the narrative itself, Martin's racial attributes are never overtly presented. What permits us to assume his whiteness?

It is here that the presence of the second 'test subject' – even if not named as such – becomes crucial in the tale. When Ghana-da and Martin stumble into Nishimara's laboratory for the first time, they are

apprehended by the Japanese scientist and his unnamed bodyguard who calls forth an overtly racist representation – a 'very devil of a kaffir' (the Bengali word deployed is *Kafri)*. Not only do Ghana-da and Martin have to overcome the dumb, brute force of this colonial caricature before they can terminate Nishimara and his experiments, but their own humanity is defined in opposition to him as an absence of blackness. Along with Tan Lin, the unnamed 'kaffir' thug should then be properly understood as one of the 'test subjects' or apparatuses in an experiment conducted by Ghana-da's narrative in a secret parallel to the more obviously heinous activities of Nishimara. However, the outcome of both the experiments is identical – that is, they establish the limits of the 'human' by defining what it is not and, in so doing, attempt to stabilize a racialized and gentlemanly world order.

Such representational gambit may at first appear to be resolutely opposed to the spirit of non-alignment championed by Nehru for two decades from the 1940s. After all, in the famous Bandung conference of 1955 where Nehru formally announced his vision of a non-aligned world, he also stressed how the legacies of colonial racism would first have to be overcome if such a world was to come into being:

> But I think there is nothing more terrible, there has been nothing more horrible than the infinite tragedy of Africa in the past few hundred years. When I think of it everything else pales into insignificance, that infinite tragedy of Africa ever since the days when millions of Africans were carried away as galley slaves to America and elsewhere, the way they were treated, the way they were taken away, half of them dying in the galleys. We must accept the responsibility for all of this, all of us, even though we ourselves were not directly involved [….] it is up to Asia to help Africa to the best of her ability because we are sister continents. (*Selected Documents of the Bandung Conference* 1955, 10–11)

Nehru cited the memory of the Atlantic slave trade in the hope of forging a trans-continental Third-World sorority. Yet, note that for him this was not a partnership of equals – it is 'Asia' that possessed the capacity to assist 'Africa' while expecting nothing in exchange except the noble satisfaction of having done the right thing. Such fault-lines around ideas of race and 'development' ran right through the 'Bandung spirit'. Richard Wright, the pioneering African-American author, who travelled to Bandung to report on the non-aligned conference, was initially confident of the common ground he shared with the recently independent peoples of Asia and Africa:

> I'm an American Negro; as such, I've had a burden of race consciousness. So have these people. I've worked in my youth as a common laborer, and I've a class consciousness. So have these people. I grew up in the Methodist and Seventh Day Adventist churches and I saw and observed religion in my childhood; and these people are religious. I was a member of the Communist Party for twelve years and I know something of the politics and psychology of rebellion. These people have had their daily existence in such politics. These emotions are my Instruments. (Wright 1955, 13)

But Wright's reportage from Bandung painfully revealed the centrality of race in non-aligned thoughts about development and progress, even or especially during moments of epochal crises such as de-colonization. He spoke to Asians and Africans who had no problems folding race as a constitutive element of their anti-colonial world view:

> In an intimate interview with one of the best-known Indonesian novelists I asked him point-blank:
>
> 'Do you consider yourself as being colored?'
>
> 'Yes.'
>
> 'Why?'
>
> 'Because I feel inferior. I can't help it. It is hard to be in contact with the white Western world and not feel like that.' [….] Yet he holds the most violent attitudes towards the Japanese.
>
> 'Those yellow monkeys!' He spat as he referred to them.
>
> 'But they are colored too,' I reminded him.
>
> 'But we Indonesians are brown,' he told me proudly. (Wright 1955, 162–3)

Wright's diagnoses of the Bandung moment was not optimistic. He saw at the conference a toxic blending of racism and a 'defensive religious consciousness'. In his judgment, 400 years of 'racial conditioning' had produced human beings for whom 'this vicious pattern of identification' had become second nature (Wright 1955, 100).

Thus, the laboratory in Mitra's *Mosha* should be seen both as the site where a successful experiment to establish the world historical credentials of the Bengali gentleman is conducted *and* where the prejudices and assumptions underlying the production of 'scientific' knowledge and facts are laid bare. Such a dual operation, we can now see, generates precisely the dialectical tension that Jameson sees between *utopian programs* (such as non-alignment, decolonization and post-colonial nation-building) on the one hand, and *utopian impulse* on

the other, which, by remaining heretically suspicious of and only ever equivocally committed to the former, prevents the closing down or foreshortening of utopic imagination itself (Jameson 2005, 3–4). If it is indeed the case that 'the best Utopias are those that fail most comprehensively' (Jameson 2005, xiii) because they work to make us aware of our ideological and imaginative limits, then such work is usually organized around a utopian space. At first sight, the laboratories in early Indian post-colonial science fiction do not seem to fit Jameson's description of such spaces: 'in them, the differentiation process has momentarily been arrested, so that they remain as it were momentarily beyond the reach of the social and testify to its political powerlessness, at the same time that they offer a space in which the new wish images of the social can be elaborated and experimented on' (Jameson 2005, 16). But it is their deliberate openness to and saturation by the social that allows them to undertake the urgent work of exposing the negative print of the utopian programme of 'Nehruvian science' and non-alignment. In so doing, they perhaps signal the necessity of thinking about utopia and utopian programmes in their properly worldly dimension – one which would include their colonial and post-colonial dimensions as integral parts of the culture of capitalist modernity itself.

Laboratories continue to appear as a key narrative element in many Ghana-da stories that followed *Mosha*. But they are not necessarily immediately identifiable *as* laboratories. Rather, in line with Kapil Raj's suggestions about the 'open-air' character of colonial science, a whole array of locations take on *laboratory-like* features and functions in Mitra's fiction where the production of knowledge takes place via the mechanisms and devices identified by Latour and others. For instance, in *Maach* ('Fish', 1949), the ability of certain species of catfish to detect the tremors of an impending earthquakes long before they become evident to human senses is experimentally proved, but the location, devices and mechanisms of this experiment are borrowed from hoariest of stereotypes belonging to the colonial adventure tale genre – the perils posed by African savages, the jungle of 'darkest Africa', the 'cannibal pot' and so on. As in *Mosha,* an alliance between a white scientist – the benign figure of the British Dr Alfred Hill – and the Bengali scientific entrepreneur Ghana-da, seemingly works to validate the heroic credentials of the latter. After Hill's attempts to cure an African chieftain's migraine with aspirin makes him the object of the village witch-doctors' ire, he is falsely accused of being the source of a plague that has decimated the community's prized cattle and is condemned to be boiled alive along with Ghana-da in the proverbial pot (and presumably eaten). On this flimsy narrative premise, however, is staged a sustained

interrogation of the process of the production of scientific evidence and the authorization of scientific knowledge. Ghana-da at first proceeds with colonial assumptions about the savage mind, and tries to purchase their freedom with overtly racist threats: 'Spurred on by your false priests, do you know who you have upset? Can you not see from the colour of his skin that he has come to us from the moon itself?' (Mitra 2000 vol. 1, 72). Much to his consternation, the witch-doctor's replies are couched in the distinctly modern demand for evidence: 'All lies. Where is your proof?' 'Is his colour not enough?' 'No, we want real evidence' (Mitra 2000 vol. 1, 72). With time running out – they have been given the length of a half-burnt torch to prove the unprovable, that is, Hill's celestial nature – Ghana-da notices the agitation of a catfish kept in a container nearby and concludes that their salvation is nigh:

> The fire was nearly out and I was almost resigned to reciting our last rites when I heard a sound coming from the water jar. The fish in it had suddenly started splashing with great vigour [….] I started to yell, 'Where is the chief and his witch-doctors? Come and see the power of the man from the moon!' They came running. 'You thought that by conjuring clouds you would defeat him. Behold, he will now crack open the very mountains and earth itself.' (Mitra 2000 vol. 1, 73)

The earthquake duly arrives, destroying the village and enabling the heroes to escape. It also results in the opening of the channels of a new river, the discovery of which is celebrated by the awarding of a fellowship of the Royal Geographical Society to Dr Hill.

Note what kind of narrative experiment the 'open-air' laboratory of 'darkest Africa' allows Mitra to perform here. The physiological properties of the catfish are offered at first as the evidence for something that can only be a racist fabrication – Hill's supernatural 'white' cosmic power. But since we know from Ghana-da himself that the former can in no way prove the latter, it is clearly inadequate to meet the demands of evidence by the witch-doctors, and what the episode in fact reveals is what Latour and Woolger had concluded from their field-work about laboratories – namely, that they produce facts and realities through the interlocking processes of inscription, negotiation and authorization that are activated by various apparatus and devices. Ghana-da's tall-tales and their recording by the narrator Sudhir, one of the residents of 72 Banamali Naskar Lane, is of course the most privileged form of inscription in Mitra's story-cycle. The 'cannibal pot', the catfish and the various accoutrements of modern civilization such as aspirin act as

the various devices and apparatus. The conclusion points to the kinds of socio-political power that authorizes scientific facts. The fellowship of a metropolitan scientific organization makes Hill the author of a 'discovery' that is not made by him and entirely erases any traces of labour expended by his non-European collaborators of whom Ghana-da is only the most prominent. It also reveals the human cost of such authorization – the dead African 'savages' over whose villages, cattle and bodies flow the new river that is the physical proof against which Hill's prestige is acquired. Thus, what initially appears as an experiment designed to demonstrate the sway of science over superstition turns out actually to provide evidence for the kinds of social and historical powers that sanction such epistemological and ethical superiority.

Not all of Mitra's laboratories are either 'open-air' or African, but they are all deeply marked by geo-politics. In *Phuto* ('Hole', 1954), Ghana-da is parachuted with an American spy, Michael, into a remote Russian outpost near the Arctic circle in order to penetrate the secrets of a laboratory conducting space research. Published three years before the launch of the Soviet *Sputnik 1* as the first artificial satellite in space and the subsequent triggering of the 'space race' phase of the Cold War, *Phuto* has its finger solidly on the geo-political pulse from the opening moments of the narrative:

> Not many people know that since the last world war, the two superpowers have each started thinking about building a space station in order to make themselves invincible. One scientist has even drawn up a blueprint for it. A small satellite would be constructed fifty miles above earth, and just like the moon, it would orbit our planet. To make this possible one would need advanced aero-space science and engineering. Therefore, the two superpowers were keeping tabs on each others scientists and many spies were risking their lives to gather information about them. (Mitra 2000 vol. 1, 130)

The complete absence of any recognizable scientific apparatus alerts Ghana-da and Michael about the unusual nature of the laboratory, and it soon becomes obvious that they are going to act as the instruments in an extraordinary experiment by the presiding genius, Dr Minosky. Minosky exposes Michael's real espionage mission and reveals that the laboratory is in fact a spaceship, and the experiment he was about to conduct would prove the existence of a fourth dimension in addition to the familiar three – length, height and breadth. Actually, the experiment helps stage Ghana-da's impeccable non-aligned sensibilities, since he

helps Minosky to overpower and restrain Michael and volunteers to be his 'test subject'. Unlike the unfortunate Tan Lin from the earlier story, however, the experiment is non-lethal:

> When I came to, I was sitting exactly on the same spot. Michael was still out of it. Minosky was staring out of the window. Hurrying to him, I asked 'What happened? What are you looking at?' He smiled and said, 'Take a look.' What I saw stunned me. Instead of the Siberian permafrost, all I could see was a red desert. 'Is this the Sahara?' I exclaimed. Minoski laughed aloud and said, 'Try something a little further. Like Mars.!' [....] 'But how?' I asked, bewildered. 'Through the hole', he said. 'The hole that is the fourth dimension in space. Length, height, width – we are used to seeing things in these three dimensions. We have known of a fourth mathematical dimension, but no one had hitherto been able to find its physical form. My experiment has now brought this within the grasp of mankind.' (Mitra 2000 vol. 1, 135)

If in some of the other stories Ghana-da's, and by extension Bengal's and India's, world-historical credentials had been secured at the cost of reinforcing colonial ideologies, here it is balanced by the role he plays in the sabotage and defeat of an American espionage mission against the Soviet Union and the accreditation of the humanitarian credibility of 'socialist science'.

Weapons and energy are the two products that are unsurprisingly associated with the various laboratory-like spaces that feature in Mitra's Ghana-da tales during the non-aligned years. The narratives describe the tussle to control them both in acknowledgment of their pre-eminence in geo-political calculations of the Cold War, and as a way of testing Nehru's submissions of India's unique mediatory role in this conflict. At the same time, Ghana-da's entrepreneurial inclinations mean that such mediations as imagined by Mitra never really conformed to the Nehruvian ethics usually proclaimed in relation to it as the historically disinterested pursuit of world peace and equality among former colonies as well as among the Euro-American powers. Rather, Ghana-da's extractive and managerial ventures, even or especially when they fail, air the suspicion that the non-aligned position should be seen more properly as an extension of a bid for power by India's new rulers dominated by the *bhadralok* classes, both Bengali or otherwise.

Shishi ('Bottle', 1959) begins with a testing of the authority and credibility of Ghana-da's tall-tale. The residents of 72 Banamali Naskar Lane take advantage of an international science congress being hosted

in Calcutta to print a fake invitation to Ghana-da purporting to be from one of the famous attendees of the event – the French geographer Sustel. Like many of the other stories, the narrative tension is here generated by the question of how or whether the trap engineered by Ghana-da's fellow residents will be matched and neutralized by the hero's own fake counter-narrative. This can only happen if the latter is able to produce enough evidence that cannot be disproved by his audience, and therefore outweigh their own 'fake' proof, which is of course the invitation letter that they have concocted together with much care and ingenuity. That is to say, like the other Mitra stories we have looked at, *Shishi's* geo-political and scientific adventure is an experiment about the production of the authority of facts.

The laboratory spaces that host such a narrative experiment in *Shishi* include both the 'open-air' variety – which here are the Galapagos islands where Ghana-da is studying a rare type of sea iguana with his Ecuadorian indigenous assistant – and the enclosed kind – on board a nuclear submarine where he is taken by Sustel and his mysterious boss after they kidnap him. The pursuit of the seemingly 'pure' scientific knowledge on the island is made possible by the fully, and occasionally violently, authoritarian relationship between Ghana-da and his superstitious, Christian assistant. The nuclear submarine, on the other hand, is engaged in the practice of obviously geo-politicized science – the mapping of the deep-sea trenches in order to discover a navigable route that will break the monopoly of the global superpowers on military technology *and* to prospect for the extraction of minerals and petroleum from such oceanic depths. But such military and economic challenges to the superpowers are far from desirable to Ghana-da's sensibilities:

> From Sustel I learnt that it was not just the mapping of the Atlantic Rift Valley he was interested in, but also the undersea mountains rich in petroleum and all kinds of precious minerals [….] This means that the rumours are true […] A secret third power, different from US or Russia, is emerging. Despite their many faults, both the US and Russia are committed to human progress. But this power has no such weaknesses. (Mitra 2000 vol. 1, 248)

The scientific experiment Ghana-da conducts on board the submarine in the first instance demonstrates the remarkable properties of the chlorella fungus that can filter oxygen from carbon dioxide, and the application of which saves the whole party from death when the ship malfunctions and is stranded on the ocean floor. But it also enables the defeat of this unnamed and malignant 'third power' since it allows Ghana-da to

pass off a fake map of the marine trenches to its agents and therefore sabotage the whole project with Sustel's reluctant assistance. That is, in Ghana-da's narration, the evidence provided by the experiment with chlorella also establishes the authority of the fake map and this in turn outweighs the credibility of the fake document that the hostel residents attempt to entrap him with in the frame-narrative. This complicated fabrication of facts also authorizes Ghana-da's non-aligned balancing act that maintains the geo-political structure of the Cold War. We shall return again to this story in the following chapter to examine the implications of the representations there of the moral and ethical differences between national and cosmopolitan belongings for Mitra's engagement with the idea of non-alignment.

We can conclude this discussion of laboratories in Mitra's fiction in order to turn to the corresponding treatment of the trope by Ray with one more example that features a key 'developmental' concern of the non-aligned years – food security and population growth.[5] *Chuunch* ('Needle', 1963) begins with a discussion among the hostel residents about the rising price of basic food items and their attempts to trap Ghana-da into a (fake) agreement of starting a sustainable urban farm on their terrace that would require the pooling of money and labour. Predictably, Ghana-da retorts with a tall-tale about two scientists called Lavalle and Solomos, whose research might lead to the patenting of artificial chlorophyll and solve forever global food scarcity by photosynthesizing sunlight into edible protein. However, the successful conclusion of this experiment depends on another one, which is conducted by Ghana-da himself, and which secures the freedom of the scientists from the intervention of powerful forces that want to monopolize the production of this artificial chlorophyll, as well as from the credulous African 'primitives' who have been easily manipulated into imprisoning Lavalle and Solomos.

The cat-and-mouse game to rescue the scientists between Ghana-da and his adversary, the secret agent Sabatini, traverses Europe, the Middle East and Africa, but the *denouement* is staged in a make-shift laboratory in the jungles of Gabon. Here, the two scientists are hiding from their pursuers and are close to the experimental breakthrough when, as in *Maach*, the local Fang tribes are incited by Sabatini to rise up against them. There is a variation built into the caricatures about the savage mind here, in so far as it is the Fang who had built the laboratory and

[5] By 'developmental concern', I mean here something like the ideology of development or 'developmentality'. On the growth and entrenchment of this ideology see in addition to Escobar 2011, Sutton et al. 1989, 35–60.

installed the machines and devices. But while they possess the kind of technical expertise required for these tasks, they are incapable of sifting through the false proof presented to them by Sabatini regarding Lavalle's alleged impiety and they intend to sacrifice him to their gods. Thus is maintained the distinction between the properly scientific and technical labour that, as we have seen from Anderson and Shapin's accounts, is one of the basic structural principles of the modern laboratory. Ghana-da's experiment, involving sowing the local rivers with florescent microscopic sea anemones and correctly predicting that they will light up the river with crimson colours, outweighs Sabatini's fabricated evidence and, empowered by such authority, he persuades the Fangs to set Lavalle free. In so doing, Ghana-da activates a two-fold process of accreditation. First, he solves the labour problem that had sabotaged the laboratory, where the 'primitive' workers (the Fangs) had disrupted the hierarchy of knowledge-production by holding the scientist captive. This secures Ghana-da's administrative credibility. But this managerial solution can only be imposed through the scientific proof of the physical properties of the sea anemone. Granted the latter has to be translated into the language of religion to account for the 'underdeveloped' sensibilities of the Africans. But the Fang's capacity for appreciating the experimental production of proof also signals their potential, under the correct tutelage, for 'development'. This recalls a key mantra of 'Nehruvian science' – that popular and spectacular demonstration of scientific experiments would gradually inculcate a 'scientific temper' among the 'backward' populations. The African tribal and her Indian counterparts can thus be seen as interchangeable units carrying similar values in such developmental calculations. This too, is one of the proofs offered by Ghana-da's narrative experiments to the convictions of post-colonial scientific developmentality.

Many of the issues raised by Mitra's use of the laboratory as a narrative device are also present in the fiction of Satyajit Ray. The careful revelations regarding the process of constructing facts, the hierarchical structure of laboratories and the labour relations that this involves, the nature of evidence and the kinds of authority they produce, the geo-political implications of laboratory work – all appear as central concerns of the Professor Shonku stories. But we can immediately notice two key differences between Shonku and Ghana-da. First, Shonku's entitled credibility as a professional scientist – *Professor* Shonku – and the absence of a comparable conversational milieu around him (despite the intrusions of his neighbour Avinash *babu*) mark him out as a decidedly different kind of gentleman than Mitra's hero. Perhaps he has more thoroughly internalized some of the key ideologemes of modernization

– efficiency, professionalization, organization, productivity – all of which must be achieved by avoiding arcane social practices such as Ghana-da's *adda* sessions that merely serve to waste time.[6] Second, there are fewer 'open-air' laboratories in Ray. Shonku's experimental spaces contain many more obviously scientific devices and apparatus, are organized more effectively and are more obviously aligned to the production of 'pure', 'disinterested' scientific knowledge. These two differences, paradoxically, serve to make Ray's fictional interrogations about the premises of scientific knowledge and scientific development – those keystones of Nehruvian national and international policies – more dramatic. Despite the inaugural genealogical account of the Shonku archive in *Byomjatrir Diary* ('The Diary of a Space Traveller', 1961) and the layers of editorial interjections regarding its credibility, the stories by and large soften the tall-tale effect precisely because of the absence of the fictional body of sceptical interlocutors around the scientist who are capable of testing him through the conversational exchanges. What we get instead is Shonku's own shocked realization that his assumptions about science are repeatedly challenged from within what appears to be its exclusive domain – his own laboratory. Furthermore, these challenges are not the result of any corruption of the laboratory's organizational integrity by unruly social reality. Rather, the presence of external agents serves to confirm the thoroughly socialized character of the seemingly autonomous and antiseptic space of the laboratory itself.

Byomjatrir Diary deploys the 'lost manuscript' trope familiar to the readers of colonial adventure tales. Roy's (and Mitra's) uses of such tropes and themes undoubtedly reflect both their own formations among the anglophile Bengali literary classes and the lasting, world-literary persistence and scope of popular colonial popular-fictional genres throughout the post-colonial era. But equally notable is how they use such narrative resources to re-purpose the genre of science fiction. The story begins with the unnamed editor receiving Shonku's diary from a jobbing writer, Tarak Chatterjee, who spins him a fantastic tale of having found the text in a crater made by the recent meteorite strike in the tidal forests of the Sundarbans near Calcutta. This tall-tale is presumably to be tested by the subsequent experience, shared by the fictitious editor and her readers alike, of sifting through the various events recorded by Shonku in the diary. Among the very first events, we note, are the struggles that mark everyday life in Shonku's laboratory. These

[6] The best-known discussion of the practices and social meanings of Bengali *adda,* or conversational gatherings, can be found in Chakrabarti 2000, 180–213.

pit Shonku against his servant Prahlad, who is also his only assistant in the experiments conducted there and, in so doing, underscore the hierarchical and oppressive labour-relations that mark this space. It also readily recalls the accounts of the historical versions of such conflicts in Indian laboratories of the era in the notes of Anderson and others.[7] Shonku's first significant act is to punish Prahlad for uncovering a mirror, and thus startling Shonku by revealing his own aged (and scarcely human) appearance after months of solitary experimental work. Prahlad's punishment is a comic variation of the more sinister activities that we saw in Nishimara's laboratory – Shonku fires one of his own inventions, the snuff gun, at his assistant resulting in the latter's continuous sneezing for 48 hours (Ray 2008, 5–6).

Shonku further suspects that Prahlad's incompetence has more serious implications for his laboratory work. Prahlad's tampering with the clock has already resulted in a catastrophic miscalculation and the failed launch of the spacecraft that Shonku has been devoting most of his inventive energies to. Yet, the servant-assistant remains indispensable to Shonku:

> There is no doubt that Prahlad is very brave. I remember one particular occasion very well. A gecko had fallen from the ceiling on my bottle of bicornic acid and overturned it. I was there, but could not do nothing except watch helplessly. All my limbs went numb at the mere thought of what might happen if the acid made contact with the powder. Prahlad entered the room at this crucial moment, saw me staring at the acid, grinned and coolly wiped it off with a towel. (Ray 2008, 7)

It is this stereotype of the ideal relations in the laboratory between the masterful scientist and his physically competent, but intellectually deficient assistant, that the rest of the story scrupulously deconstructs. The space journey to Mars and then to Tafa in fact serve as occasions for Shonku to narrate the undoing of his own presumed mastery of science and of science itself as a privileged form of knowledge. Prahlad remains instrumental in such unravellings, but he is joined by another figure who is another of Shonku's experimental 'test-subjects', his robot Bidhushekhar. As Kamile Kinyon has shown, the theme of the machine that acquires consciousness and other anthropoid attributes has been a stock feature of science fiction at least since Čapek's path-breaking

[7] See, for example, Abha Sur's 2011 investigations into the gender- and caste-politics that mark Indian laboratories.

R.U.R., and is typically used to de-familiarize the 'normal' processes of economic and social reproduction (Kinyon 1999, 379–400). What remains implicit in Čapek – the allegorical function of the machine to illustrate social and labour relations in the capitalist world – acquires an added sharpness in Ray's fiction precisely because Prahlad and Bidhushekhar do not figure as industrial workers there. Rather, they occupy an indeterminate position between domestic helpers and laboratory assistants, attesting to the historical conditions of uneven development in Nehru's India where laboratories, as we have seen, displayed the unsettling combination of middle-class *babu* domesticity and institutional professionalism.

The alliance between Bidhushekhar and Prahlad is sealed not only by the near-death experience of the space travellers on Mars in the hands of the piscine aliens, but also in their shared cultural appreciation of ancient Indian epics and classic European literature – Bidhushekhar picking up verses of the *Mahabharata* from Prahlad, as well as speaking in Shakespearean cadences to the utter surprise of Shonku (Ray 2008, 24). But these uncanny linguistic abilities of his robot assistant in turn generate a thought that is much more unsettling for the scientist – that its grasp of science is better than his. He had already suspected as much when Bidhushekhar prevented him making a catastrophic error in the manufacturing of a chemical compound critical to building the spaceship (Ray 2008, 9). During the journey, Bidhushekhar warns Shonku of the danger waiting for them on Mars, and then inexplicably corrects their course to take them to Tafa – a planet inhabited exclusively by brilliant scientists belonging to the most advanced civilization in that part of the universe.

Bidhushekhar's mysterious actions have one decisive consequence – the diminution of Shonku's status as a scientist and of human scientific knowledge as such. Baffled by the aphid inhabitants of Tafa and the total absence of any recognizably scientific institutions or even technological progress there, Shonku asks to be taken to what he assumes to be a kind of Platonic elite he has evidently failed to meet thus far. The alien's reply infuriates him:

> The ant replied, 'What will you do with scientists, or science? Why don't you just stay the way you are? We'll visit you from time to time, all right? We find your plain and simple words, your naivety, most entertaining!' What impertinence! Highly incensed, I took my Snuff-gun and fired it directly at the ant's nostrils. But nothing happened. The ant remained quite unaffected. The reason was clear. These creatures haven't even learned to sneeze! (Ray 2008, 28–9)

The comic force of the ending is generated simultaneously by Shonku's obvious humiliation and his desperate but failed attempts to impose some kind of anthropoid civilizational grid on the aliens in the hope that he may be able to hide the implications of such humiliation. We may detect all kinds of literary genealogies here – from the satiric spirit of Lucian's *True History* of the second century CE to de Bergerac's comic history of the lunar republic (1656) and Voltaire's *Micromegas* (1752). What is common to this particular mode is the ironic exposure of the assumptions regarding the totality and perfection of human knowledge-systems. Ray's achievement is to preserve this mode by cross-hatching it with elements of the Victorian nonsense-verse tradition so beloved of his father Sukumar and himself, and invent an allegory for the Nehruvian scientific culture that he found himself inhabiting. The pattern inaugurated in the first Shonku story – the unexpected challenges to and dilution of Shonku's own scientific creed – was to be repeated many times throughout the first two decades of the story-cycle.

Often, this examination of the limits of science takes the form of disturbing contrasts between Shonku's laboratory processes and those of antagonists marked as non- or anti-scientific – typically coded as adherents of religious, magical or supernatural beliefs and practices. In *Professor Shonku O Harh* ('Professor Shonku and the Bones', 1964), Shonku dismisses the news of a holy man brought to him by his neighbour Avinash *babu*, who can allegedly revive the dead by chanting an ancient magical formula over their bones. Eager to expose what he is sure is a fraud, Shonku arrives at the scene only to be utterly perplexed by what he witnesses:

> I am a scientist. I do not know if the things that I saw next could have any scientific basis. May be they could; may be they did. Perhaps, in fifty years, science will be able to explain it; but certainly at this moment, all of it is incredible. Yet, I cannot deny what I saw very clearly, with my own eyes. What was just a heap of loose bones, soon disappeared. Each bone clicked into place [….] turned into a bright white rabbit. Its red eyes darted here and there for a few moments; then it flicked its long ears a couple of times, before leaping up and hopping away, making its way through people's legs. (Ray 2008, 38)

Determined to defeat this affront to his scientific sensibility, Shonku attempts to record the *sadhu's* chant. But when he tries to play the tape in the seclusion of his laboratory, it inexplicably malfunctions and Shonku becomes aware of the malevolent spectre of the holy man just outside in his garden. Months later, the two come face to face again, this time in

a south Indian cave where Shonku has been excavating the bones of a hitherto unnamed dinosaur. With the help of Prahlad and the local tribal population, he has transformed the cave into a temporary laboratory and is on the brink of announcing his discovery to the world when the holy man mysteriously appears to resuscitate the dinosaur with his chanting. Facing what appears to be certain death, Shonku also thinks that the moment marks the victory of ancient magic over modern science: 'I darted a quick glance at the sadhu. His face was lit up by a monstrous glee. Once I had used my knowledge of science on him and tried to steal his mantra [….] Today, the sadhu was here to pay me back' (Ray 2008, 46–7). Yet, it turns out that *some* modern zoological knowledge would have been useful to the holy man. The animal he has resurrected is a herbivore, who, with a perishing hunger, proceeds to devour the tree on which he is hanging. Yet, there is time for a final, magical flourish:

> And could I have imagined that, just before he died, he would give a final magical performance? [….] What I saw next was just the opposite of everything I had seen so far. A living, breathing creature, made of flesh and blood, turned once more into a great heap of bones. And through the gaps in its ribs, I could see a human skeleton. (Ray 2008, 48)

It is not just science and magic that are pitted against one another here, but specifically, the devices and processes associated with them. Against Shonku's laboratory, tape recorders, tools of excavation and, above all, his deductive reflexes supported by experimental evidence, are arrayed the holy man's chants, non- or anti-technological habitus (he mostly hangs from trees) and kinesiological knowledge (his chants work only if they are accompanied by a specific pattern of body and hand gestures). In the narrative, laboratories, both conventional and non-conventional, are spaces that facilitate if not the equivalence between these two different kinds of knowledge, then at least their fraught conversations with each other.

Indeed, one could argue that among the main functions of laboratories in Ray's stories is the revelation that magic is both archaic or residual forms of scientific knowledge that coexist with its modern variant, as well as the possibly emergent and futuristic form that the latter might go on to take.[8] The Chinese magician Chee-Ching visits

[8] This relationship between science and magic has of course been a matter of much scholarly investigation. Lynn Thorndike's monumental eight-volume investigation 1923–58, is a classic example. More recent examples include Styers 2004 and Nadis 2005.

Shonku's laboratory in *Professor Shonku O Chee-Ching* ('Professor Shonku and Chee-Ching', 1965) with precisely this question:

> 'You Plofessol Shonku?'
> I nodded.
> 'You scientist?'
> 'Yes, so it would seem!'
> 'Science is magic.'
> 'Yes, you might say that. It is a kind of magic.'
> 'And magic is science. No?' (Ray 2008, 90)

Affronted by this suggestion, Shonku tries to impress Chee-Ching with a tour of his laboratory and all his instruments, medicines and apparatuses contained there. But after Chee-Ching leaves, Shonku is afflicted with the vision of the resident gecko of the laboratory metamorphozing into a Chinese dragon and feasting on the chemicals, seemingly impervious to the might of the weapons that have been patented by Shonku. This turns out to be the traces of a 'little magic' performed by Chee-Ching that defeats any attempts by Shonku to understand it. Shonku may have embarrassed Chee-Ching in the past by exposing his hypnosis trick. But the suspicion at the end of the story is that his command over 'physics, chemistry, physiology, psychology, everything' may have enabled Chee-Ching to invent a unified, total practice that appears to lie ahead of contemporary science, and therefore appears to be magical.

Both *Professor Shonku O Egyptio Atonko* ('Professor Shonku and the Egyptian Terror', 1964) and *Professor Shonku O Baghdader Baksa* ('Professor Shonku and the Box from Baghdad', 1970) stage encounters between Shonku's modern sensibilities and ancient practices of knowledge that were scientific in their days, but can now only be thought of as magic. There seem to be little possibility of them ever re-appearing as science in Shonku's or our own lifetime, but they gesture towards a utopic horizon when such magic could be re-integrated into the scientific domain. A significant element in both the stories is Shonku's association with scientists who represent dominant world powers – the British James Summerton in the former story and the American Goldsetin in the latter – an alliance that can only be experienced as a betrayal (much to Shonku's puzzlement) by his Egyptian and Iraqi interlocutors of their common bond as formerly colonized peoples and non-aligned sensibilities.

Thus, Shonku's unreflective cosmopolitanism and his easy assumptions of equality between citizens in the world republic of the sciences rub up against the distinctly Nehruvian Third-World Arab internationalism

that refuses to forget the histories of coercion, conquest and plunder that underwrites such cosmopolitanism. This is spelt out by a stranger to Shonku in Egypt as he prepares to assist Summerton in his excavations of a pyramid: 'You appear to be an Indian. So why are you getting mixed up with these white brutes? Why are you so concerned about the ancient and holy objects of our past? [….] Interest is one thing [….] but digging the earth, then stepping into the sacred resting place of a departed soul and disturbing its peace, is quite another' (Ray 2008, 162). Thus, what would otherwise have appeared (and still does to Shonku) as Summerton's generous gift of 'one of the mummies I have found here' is more properly revealed as an act of neo-colonial vandalism with a very long history indeed. Back in his provincial laboratory in Giridih, Shonku's excitement at the prospect of conducting experiments on the mummy (unconsciously) echoes precisely the entitled connoisseurship of those European explorers and scientists whose looting of cultural treasures of their former colonies is always conducted in the name of the disinterested pursuit of science:[9]

> Having thus instructed Prahlad, I set to work. All my equipment was laid out on a table next to the sarcophagus. I dragged a chair, sat down and turned my attention to the mummy. Among the chemicals used by Egyptians to prevent a corpse from decaying, there were such things as sodium hydroxide, bitumen, balsam and honey. But, in addition to these, they used various other substances which have not yet been successfully analysed and identified by any scientist. It was those mysterious constituents that I had to uncover [….] I donned a pair of gloves and a mask, and began my work, starting from the top of the body. (Ray 2008, 173)

This absorbed and expert laboratory work is disrupted, as in the case of the holy man in *Haarh,* with the inexplicable and vengeful appearance of the Egyptian stranger. Shonku's demise at his hands is prevented by the intervention of his cat, whose scratches cause the stranger to collapse unaccountably. The mystery of his death is solved when Summerton's

[9] The eminent role played by archaeology in the production of colonial, neo-colonial as well as nationalist ideologies is, of course, well-documented. The regular and irate exchanges between Britain and Greece regarding the Elgin marbles is only one of a whole variety of examples regarding the uses of archaeology in such projects. For a general discussion, see Diaz-Andreu Garcia 2007. Egypt has always been the site of such struggles. A good discussion of Egyptian archaeology's entanglements with modern colonialism can be found in Reid 2002.

letter reveals that the hieroglyphs he has decoded from the tomb tells the story of the death of a pharaonic priest for insulting Nephdet, the Egyptian cat-goddess. Instead of the scientific revelation about the process of mummification, Shonku's laboratory offers evidence of re-incarnation told within the framework of (neo-)colonial plunder and the *ressentiment* of the colonized.

A very similar lesson is offered by Hasan al-Hubbal to Shonku in Baghdad. Having arrived in the city to take part in an international science congress, Shonku's and his friends are entertained by the story of a secret cave containing ancient wonders by al-Hubbal, who is reluctant to reveal its location. To the considerable chagrin of the scientists, al-Hubbal gives them the reason for his hesitation: 'I don't mean you, Professor Shonku, but [….] many of our valuable possessions have made their way to museums in the West. So, even if you didn't want anything for your own use. I fear you might tell some museum or other about things you've seen' (Ray 2008, 211). Even Shonku has to admit the force of this argument, and suspects that the American Goldstein, for example, may indeed be one of the people more energized by the prospects of archaeological plunder than by the pursuit of intellectual pleasures. But this unfortunate proclivity he attributes to Goldstein's wealth and antiquarian interests and to the fact that 'science is no more than a pastime for him'. Al-Hubbal also leaves his audience in no doubt about the nature of the wonders stored in what he calls 'Ali Baba's cave': 'There are many, and they are scientific inventions made before the birth of Christ' (Ray 2008, 211). The challenge he issues to the 'inventors … well-known scientists of the twentieth century' is to comprehend what 'the scientists in the first century had achieved' (Ray 2008, 215) without dismissing the latter as magic or superstition. This they have profound difficulties with, in part because they simply cannot understand the technology of the cave that must entered by the chanting of a formula at a precise aural tone and pitch; in part because of the buried remains of a Sumerian magician they find there; and in part because there does not seem at first glance anything scientific about the treasure trove they discover in the cave: 'boxes, cases, chests, bowls, pots, pitchers, vases and chairs. All were made of metal … studded with bright, sparkling gems' (Ray 2008, 216). The sense of wonder is generated in the narrative precisely because what appear to be ornamental turns out to be scientific. The most attractive article in the cave, a casket, is actually a sophisticated machine: 'The inside of the box was packed with tiny gadgets. These were made of not just metal, but what appeared to be pieces of glass and beads. It was impossible to tell what those gadgets were meant to do [….] I have handled a lot of complex machinery in

my life, but nothing as perplexing as this' (Ray 2008, 224–5). A space where such machines are kept may of course with some justification be thought of a laboratory. When Shonku experiments with the box and finds the right combination that activates the switch, the casket turns out to be a cinematic device that has recorded the moving 4,000-year-old images of funeral that took place in the ancient city of Ur. The story ends with Goldstein's predictable attempts to rob the casket, which is defeated by al-Hubbal's determination to preserve what he sees as his national cultural heritage. He dies in the cave clutching the casket, while Goldstein survives but is driven insane by something unexplained that happens to him there. Shonku's salutations to the Sumerian magician is also a frank acknowledgement that scientific development is not linear, nor can modern science define ancestral processes of knowledge production as necessarily inferior: 'We have found evidence of such a brilliant scientific mind that our own achievements have paled into insignificance. I have decided to throw my Omniscope into the Tigris. How I'll find the enthusiasm to work again when I go back home, I do not know. Never before have I experienced such an odd mixture of joy, wonder, despair, excitement and fear' (Ray 2008, 225). The scientists themselves appear to have been the 'test subjects' of laboratories that they have initially mistaken as an antique treasure chamber.

If one of the main tasks of Ray's laboratories is to turn modern science and scientists into the objects rather than authors of knowledge-production, there is one other theme that is crucial for the full achievement of this effect. It is that of professional rivalry between scientists that gives the lie to any notion of science as a disinterested, ethical pursuit of truth. Shonku's zealous attempts to guard his laboratory against intrusions by ordinary people may be an attempt to keep intact the aura of his distinction, but his scientific visitors bring with them both the solace of prestige and the threat of theft of his intellectual property. As Shonku himself comments while uneasily assessing one such guest in *Professor Shonku O Macaw* ('Professor Shonku and the Macaw', 1964):

> Other scientists have visited me before. Many of them, virtually from every country, wish to see my laboratory if they happen to be in India. A Norwegian zoologist once spent a whole month with me. But Tarafdar seemed different from any other scientists, with an interest in my work [….] Since scientists often work in the same area, there is bound to be a certain amount of rivalry amongst them, to see who has gone further ahead in doing original research and experiments. However, there was no reason to believe

> that I would answer every question, and reveal everything that I had learnt over the years through my own hard work, using my own intelligence and doing my calculations. (Ray 2008, 50)

His instincts prove to be accurate, as Tarafdar attempts to steal his research by planting an exceptional bird – the macaw of the title – in Shonku's laboratory, in the hope that it would be able to memorize his formulae. His scheme is defeated when, like Shonku's other assistants human and non-human – Prahlad and Bidhushekhar – the macaw displays an uncanny ability – in this case the ability to make moral choices. It exposes Tarafdar's plan to Shonku since it judges the latter to be 'good'. In doing so, it is accepted by Shonku as a resident of the laboratory, but only on condition of continuing loyalty and professional discretion: 'You are most welcome. But I hope you are not friendly with any other scientist? You won't be repeating my secret formula to others, will you?' (Ray 2008, 62).

Conversely, Shonku's own visits to the laboratories of foreign scientists underscore the often deadly rivalry between them. Both *Professor Shonku O Ashcharya Putul* ('Professor Shonku and the Curious Statuettes', 1965) and *Professor Shonku O Robu (*'Professor Shonku and Robu', 1968) draw our attention to the competitive system of the prestige and authority that structure the field of science. *Ashcharya Putul* begins with an idyllic description of the process of Shonku's consecration as a scientist:

> Today is a memorable day in my life. The Swedish Academy of Science has conferred a doctorate on me, thereby making all my hard work over the last five years truly worthwhile [….] Last year the Swedish scientist, Svendsen, came to my laboratory in Giridih. He was quite speechless after he'd eaten one of my creations. Upon his return to Sweden, he wrote widely about my work. As a result, the matter received a lot of publicity abroad. In fact, Svendsen is responsible, to a large extent, for the honour that I received today. (Ray 2008, 179–80)

But Shonku's trip to receive the honour soon reveals that laboratories are sites of different kinds of consecration. He is invited to Norway by Lindquist, who claims to be an artist who specializes in making miniature statues of celebrities. Wonderstruck as he is by the remarkable details of Lindquist's statues, including one of Shonku's colleague Ackroyd, Shonku is immediately suspicious when he spies discarded scientific apparatus around the house. Why would anyone deny being a scientist? The answer arrives as soon as Shonku succeeds

in surprising Lindquist working in his secret laboratory. The statues are so astonishingly life-like because they are indeed alive. Lindquist has pioneered a bio-engineering technique to miniaturize humans, and he has successfully experimented on a number of celebrities, including scientists, he has lured to Norway. Shonku himself cannot evade capture and miniaturization, and Lindquist delivers a sermon about the implications of his discovery:

> Do you know what my biggest triumph is? I haven't killed any of these people. I never will. Each one of them is alive. I give them an electric shock every day that makes them turn rigid and lifeless. At midnight, I give them another shock to revive them, and then I feed each one with a dropper. Sometimes, I even speak to them. But the sad thing is, although they have got absolutely nothing to worry about any more, none of them is happy. (Ray 2008, 195)

The combined ingenuity of Shonku and Ackroyd succeeds in thwarting Lindquist, but not before Shonku has been taught an unsettling lesson on how the pursuit of scientific distinction and consecration can, and often does, take rabid forms in laboratories.

Further proof of this kind of laboratory work arrives in *Robu*, a story that once again begins with a report of Shonku's experimental success – this time in building a robot (presumably a predecessor of Bidhushekhar, since the space journey comes chronologically later than the rest of Shonku's adventures):

> It took me a year and a half to build Robu. I built him from scratch, though Prahlad assisted me at times by handling the tools I needed. The most amazing thing about the whole exercise was the small amount of money within which I managed. The total sum came to Rs 333.85. The final product, built with this tiny sum, will act as my right hand man in the laboratory. Robu takes less than a second to do simple additions, subtractions, multiplications and divisions. I don't think he'd take more than ten seconds to solve any complex mathematical problems. (Ray 2008, 136)

Shonku is invited to Heidelberg to demonstrate the capacities of his robot by the veteran scientist Paumer, who soon bestows on Shonku an unparalleled accolade – 'I cannot think of any equivalent in the history of science that can match what you have done' (Ray 2008, 140) and insists that they show his creation to the leading German roboticist, Borgelt. But this time the demonstration does not go as well, as Robu fails to

respond to some simple questions regarding Borgelt's biography that the German scientist puts to it. Still, Borgelt offers to buy it from Shonku because he admits that Robu's mathematical capacities are greater than his own machine and if he can correct this single glitch by studying the Indian robot, he could save himself from financial ruin. On Shonku's refusal, he attempts to kill him – at which point Robu intervenes by decapitating Borgelt, thereby revealing in the mass of exposed wires that it was the German machine that had all along being masquerading as the human scientist. This venerable trope of the monstrous machine, with illustrious predecessors stretching back to Mary Shelley via Capek and others, is used here not only to demonstrate the perils of individual scientific hubris, but also to revise Shonku's initial acquisition of scientific distinction. Borgelt's robot is clearly superior to Shonku in its design, logic and linguistic capacities. Otherwise, how can it pass itself off as human to all visitors? Moreover, Shonku's rescue by Robu is possible only because Paumer has surreptitiously tampered with its circuits to enhance its telepathic link with its creator. The confident assertions of superiority by the Indian scientist are part of what his own tale dismantles.

Fictional laboratories are key devices in the writing of Mitra and Ray, who carried out experiments to test some of the central assumptions of 'Nehruivian science', among which are the nation-building capacities of such institutions, the spirit of intellectual equality and camaraderie fostered there, and their potential to solve key policy problems faced by post-colonial states. In addition, such devices also enabled the authors to raise fundamental questions about the ethical, moral and epistemological characters of modern science itself. Instead of affirming the latter's pre-eminence as a method of knowledge-production, they revealed the contingent processes involved in the fabrication of scientific facts or truths and their limits. It is entirely true that Mitra and Ray did not do this in order to retreat to the 'post-truth' regimes that we see resurgent across the world today. They did so in order to explore the implications of the historical development of modern scientific practices within and through colonialism, imperialism and capitalism. Yet, since much of Nehru's vision of a non-aligned Third World was based on the idea of scientific development, the laboratory lives of Shonku and Ghana-da also helped outline the critical limits of such a utopia.

Chapter Two

The uses of weapons

The scientist and the soldier

We have seen from our discussions above that when vital questions regarding scientific knowledge and their relationship to geo-political processes such as the Cold War or non-alignment were raised in the fictional laboratories of Ray and Mitra, they were often done so in relation to the inter-related issues of weapon-making and war-making. This is of course unsurprising, given the global importance of weapons and wars at a time when conflicts may have been of the 'cold' variety in Europe, but without a doubt were of the extremely 'hot' kind in south-east Asia, Africa and Latin America.[1] What is immediately noticeable, though, is how strikingly different sometimes were the manner and use of weapons in the Indian science fiction of Nehruvian era in comparison to their European and American counterparts. The earliest weapons we see in the Ghana-da and the Professor Shonku stories (*Mosha* and *Byomjatrir Diary*) are marked not so much by what H. Bruce Franklin has called the 'super-weapons' imaginary (Franklin 1988, 4) that came to dominate Euro-American science fiction long before the Cold War era, but by their comic and bathetic failures. Shonku's outrage at the feeble ineffectiveness of his fabled snuff gun in the face of the superb condescension of the aphid inhabitants of Tafa may well in the first instance work to expose the limits of his anthropocentric scientism (Ray 2008, 29). But since his failed weapon is also a part of Ray's (inter-)national allegory pertaining to the power and sovereignty of a post-colonial state, it gestures to the problematic status of weapons and war within the strategic scope of Nehruvian non-alignment itself. Likewise, the desperate slap with which Ghana-da

[1] For an expert account of the relative differences in the temperature of the 'Cold War' across the world, see Heller 2006 and especially Westad 2017.

quells the deadly threat of Nishimara's bio-weapon – the solitary, buzzing mosquito – may momentarily assure the Bengali gentleman's historical importance to the Cold War dispensation (Mitra 2000 vol. 1, 29). But since Ghana-da's allegorical weight and function are comparable to Shonku's, such comic-bathetic resolutions in fact raise further questions that cannot be contained within the narrative ending in *Mosha. S*hould elimination or control of weapons produced by non-European powers be the appropriate mission of Nehru's 'laboratory state', especially since this would serve to cement the Cold War status quo? Does the Indian scientific entrepreneur's involvement in the trade of information and raw materials used in the production of 'super-weapons' inevitably corrode the moral compass of a non-aligned nation? The urgency of such debates would come to define, for many, the tenure of Nehru as a political leader and the success or otherwise of his non-aligned policy.

A very large but unwieldy and unbalanced military apparatus was among the pre-eminent colonial legacies that the newly independent nations of South Asia had to contend with after 1947. Questions of weapons, military organization, national security and war-making capacities were unsurprisingly entwined with those of sovereignty and governance themselves. Nehru's own party sought to maintain a careful balance between its declared principles of non-alignment and the pursuit of world peace with the *realpolitik* logic of the maintenance and enhancement of military capacities as well as the Indian aspirations regarding its status as a major power, at least at the regional level. Within four years of independence, the Indian National Congress therefore felt compelled to publish a record of the military challenges the nation had weathered to date under its leadership, Among these immediate 'storms and stresses' it identified were the evacuation in 1947 of 8,000 British officers and the immediate handing over of command and control functions to their Indian counterparts, many of whom had to be promoted without the requisite experience; the transfer and resettlement of the partition refugees; and the first acts of war in the mountains of Kashmir where the terrain and weather posed their specific logistical challenges (Indian National Congress 1951b, 3–18). But perhaps the most keenly felt difficulty had been the shortage of ammunition and the obsolete armaments that plagued the Indian forces. Accordingly, the largest defence project undertaken was the setting up of a weapons prototype and machine-tools factory that could in turn enable the ordinance manufactories to meet the pressing need for arms (Indian National Congress 1951b, 25). Nehru's defence minister, Sardar Baldev Singh, was quick to link such questions of arms with that of the nation's industrial development itself:

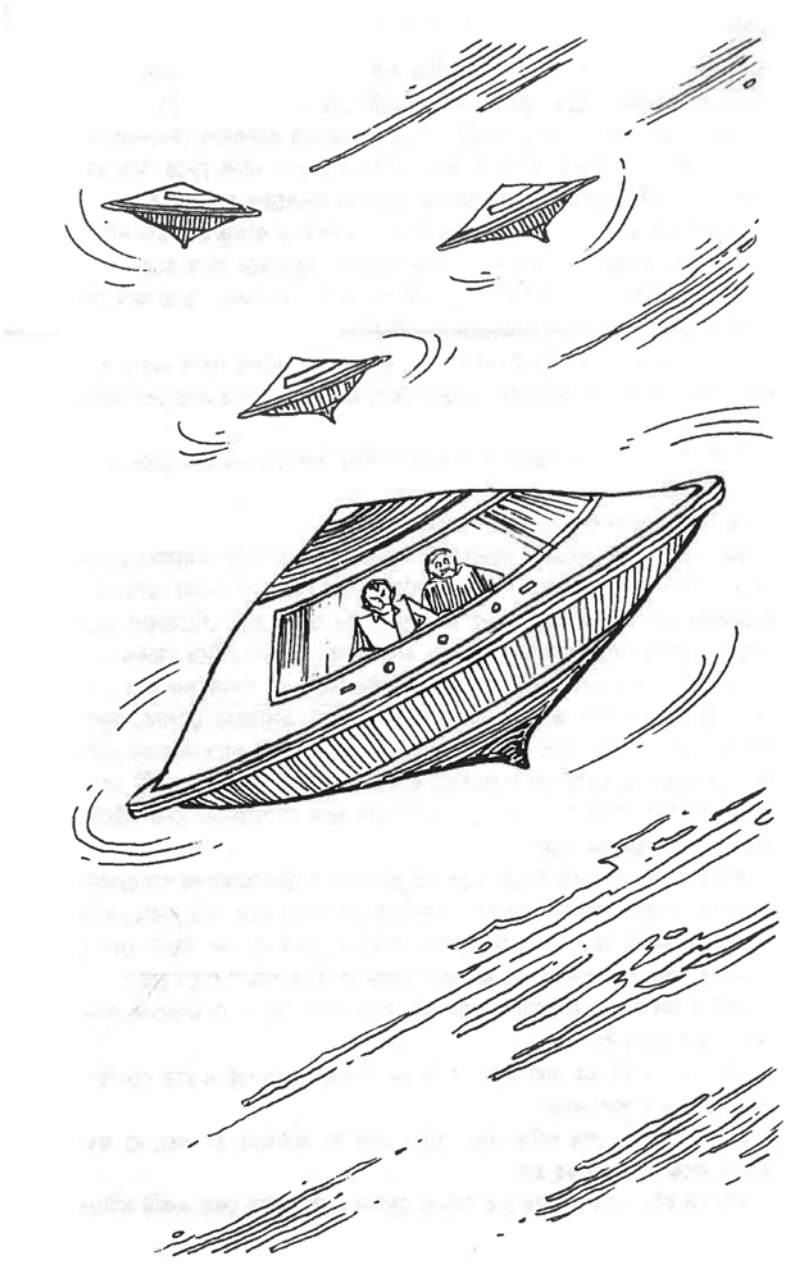


Figure 2: 'The babu's world wars', *Ghanada Samagra*, Premendra Mitra (2000).

> What India possessed of these factories, therefore, is a national asset of considerable importance. But we do not have all we need; nor is our technical staff sufficiently advanced, particularly in the higher grades [….] To make them function at their best we must find necessary material, raw or processed within the country itself. Basic industries have to be established; steel and other metals of requisite standards must be produced within India. the steel plant will take some years to operate [….] And remember also, along with the development of industries, our own nationals must require technical knowledge and specialization of a high order, so that we may not have to depend on outside assistance for long. (Indian National Congress 1951b, 28)

Key to such a military-industrial complex was a defence science organization (DSO) that would be 'concerned with the integration of military and scientific thought and planning for defence research and will work in close touch with other organizations engaged in scientific and industrial research' (Indian National Congress 1951b, 30–1).

After Nehru's declaration of India's commitment to international non-alignment based on five key principles (the famous *panch sheel*) in Bandung, such questions about weapons, military strategy, national security, sovereignty and India's moral leadership in the Cold War world demanded increasingly more refined explanations and considerations. As the Indian Council for World Affairs put it in their recommendations for national defence strategy in 1958: 'The deliberate preparation of defence plans and their resolute application is always necessary. Until India's Pancha Shil is unanimously accepted, until a stage is reached where all nations automatically resort to friendly negotiations to solve international disputes, it is the inescapable duty of every country to plan for this security, whether it believes in the use of force or not' (Indian Council for World Affairs 1958, vii). In particular, the Council recognized that the era of global 'super-weapons' such as military satellites and thermonuclear bombs that could hit targets from thousands of miles away, securing India's 7,5000 kilometres-long coastline demanded a paradigmatic shift in military imagination (Indian Council for World Affairs 1958, ix–x). Like Baldev Singh seven years ago, the Council was quick to connect militarization and industrial and financial development. European colonial powers, so went their argument, were able to dominate the Indian oceanic zone (and elsewhere) for over two centuries precisely because of the symbiotic network that tied together their industrial and military organizations. In order to ensure that such global disparities of power could never be repeated in the future, the tri-continental nations

would have to, to a certain extent, develop their own military-industrial complexes with scientists occupying key positions therein (Indian Council for World Affairs 1958, 2–3). It would also be a mistake to think of these European powers only in terms of their colonial pasts because that would ignore their active attempts to shape a neo-colonial world order in the present moment. The council offered the example of three recent political developments in Asia – US military aid to Pakistan, the signing of the Baghdad pact and the formation of the South-East Asia Treaty Organization. From the Indian perspective, all three US-led initiatives were designed to ensure the pre-eminence of the 'West' in Asia (Indian Council for World Affairs 1958, 177–8). To counter the effects of these developments, the Council recommended abandoning, or at least diluting, the two prevailing trends in non-aligned strategic thinking – selective alliance with a major power and accepting the resultant loss of sovereignty; pursuing policies of neutrality or non-alignment and risking being out-manoeuvred by countries who do not commit to such policies (Indian Council for World Affairs 1958, 142–4). Instead, it recommended the rapid organization of a scientific defence industry and military until such time that India's policy for global peace would be accepted by the majority of the world's nations (Indian Council for World Affairs 1958, 95).

Such conclusions arrived at by people working closely with Nehru's own government at the height of the non-aligned years clearly show the fault-lines running through the political ideas about India's international and regional/local prerogatives, as well in the thinking about the proper relationship between science, scientists, weapons and war. The Indian Defence Science Organization, whose remit was to formulate recommendations precisely in these areas, began publishing a journal where such considerations were given sustained attention. In one of the earliest issues, we find Major General H. H. Stable reflecting on the altered relationship between the soldier and the scientist since the Second World War:

> The Scientist, if one may say so, is less remote, more forthcoming and indeed more human. He no longer hides-himself from the view of the ordinary man in the obscurity of scientific formulae but emerges into this rough and ready world, slaps the soldier on the back, and tells him to regard Science not-so much as something obscure, lofty and unattainable but rather as systematized investigation and knowledge. The soldier for his part no more withdraws to brood in his military shell but comes forth prepared to cooperate and to learn: In fact, he has started to think! The relationship between a soldier and a scientist is perhaps not unlike that between

> a patient and a specialist. The patient must say what is wrong or what he requires put right: the specialist must prescribe. (Stable 1950, 115)

Interestingly, Stable also invoked the example of Britain's initial setbacks in that war to suggest that there could be an inverse relationship between military underdevelopment and defence scientific innovations: 'While Germany was thundering across France, knocking hell out of everything and everybody that stood in the way of her armour and her aircraft, Britain was striving desperately to work out her own salvation' (Stable 1950, 117). Such innovations, for a senior army figure like Stable, in the final instance depended on three things: a bespoke scientific body that was directly enmeshed in the chain of command; a rapid escalation of defence industrial production; the political acknowledgement of the inevitability of conflict and the ability to exploit the creative potential of war-making (Stable 1950, 121–2).

Stable's template of the relationship between the scientist and the soldier was repeated, albeit with certain variations, in the pages of the journal long enough for it to be considered as the 'common-sense' position on defence in Nehru's India. Nor was this an exclusively soldierly perspective on matters scientific. Some of the leading Indian scientists who comprised, in Anderson's words, the 'nucleus' of the Nehruvian 'laboratory state' also energetically advocated such positions. D. S. Kothari's observations on the organizational challenges of India's defence began with seemingly orthodox statements about the importance of theoretical science and the consolidation of a national civic space marked by exchange of information and conversation between experts (Kothari 1952, 67). Kothari even managed to present Gandhi as an exemplar of modern scientific practice by citing the experimental nature of his autobiography captured in its sub-title, *My Experiments with Truth*. But soon this paean to scientific theory and experiments was linked to defence research, understood by Kothari as scientific activities concerned with weapons performance, operational research and various 'special studies' (Kothari 1952, 72). For Kothari, the development of such a sector would also mean resisting the glamour of 'pure research' and recognizing the importance of the 'applied' variation – which would amount to nothing short of what he saw as a massive shift of in the science culture of South Asia (Kothari 1952, 78). One way to appreciate the cultural force of Ray's Professor Shonku is to see in him precisely this amalgamation of 'pure' and 'applied' research.

Kothari's submissions about the importance of modern applied research to the making of science and war were supported by his fellow

scientist Shanti Bhatnagar who played a key role in steering 'Nehruvian science' in the two decades after independence. In addition to reiterating the by now 'common sense' of the importance of a scientific presence at the heart of military organizations, Bhatnagar went much further than his colleagues to detect the presence of militarized science in every aspect of modern life. Citing the example of electronics that permeated contemporary 'industry, transport, communications, education, entertainment,' he argued that this degree of technological penetration of the everyday simply would not have been possible without the labours of the scientist-soldiers (Bhatnagar 1952, 86). Thus, he called for the embedding of defence science in selected elite public universities in India and outlined his vision for military-sponsored research and teaching activities in such institutions (Bhatnagar 1952, 87). Here we see emerging, in addition to argument that war is good for science and vice versa, a second major preoccupation of the Nehru's scientist-soldiers – institutional organization. This was understandable in the context of, as we have seen in the case of the Indian army, the abrupt denudation of the upper managerial and administrative layers that had until recently been occupied almost entirely by British personnel. As G. E. Gale observed, the defence scientist must also train to be a good administrator who would be able to arrange 'affairs to the best advantage in order to secure a desired end' (Gale 1953, 20). Viewed thus, 'administration enters into most of the things that we do, both great and small. We are all of us making administrative decisions of one sort or another all the time, whatever our job is. Nobody can undertake (or at least ought not to undertake) even a simple experiment in the laboratory without consciously or unconsciously going through certain administrative processes' (Gale 1953, 20). The defence scientist therefore must be able to identify the proper objective and ask the relevant questions regarding it, allocate resources rationally, work collaboratively and command a reasonable volume of specialist information (Gale 1953, 22–6). Since the leadership of such scientific organizations occupied a structurally analogous position to that of their military counterparts engaged in combined operations, Gale thought it was imperative that they too should have at their disposal a joint planning team comprising of specialists from various disciplines who would each approach any given problem from their individual perspectives in order to solve it in collaboration with the others (Gale 1953, 29). But against such 'common sense', the British physicist Patrick Blackett, who acted as an advisor to Nehru's government, warned that joint command structures had the potential of 'elaborating a simple problem unnecessarily' (Blackett 1955, 276) and of the inherent fragility of complex administrative systems, whether military or scientific: 'I made

some formulations many years ago during the war about the operational theory of small changes. The theory is this: Man is not clever enough to calculate what will happen in any big operation. It can be calculated with some success what will happen if some small changes are made in the existing arrangements' (Blackett 1955, 279). These trends in the Indian 'soldier and scientist' debates together raised some fundamental questions regarding the relationship between science, war and weapons when Nehru's non-aligned policy seemed to have gained considerable international traction. How should a country officially committed to promoting global peace by maintaining critical equidistance from the Cold War arms race approach the knotty issues of arming itself and devoting resources to a scientific organization of its army? In a situation of resource scarcity and organizational underdevelopment, how could it justify using the energies of its scientists to develop weapons rather than address the basic needs of its citizens? But in addition to this, such debates touched on issues central to the whole project of Nehruvian nation-building as such – economic development, technological innovation, organizational reform. Each of these questions had at their heart, it turned out, the figure of the scientist-soldier.

Nothing captured these dilemmas encapsulated by this figure better than, as we have already seen with Anderson, the often tortured relationship between Nehru's government and India's nuclear scientists. One of the most interesting things revealed by Anderson's enquiry is the paradox of India's relatively advanced stage of nuclear research existing within a general context of the underdevelopment of the country's scientific and technological institutions (Anderson 2010, 1, 120, 183). Such an advanced sector of the scientific field, comparatively rich in resources and funding, often exerted a gravitational pull on Indian scientists irrespective of their personal interest in super-weapons or in the military–industrial complex. Despite being fully aware of the dangers that a nuclear weapons programme posed both to India's regional and international relations, Meghnad Saha had already commented before the formal declaration of independence in 1947 on the organizational benefits that something like the Manhattan Project could confer on the country's scientific, technological as well as political development (Anderson 2010, 128). But it was very difficult, if not impossible, to build such a programme in India without getting entangled in Cold War alliances. Britain and the US in particular, were keenly interested in the deposits of fissile material, such as thorium and beryl, in the country and were dangling the carrot of the transfer of technological expertise in exchange for access to these minerals (Anderson 2010, 189). For a prime minister who had once reportedly rebuffed offers to

draw up a defence plan by saying that he would not need one because he led a non-violent country, such affairs had to be kept secret even at the cost of being labelled undemocratic by his parliamentary opponents (Anderson 2010, 206). Nor was India's nuclear programme the only area of 'Nehruvian science' where the problem of unwelcome international attachments – attachments that ultimately had a detrimental impact on the country's sovereignty – reared its head. Weapons procurement, according to Patrick Blackett, was precisely the area where the risks of post-colonial dependency could be seen. Reflecting on his report to the Indian government in 1948, Blackett observed: 'Indian officials and advisors were thinking purely from an Whitehall angle. There was an appalling psychological dependence on every word that Whitehall speaks [….] But a great many of your problems are due to imitative adoption of Whitehall habits. Actually a lot of that thinking should not be exported anywhere' (Anderson 2010, 217). As a result of this, such Indian government officials could be easily co-opted by British arms manufacturers who were interested in selling expensive weapons to a country that did not need them. Blackett therefore strongly recommended against the purchase of atomic and chemical weapons, supersonic and other high-performance jets, and guided missiles. But such thinking did not play well towards the towards the end of Nehru's life, when the military defeat to China in 1962 and the successful testing of the Chinese atomic bomb provided scientists like Homi Bhabha the opportunity to push through an official nuclear weapons programme.

In today's India, political scientists and military historians – many of them anxious to lend credibility to India's attempted projection of regional and international power – are often critical of these aspects of Nehruvian militarized science. For them, there was much too little militarization and far too much science in India between the 1940s and 1960s, and this they blame on both Nehru's personal preference for the scientist over the soldier, and on the Nehruvian state's grip over the army. Kartik Bommakanti sees in mid-twentieth century India the paradox of a strong state and a strong, open society that resulted in a delay in the 'modernization' of military organization and weapons systems, since it ensured that the imperative to allocate resources to the 'developmental needs' of the population always outweighed that of warfare (Bommakanti 2015, 11–13). The Defence Science Organization, a Nehruvian body *par excellence,* has been singled out for hobbling India's military capabilities with its 'mishmash of policies promoting autarky, distrust of the military, and the avowed objective of building an indigenous technology base and establishing self-reliance in military preparedness' (Routrey 2015, 38). Gopi Rethiniraj blames India's status

as an 'ambiguous' or 'reluctant' nuclear power on Nehru's foreign policy as well as Cold War *detente* expressed in the Non-Proliferation Treaty that denied countries such as India and Brazil the right to pursue the development of civil nuclear energy research (Rethiniraj 2015, 68–70). He also lauds the BJP prime minister, Atal Bihari Vajpayee, as different a figure to Nehru as imaginable, for ordering a series of nuclear bomb tests in May 1998 that ended the ambiguity about the Indian nuclear weapons programme (Rethiniraj 2015, 71). And for Ayesha Ray, it was Nehru's decision to more or less keep intact the military organization that he had inherited from the British – wherein a clear distance was maintained between the army and political decisions regarding strategy – that accounted for the stunting of India's war-making capacities, most painfully evident in the humiliation it suffered at the hands of China in 1962 (Ray 2013, 20–1). Ray also notes the tight budgetary leash Nehru kept his army on – with defence spending at no more than 2 per cent of GDP between 1947 and 1962 – and puts this down to his 'inherent fear of the military' (41).

Thus, in contrast to many of the critics of the militarization of science and the scientific organization of the military *during* the Nehruvian era, most of the post-Nehruvian criticism of India's military shortcomings have been mounted on the grounds of the elevation of the scientist above the soldier, both organizationally and in terms of complex decision-making capacities. Of course, as we have noted above, a lot of this undoubtedly reflects radical shifts in Indian domestic, regional and international strategies, particularly over the 'post-liberalization' years. Still, both sets of criticisms do point out the fundamentally ambivalent, not to say contradictory, position of the Nehruvian scientist-soldier with regard to one of the basic markers of national sovereignty, whether post-colonial or otherwise, which is its capacity and commitment to bear arms. Naturally, such ambivalences and contradictions were also related, as we have seen before, to others that were embedded in the idea of non-alignment itself, which Nehru advocated not only in the context of a global Cold War, but also in that of, as Kanti Bajpai has called it, *regional* 'protracted conflict' or 'enduring rivalry' (Bajpai 2016, 21). Many commentators, such as Andrew Kennedy, have admired Nehru for forging a political strategy that in his judgement was in equal parts 'realist' and 'idealist' in so far as it aimed to both 'transform international norms and institutions on the basis of moral principles' and to secure India's strategic advantage while doing so (Kennedy 2015, 93). But it is also true that such a careful balancing act undoubtedly produced uncertainties regarding the use of weapons in an age when post-colonial India was meant to take its seat as an equal among the

nations of the world. Science and scientists, designated as key players responsible simultaneously for the pursuit of peace and prosecution of war, now could be tested in fiction and otherwise about their capacity for bearing the burden of this herculean task.

War stars

Science fiction has been remarkably adept at reflecting on the relationship between knowledge, weapons and warfare. This stands to reason. If, as Charles Tilly has convincingly shown, 'war-making' and 'state-making' have been among the signal consequences of the business of capitalism over the past five centuries (Tilly 1985, 169–86), it should come as no surprise that a literature whose distinctive features include a kind of 'world building' that offers 'however unintentionally, a snapshot of the structures of capital' (Bould and Mieville 2009, 4) should meditate on the relentless militarization of all aspects of modern life. Understandably, such generic predilections came notably to the fore during periods of prolonged and sustained global conflicts such as the 'long' twentieth century. The European and American counterparts of Premendra Mitra and Satyajit Ray were perhaps marked above all by their hypnotic attraction to the questions of 'super-weapons' and 'future wars'. Some of these fictional trends should now be noted briefly to allow us to see how the Indian writers fared in comparison.

Of course, 'super-weapons' and 'future wars' were by no means exclusively Cold War themes. H. Bruce Franklin's exhaustive survey of the American cultural obsession with them puts their emergence in fiction between 1880 and 1914 (Franklin 1988, 5). Even more crucially for Franklin, war and weapons-making was hardwired into the very logic of American geo-political and economic expansion from the republic's earliest days, and this guaranteed the pre-eminence of 'super-weapons' in its collective imagination that could be seen across a whole variety of cultural forms, including most memorably in its speculative, fantastic and science fictional literatures (Franklin 1988, 92–113). Thus, the imaginary and real weapons and conflicts co-produced each other, and Franklin seriously considers the relationship between American science fiction and the air-war strategies adopted in the Second World War, including the use of nuclear bombs in Hiroshima and Nagasaki:

> Why did they think as they did? The imagination and consciousness of these men were shaped, in part, by forces of which they were only dimly aware. When Harry Truman made his fateful decision,

> he was behaving as a fairly typical American man of his era, a product of his culture. This is not to argue that he was directly influenced by the pre-World War I future-war fantasies serialized in the magazines to which he subscribed as a young farmer in Missouri [….] But the fate of Hiroshima and Nagasaki did indeed demonstrate the power of the first primitive nuclear weapon. It also demonstrated the power of the superweapon in American culture. By the eve of World War II, the old American dream of the ultimate peacemaking weapon, first projected by Robert Fulton and popularized by future-war fantasies during the rise of U.S. imperialism, had been transformed [….] into a panorama of American military-industrial invincibility. (Franklin 1998, 153)

Nuclear bombs may have been the doomsday weapon of choice in fact and fiction, but Franklin's work also shows how quickly apparently peaceful scientific inventions could be pressed into the services of militarism precisely because the pervasiveness of this super-weapons imaginary. In his battle to patent his own electricity-generating devices against that of Nicola Tesla, Thomas Edison gained advantage by claiming that he could use alternating current (AC) to create a chain of invincible fortresses across America capable of defeating numerically superior enemies (Franklin 1998, 59). In Franklin's estimation, the vast majority of American science fiction, even when concerned with exposing the horrors of weapons and war-making, betray a fascination with the potency of futuristic weaponry and do not seriously question their seemingly indispensable role in national and international 'development' and progress.[2]

Many of Franklin's observations also apply to European science fiction, particularly those written over the 'long' twentieth century in what was designated its 'western' zones. Cataclysmic conflicts powered by weapons of mass destruction designed by scientific geniuses appeared in British and French literatures during the Napoleonic wars, before re-emerging as the theme of an international best-seller in the *Battle of Dorking* phenomenon in the late nineteenth century (Clarke 1997, 34–9). George Chesney's 'future war' tale of German invasion of Britain, published in *Blackwood's Magazine* in May 1871, drew both on the

[2] This cult of 'super-weapons' is far from confined to American science fiction. It saturates, obviously, the substantial body of war literature and is the reason why the combat troops interviewed by Chris Hedges can declare that there are no 'anti-war' war movies – all of them fuel the seductive fantasy of the use of weapons with impunity. See Hedges 2002, 83–121.

author's own experiences with the British colonial army in India and the anxieties of a global superpower during an era where perceptions regarding war-making were undergoing rapid change after the twin impact of the Franco-Prussian and American civil conflicts (Clarke 1997, 40). Such was Chesney's ability to surf the *zeitgeist* that the pamphlet edition had sold around 80,000 copies within three weeks and,

> as the new telegraphic systems spread the news of Chesney's story throughout Europe, and further afield to Australia, Canada, and the United States, the demand for the original version led to translations into Dutch, French, German, Italian, Portuguese, and Swedish, plus two pirated US editions, two reprints in Canada, one in Melbourne, and one in New Zealand-all within months of the original printing. (Clarke 1997, 43)

The global conflagration known as the First World War whetted mass appetite for 'future war' stories and super-weapons such as remote-controlled guns and in particular, the 'death ray (Fanning Jr. 2010, 253). As with many imaginary weapons, the 'death ray' arose out of historical developments in scientific research into energy sources such as electricity, X-ray and radium, and quickly assumed the status of breakthrough technology among military planners, journalists and scientific innovators alike (Fanning Jr. 2010, 254–6). A constant stream of science fiction stories written by internationally recognizable authors such as H. G. Wells and Alexei Tolstoy, as well as lesser known ones such as Werner Gresseger, Sax Rohmer and John W. Campbell, marvelled at the potent nature of this fantastic weapon and its ability to alter the existing political balance of the world (Fanning Jr. 2010, 259–64). The most spectacular representation of this actually non-existent weapon was often cinematic, in films like *The Invisible Ray*, featuring iconic actors such as Boris Kerloff and Bela Legusi (Fanning Jr. 2010, 267).

After the Second World War, it was undoubtedly the existence of real doomsday machines in the form of nuclear weapons that posed the question of the worldly alignments of science and scientists most acutely. The moral conflicts experienced by prominent nuclear weapons scientists such as Ernest Rutherford, Leo Szilard and even Robert Oppenheimer were repeatedly rehearsed and (partially) resolved in most Euro-American science fiction by the use of the promethean trope to represent such figures (Dowling 1986, 141). Besides, whatever the misgivings of the science fiction writers regarding nuclear weapons, their existence was certainly good for their business and not just the business of writing either:

> The writers of pulp-magazine science fiction found themselves in an ambivalent position after the explosion over Hiroshima of the first atomic bomb. On the one hand, they were acknowledged as prophets proven right by the course of events. Some of them began new careers as writers of popular science and as consultants and participants in government-and university-sponsored seminars on social and technological change. Even those who remained close to their roots in magazine fiction found themselves newly prosperous as a result of the increased attention the bomb had brought to 'that Buck Rogers stuff'. (Berger 1976, 143)

Nuclear weapons were also good to think with for ideologues who fantasized about rolling back mid-twentieth century's Euro-American welfare states by applying neo-liberal measures. Noting how often fictional super-weapons were deployed as 'final solutions' to problems such as urbanization, Martha Barter notes:

> Cities get old, worn-out, dirty, dysfunctional. No technological 'fix' seems to satisfy us as we struggle with deteriorating neighbourhoods, narrow streets, and ineffective sewers. We long for the opportunity to clean house from top to bottom, to 'make it new' [....] While we would deny actually wanting our major cities destroyed, and with them our landmarks and our history, we note the popularity of movies like Godzilla, which show the fragility of our urban culture. Thus, atomic war has traditionally been presented both as obvious disaster and as secret salvation. This covert message is usually overlooked in fiction, even by authors, but it powerfully influences our cultural subconscious. (Barter 1986, 148)

The increasing embedding of American science fiction writers within the military apparatus after the anti-colonial wars of the mid-twentieth century, particularly in Vietnam, also served to disseminate the powerful myth of the inevitability of war as well as the benefits it confers to the right kind of victors (Gray 1994, 315–16). Since the 1980s, it has been a common practice in the US to invite science fiction writers to military planning sessions about current and future conflicts, and science fiction itself is an important part of the literature consulted by senior American military personnel (Gray 1994, 321). Former military scientists like Jerry Pournelle, professionally associated with top secret missile technology initiatives like 'Project 75', have also emerged as successful 'future war' fiction writers peddling fantasies of committing mass slaughters of environmentalists, Marxists and generally dissidents

of all stripes with increasingly effective super-weapons including cyborgs (Gray 1994, 323–4). If such writing is technophiliac or even epistemophiliac, it is only as a part of the increasingly desperate attempts of projecting full-spectrum American global dominance. Vietnam, of course, can be seen as precisely the moment of the fictional consecration of the soldier-scientist figure in Euro-American science fiction. Not only did the famous opposing advertisements in the pages of *Galaxy* pit leading writers against each other regarding the war itself, science fiction emerged as a robust platform where modern American war-making capacities were thoroughly scrutinized and debated (Franklin 1990, 341–2). Iconic television series such as *Star Trek* projected issues such as armed intervention, balance of power and use of weapons of mass destruction for strategic purposes into space in order to reflect the bitter divisions that had opened up in American and European societies around these issues (Franklin 1994, 24–5).

What are we to then make of what I have called the largely comic and bathetic depiction of weapons in the Indian science fiction of the Nehruvian years? Did they register a non-aligned sensibility of distrusting 'super-weapons' and 'future wars' as instruments of Euro-American domination of the tri-continent? Were they critical indices of India's own dilemmas about regional military ambitions? Did they raise questions about the relationship between weapons and 'development', as well as that between scientific knowledge and war- and state-making? Returning to the issue I raised in the introduction, can we see in the armed adventures of Professor Shonku and Ghana-da semi-peripheral musings on the proliferation of weapons and war in a period of systemic global crisis? We turn to some of their stories now to offer some answers to these questions.

A third power

It is not so much the case that super-weapons were absent in the writings of Mitra and Ray during the non-aligned years. It is more that instead of being a part of a perpetual 'future wars' scenario, they were used in narratives that were designed to present the limits of such militaristic fantasies. Moreover, the super-weapons that do appear in these narratives tend not to be of the nuclear kind, but point to a different kind of imagination at play – one that was more interested in the weaponization of biology and genetic, rather than mineral, resources, in order to harness their destructive powers. Thus, on the one hand, the Bengali *bhadralok* scientist or scientific entrepreneur was distinctive in

such stories for his ability to defuse or even sabotage the production of weapons that threatened to disturb the balance of global power. In this respect, he embodied the 'idealist' aspect of Nehruvian non-alignment where the refusal to submit to the logic of the arms race was seen as an essential precondition of keeping global conflicts relatively 'cold'. On the other hand, Ghana-da and Professor Shonku's heroic credentials are marked at least in part by their ability to handle or invent weapons or organisms and devices that can behave like weapons. Here, we glimpse the 'realist' strand of non-alignment at play, where the self-sufficiency and innate capabilities of Indian scientist-soldiers could usher in the country's regional strategic ambitions and projection of power.

Having started publishing in the 1940s, Mitra in his writings made the connection between the 'hot' and 'cold' conflicts of the mid-twentieth century more strongly than Ray did. The prominence given in these stories to the recent memories of a world war also kept their imaginative horizons free of the appalling attractions of 'future wars' as a way life. We have already seen how Nishimara's deadly laboratory work involved genetically altering a non-human species into a bio-weapon that could then be used on certain kinds of human population, precisely because in so doing it stripped them of their species designation as human. Nishimara's insistence of proving the effectiveness of his mosquito by testing its bite on Martin, the American scientist, was also couched explicitly in terms of scientific and imperial rivalry with a contemporary global superpower. And the glowering presence of Nishimara's gigantic black bodyguard, who must be overcome by the Bengali and the American, also gestured to race being weaponized in this struggle and pointed to the Bengali's qualified support for a world order that relied on such toxic classifications for maintaining its lines of power.

Such confluence of weapons, biology and race could also be seen in *Pokaa* ('Insect', 1948) – a story that attends to European anti-semitism's formative role in post-war dispensation. The narrative begins with yet another near-exposure of Ghana-da's heroic posturing, as his entomophobia is rehearsed in a scene that recalls the unfortunate Tan Lin's demise in *Mosha*. Alarmed by his terrified screams one evening, the hostel residents investigate his attic room and discover a dung-beetle under his bed, and the latest Ghana-da performance begins as an attempt to salvage this humiliating situation with a familiar bombast: 'Ever chased a humble insect over eight thousand miles? Ever thought of how to dispose of three thousand tons of dead insects? Ever wandered in deepest Africa with nothing but an empty bottle and a piece of paper?' (Mitra 2000 vol. 1, 32). But the adventure of what turns out to be another bio-weapon – African locusts bred to target European

food crops and cause a devastating famine – begins before the Second World War in a Europe increasingly dominated by Nazi Germany. In Riga on unspecified business, Ghana-da is invited to meet the much decorated 'true blue' Prussian war veteran General Vornoff, who appears to be hiding there in exile. Vornoff shows the Bengali a photograph of the Jewish scientist Dr Jacob Rothstein, who is rumoured to have gone missing in Africa while researching the breeding habits of the Tsetse flies. On Gana-da's investigation into Vornoff's curious exile, it is revealed that Rothstein and Vornoff (whose real name is Isaac) are siblings, and they have chosen dramatically different paths to fight the vicious and enduring European anti-semitism – Jacob by becoming a renowned scientist and Isaac by adopting the fake identity of a 'real German' and distinguishing himself in the First World War. The brothers had accidentally re-discovered each other while on a train to Munich and Jacob revealed to Isaac his plans to exact revenge on a continental scale. This prospect of a 'future war' horrified Isaac because it affronted his sense of a universal humanism:

> After meeting him in Munich I understood that despite being a great scientist, the insults and affronts he had suffered because of anti-semitism had driven Jacob mad. His plan for vengeance was born equal parts of insanity and well as scientific genius. It struck me how differently the same experiences of race hatred had affected us. Despite being the shame of my people, I had slowly learnt to rise above communal hatred and love mankind. But Jacob had turned into mankind's enemy. I tried to show him the destructive folly of his plan, but he merely smiled at me sarcastically and said 'While faking your identity you have turned into a true German. You will not understand me.' (2000, 37)[3]

It is in the defence of this humanism that Ghana-da joins Rothstein/Vornoff to sabotage his brother's plans to desertify Europe by unleashing genetically modified African locusts. Armed with the sample of a dead locust to help him identify the correct swarm along with instructions on how to neutralize it, Ghana-da tracks down Jacob Rothstein to the

[3] The figure of the malevolent Jewish scientist intent on wrecking havoc lingered on in Europe despite, and to a certain extent because of, the revelations about the Nazi holocaust. The structural discrimination faced by Jewish scientists in the twentieth century are memorably revealed in the Soviet mathematician Grigori Freiman's 1980 essay. For a general history of Jewish scientists in that period see Efron 2014.

depths of Africa just as he is about to release his deadly insects on Italy, Germany and England. He is able to introduce to this biblical host a deadly virus given to him by Isaac, and the swarm, whose flight had darkened the skies from Sudan to Libya, falls dead over the Sahara and off the shores of Corsica. But the narrative ends with the call for eternal vigilance against the vengeful Jewish scientist – the very figure that had helped sustain the anti-semitic hysteria in Europe: '*Cistocirca Gregoria* is finished, but not Jacob Rothstein. Who knows what plan he is concocting hidden away at the end of the earth. Perhaps this insect is his ambassador' (Mitra 2000 vol. 1, 39). Ghana-da's entomophobia, on this reading, thus turns out to be a code for enduring anti-semitism – the very disease Rothstein's story is supposed to inoculate the reader against. The Bengali's containment of the threat of bio-weapons, as in *Mosha,* is conducted in the service of maintaining and enhancing the post-war dispensation – whose lip-service to ending anti-semitism and other kinds of racism (the famous declaration of 'never again') in reality turns out to conceal nothing less than the consolidation of racism in the interest of new forms of global dominance.

When nuclear 'super-weapons' do enter Mitra's narratives, Ghana-da's task is often to prevent their proliferation and thereby maintain the status quo regarding the monopoly exercised by the Cold War superpowers over the right to possess them. Since the narratives often retrospectively pitched such encounters with the doomsday machines before or during the Second World War, the implication of Ghana-da's adventures in nuclear non-proliferation seemed to be in line with the 'balance of power' logic that held global peace, or at least the relative lowering of the intensity of conflicts, was a far more attractive proposition than the prospect of perpetual 'future wars' that excited his Euro-American counterparts. Biology, and in particular race, remained as one of the key filters through which 'future wars' scenarios were defused in Mitra's tales. *Kaanch* ('Glass', 1950) offered the cliched racist stereotype of the virile and hyper-aggressive African-American male athlete as part of the 'fake news' designed by the residents to entrap and expose Ghana-da:

> I don't know if you have heard of Black Tiger – the negro boxer as ferocious as a tiger. He arrived in Calcutta a month ago. He is due to fight out our welterweight champion Surajit Das [….] So far he has sent five referees to the hospital, and one of them is yet to return. When he is angry, he tends to confuse referees with his opponents [….] We need a referee like Ghana-da. He can both enforce the rules, and can tame Black Tiger with an uppercut if

> he steps out of line. Ghana-da, do tell them about the time you floored Battling Micky with a straight left? (Mitra 2000 vol. 1, 53)

Ghana-da counters this narrative trap with a tale about defeating the Nazis in the race for the nuclear bomb, but unlike other occasions this story is marked by his partial affiliation with certain kinds of black Africans.[4] The action is set in Angola and begins with a violent altercation between the Bengali and two young German Nazis on board a train on its way to the Bihe mountain ranges, which are reputedly rich in uranium. The Nazis attempt to eject Ghana-da on grounds of racial hygiene and are taught their manners with the appropriate degree of physical chastisement by our hero. At this point, their shrewder and more experienced leader, von Papen, enters the scene and Ghana-da realizes that it is up to him to stop the Germans from extracting the minerals that would give their nuclear weapons programme a decisive boost. This he proposes to do by recruiting his trusted African porter Nwala to sound a false alarm through the tribal 'bush telegram' – the mythical drum beats relayed from settlement to settlement – about the German's 'sacrilegious' mission to the mountain. But the move appears to backfire if only because it works too well, and the expedition faces both the prospect of the impending attack by both the local 'savages' as well as by the African porters of the expedition, who assault them at night and leave von Papen and Ghana-da helplessly stripped and bound. The Nazi youths, however, are undeterred and manage to proceed to carry on with their search. The prospect of the Nazi bomb is in fact uppermost in Ghana-da's mind even while facing certain death: 'The extent of uranium deposits on the Bihe plateau was no secret to me. It was not impossible that the two young Germans could stumble upon the thick veins of pitch-blend. I could not let them find that treasure. Yet, here we were about to lose our lives to the savages' (Mitra 2000 vol. 1, 61). The conundrum is solved as usual by a flash of scientific ingenuity, when Ghana-da manages to refract sunlight on to the savannah grass with the help of a broken lens. The resulting fire drives off both kinds of 'savages' – the Nazis and the bellicose Africans – and prevents the development of the Nazi super-weapon. Thus, *Kaanch*, only partially disturbs the assumptions about race with which the narrative begins – Nwala is an ally in so far as he can be trusted to carry out

[4] Mitra's ability to give fictional form to historical events that were not only recent, but not yet subject to full investigation, was remarkable. His tale of the Nazi bomb, written five years after the end of the Second World War, preceded most scholarly discussions on the topic. For a history of Nazi nuclear research, see Powers 1993 and Aczel 2009.

the precise instructions given to him by the intellectually (and racially) superior Bengali, and these instructions are designed to defeat the Nazis by playing on the savage 'credulance' of other Africans. But in acknowledging that such racial coding lay at the heart of Nazism, and that this could be confronted only by the combined wit of the Bengali and Nwala, Ghana-da seems to perform a qualified shift from the degree of racism that had sustained some of his other adventures with super-weapons.

If the German ambitions regarding super-weapons are successfully thwarted, due attention must of course be paid to other Axis powers such as Japan. In *Ghori* ('Watch', 1948) the only country to have suffered a nuclear attack in history is re-imagined as a rogue nuclear power whose threat must be neutralized at all cost (echoing thereby precisely the propaganda offered by the US in order to justify Hiroshima and Nagasaki). This is done in the story not by rehearsing a fictional version of the historical carnage administered by 'Fat Man' and 'Little Boy' (the creepy code-names given to the two nuclear bombs that were dropped on the two Japanese cities), but by offering a model of the kind of administrative acumen that we saw had emerged as a desired quality of the Nehruvian scientist-soldier. Ghana-da's tale begins with an account of a devastating tsunami in the Pacific, which later on turns out to have been triggered by improvised Japanese 'dirty' bombs that Ghana-da had helped defuse and then dump into the ocean. While plying his import–export trade in the Polynesian islands, Ghana-da receives reports of mysterious explosions crippling European transport hubs and infrastructure. At the same time, his warehouse in Samoa is broken into, and the robbers make off with some cheap Japanese watches. The connection between these two apparently random events begins to be pieced together by Ghana-da's investigations, when an agitated Japanese businessman appears at his office and explains that all the stolen watches must be recovered and that in fact the entire shipment had reached Samoa by a clerical mistake and he was there to recall it and compensate Ghana-da for his losses. Intrigued by his disproportionate concern for what appears to be entirely disposable cheap goods, Ghana-da recruits a visiting American chemist to examine the watches. Upon discovering their explosive potential, he then co-ordinates, with the help of his contacts in British and American intelligence, the gathering of all the watches distributed in Europe by the same Japanese company. This is accomplished by a mammoth logistics exercise involving military transport planes and ships that deliver

> Two million fifty-three thousand three hundred and one watches. Each one with the explosive power of a mini atomic bomb. Each one

> had timers set to go off at different intervals, when two explosive chemicals were released to combine with deadly results. The Japanese company had exported these cheap watches all across Europe and America. Many ordinary people – from factory workers to barristers had bought them. This explained the random explosions. A few more months, and most of the American and European infrastructure would have been destroyed. There would have been no need for the Second World war. (Mitra 2000 vol. 1, 155)

The weapons are dumped into the ocean, but in an uncanny prophecy of the fate of the Pacific islands in the era of oceanic nuclear testing as documented by Elizabeth Deloughrey and others (Deloughrey 2009, 2013), their 'safe' defusions generate killer waves that lash the shores from Tahiti to Fiji and cause countless deaths. As ever, Ghana-da's tall-tale serves the triple purpose of maintaining his social prestige among his interlocutors, testing out some of the claims of 'Nehruvian science' and its scientist-soldiers, and laying bare the human costs of such strategies that are usually displaced onto the 'savages' of the earth. We should note in passing, however, the specific skill that the Bengali deploys to trump the Japanese. If the exposure of the 'dirty bomb' campaign is enabled by administrative mismanagement by a Japanese corporation (historically famous for avoiding precisely such calamities), Ghana-da's heroism in this tale is secured not so much by his physical or scientific prowess, but precisely by his managerial capacities that enable him to mount a swift and effective trans-continental logistical operation. But typically, such skills and capacities are revealed as Janus-faced. On the one hand, it offers a fictional resolution to the historical shortages of such expertise that adversely affected Nehru's India and thereby puts forward an imaginary claim for India's regional pre-eminence; on the other hand, it reveals the outsourced human cost of such expertise in the casual but telling reference to the Polynasian mass deaths with which the story begins.

As we have seen before, Nehruvian non-alignment was fundamentally ambivalent about nuclear weapons – calling for their banishment yet harbouring secret longings for developing, if not actually wielding, them. In a story like *Hnaash* ('Duck', 1957), Mitra made such ambivalence his narrative motor. The conversational sociability of the men's hostel is disturbed when a new resident, Bapi Datta, flies into a rage on discovering that the duck meat he had bought for his family had been diced and dressed by Ghana-da and served up for general consumption. Faced with Datta's ferocious demands for explanation behind such uncivil appropriation of private property, Ghana-da offers a story about

the extraction of resources from nature – in effect, a rhetorical defence of his entrepreneurial instinct for accumulation of all kinds things over which he exercises no actual rights whatsoever. The natural resource in question here is deuterium oxide, or heavy water – a valuable ingredient in nuclear energy and weapons research – that is in the story found in abundance in a remote Tibetan lake. Unlike *Kaanch,* however, the arms race in *Hnaash* is not between agents of the global superpowers, but between rogue entrepreneurs with no obvious allegiances to anything but profiteering. As Ghana-da blithely puts it to his rival, the murderous Muller, who has already killed one scientist to possess the secret of the lake,

> Like I said, I am looking for heavy water. If I could sell a small bottle of it in this age of the hydrogen bomb, I could immediately retire. Dr Callio had risked his life in the quest for heavy water and found a secret lake in Tibet which held a century's worth of reserve. But he made the mistake of revealing this to you because he thought you were a harmless explorer. And you stole the map from him and left him to die in the blizzard. (Mitra 2000 vol. 1, 164–5)

Muller and Callio's nationalities are revealed with varying degrees of explicitness (one is marked by his stock Germanic name; the other, his victim, is eventually identified as Finnish), but they are not in any way allied to *national* interests. Instead, they are identified as scientists – one rogue and the other respectable – both in search of what Jason Moore calls 'cheap nature' so that they can then sell such wealth to the highest bidder (Moore 2015, 17–18). In this respect, Muller has form, since we are told that he is 'the shame of the scientific world, a fraud, a thief and a murderer. You stole radium from the first laboratory you worked for and have been on the run since, changing names as you went' (Mitra 2000 vol. 1, 165). But while his victim Callio is certainly not as murderous as him, it is not clear why his search for heavy water is any different in moral terms to Muller's, since they both aim to extract what cannot belong to them on any grounds except those of the historical privileges granted to (some) Europeans by the dint of their colonial relations to Asiatic peripheries such as Tibet.

It is to such privileges that Ghana-da's own entrepreneurship lays claim to in this story. As his confession to Muller shows, he is motivated exactly by the same acquisitive spirit as the European scientists and it is precisely this instinct that Mitra's narrative interrogates in its *denouement*. Having recovered the map of the remote lake from Callio's

corpse, Ghana-da is chased by a fiercely determined Muller across the icy wastes and finally cornered. Here, Mitra deploys the familiar tactic of generic discontinuity, as tropes of the imperial adventure stories such as hunting (Green 1979; MacKenzie 1988; Mukherjee 2005; Thompsell 2015) are grafted on to the tale of scientific wonder. Spying a wolf stalking some migrant ducks, Ghana-da shoots the animal with his last bullet at the very moment it has caught a stunned but live bird in its mouth. He then forces the map down the gullet of the duck and sets it free on its flight across the Himalayas to the warmer climes of India. It is this search for the map in the stomach of the fugitive bird that has since led him, such is his claim, to slaughter 1,232 ducks thus far. Thus, the end of the narrative returns us to the problem posed by the enraged Bapi Datta in the beginning – on what grounds can Ghana-da explain his appropriation of the ducks that Datta had bought for his private consumption? Ghana-da's tale suggests that the only justification for such an action is the possession of a certain kind of power. It is Ghana-da's mimicry of the role of the European scientific adventurer in the colonies that guarantees the success of his story, the narrating of which in turn tames Bapi Datta's rage and converts him into yet another of Ghana-da's resident acolytes. Yet such acquisitive spirit of profit-making, and the kind of weaponized power it produces, also raises questions about the non-aligned positions on nuclear weapons research. How does the figure of the enterprising scientist who externalizes nature as a resource for plundering fit into the project of building a nation that renounces the legacy of colonial extractions? If the services of such experts are reserved for the highest bidders, how do nations cope with the potential proliferation of super-weapons? Can one distinguish the desire for super-weapons displayed by the global powers and from that harboured, despite all the denials, by a post-colonial nation such as India?

In fact, such questions about scientific entrepreneurship and privatization of super-weapons research were raised repeatedly in Mitra's fiction. In *Daant* ('Teeth', 1955), Ghana-da runs into the foul-mouthed, racist, American millionaire Benito while tuna-fishing in the seas off California. Of course, this turns out to be a cover for an investigation he is conducting into the death of his old friend De Costa, whose body has washed up on the beach soon after sending a distress call to Ghana-da. The small fishing town is awash with rumours regarding De Costa's death, as well as those about a giant tuna that is apparently able to cut through the strongest lines cast by the most experienced anglers. The resolution of the twin mysteries occur on board of Benito's luxurious yacht, when a glamorous party is disrupted by the announcement of

theft. Benito catches Ghana-da in his private cabin, and the Bengali readily confesses to photographing a bundle of secret papers and sending them to the appropriate authorities. But how has he done all this without leaving the yacht?

> Why, I sent them attached to the very torpedo that you have been using in your researches on guided missile technology! The same torpedo you have been using to cut the fishing lines of the tuna fishers as a prank. I have sent it towards the Newport coast with all the photos on board and it will be fished out of the sea by the authorities in the morning. (Mitra 2000 vol. 1, 145)

Of course, an uncouth person such as Benito could not have possessed such secret weapons without expert help. So enters the story the figure of the enterprising scientist, this time presented in a pathetic key. Ghana-da escapes Benito's clutches with the help of Anthony Fisher – employed by the millionaire to develop the missile – who rebels against his employer:

> Yes, I am Anthony Fisher. The same man you had kidnapped and used as a slave for five long years. I have obeyed your every command like the weak, cowardly scientist I am. Not only have I built a guided-missile system for you, I have also given you the formula for the cobalt bomb. But that formula is no longer yours. You cannot hold the entire world to ransom with it. This is my greatest consolation. I will no longer be your puppet. (Mitra 2000 vol. 1, 146)

The conscience-stricken scientist was, as we know, a feature both of Cold War history and science fiction. But here his services, coerced as they are, are rendered for a rogue millionaire rather than to a rogue nation. Ghana-da's intervention seems to restore the appropriate order of things – the cobalt bomb and the guided missile system presumably designed to deliver it – are delivered to the 'appropriate authorities' representing the American state. But it does leave open the question regarding his own motives, which *Hnaash* had also raised. Are his dreams of profiteering from selling super-weapons, ingredients registered in that story, any different to those of Benito's?

We meet the morally compromised scientist once again in *Shishi* ('Bottle', 1959), but this time his malevolent patron represents not just a private interest but a shadowy, unnamed 'third power' set to disrupt the global balance of power. We may recall from our previous discussions regarding laboratories that in *Shishi*, the story-within-the

story has Ghana-da claiming to be the bearer of Darwin's legacy while carrying out research on marine iguanas in the Galapagos islands. His sole companion is a stereotypically 'primitive' indigenous Ecuadorian whose religious beliefs – in this case marked as 'Christian superstition' – serve to foreground Ghana-da's own impeccable scientific credentials. Into this drama of the clash between science and religion enters a mysterious sea-creature glimpsed at night and which serves as a test for the opposing claims of the two world views. But the creature turns out not to belong to either the theological universe of demons or the biological universe of hitherto unknown marine life-form. The proper classification for it is in fact techno-political, since it is a super-weapon – a nuclear submarine that is engaged in mapping an underwater rift valley running between the Atlantic and the Pacific so that it can travel undetected by existing American and Soviet radar systems.

What appears most disturbing to Ghana-da is the fact that this super-weapon has no national affiliations. The crew that operates it, the geographer Sustel and his unnamed patron, are marked by their weak or non-existent nationalist markers such as language and citizenship. Ghana-da mounts his reluctance to co-operate with them precisely on the grounds of their rootless cosmopolitanism:

> How can I go with you? Had you abandoned your broken English and spoken in your own tongue, I may have been able to guess where you were from. Granted, Sustel himself had neither a country, nor a mother tongue. He was born in Tunisia, educated in Germany. After the war, the Russians had imprisoned him for a while. After that he had been commissioned by the British to drawn up maps in Africa, Bolivia and Ecuador before disappearing. How can I accompany you two strangers? (Mitra 2000 vol. 1, 245)

Forced on board the vessel, he is then confronted with the sinister pair's real plans – to recruit him to chart the vast reserves of petroleum and minerals embedded in the oceanic mountain ranges that they then plan to sell to enhance their military capacities. Ghana-da senses that Sustel, just like Anthony Fisher in *Daant,* has misgivings about his patron's schemes and attempts to turn him back to the right side:

> So the rumors are true. There is a third power besides the Russians and the Americans that is growing in stature. Whatever their faults, both the superpowers basically want good for mankind. But the third power has no such weaknesses. Whatever else you may be, you are French. How can you sell yourself to these people? If you

> do not feel anything for your country, do you not have any considerations for humanity as such? (Mitra 2000 vol. 1, 248)

The Bengali's appeal to Sustel's humanity is thus expressed exclusively in terms of national belonging – his French-ness. Compared to the cosmopolitanism of his patron, even the nuclear-armed nations appear to be benevolent and they are certainly to be preferred for the maintenance of world order. Ghana-da's words are effective. Sustel confesses to his moral failings and avariciousness and conspires with Ghana-da to produce a fake map of the submarine trenches, mountains and fuel reserves and the rise of the would-be 'third power' is decisively stalled.

Writing nearly two decades after Mitra, Ray's Professor Shonku stories seem at first sight to largely avoid the narrative possibilities activated by the presence of super-weapons. However, it may be more accurate to suggest that Ray's interest lay in the moral and ethical problems posed to scientists by their capacities to develop destructive technology of which weapons are a significant, albeit not the only, part. What is also noticeable in the Shonku stories is their interest in bio-weapons and lethal robotics, rather than in the more conventional super-weapons, such as the nuclear arsenal. This combination of anxieties about the scientist's capacity to succumb to the glamour of killer technology and the corresponding capacity of that technology to colonize entire life-worlds, further extended Ray's enquiries into the militarization of science inaugurated by Nehru's policies in post-colonial India.

We have already seen these trends in the earliest Shonku stories, where the comic ineffectiveness of the scientist's own patented super-weapon is combined with his failure to comprehend the powers of his rivals, who are usually presented as anti- or non-scientific figures, such as the *sadhu* in *Harh*. We will recall that in *Byomjatrir Diary* the snuff gun is only useful in tormenting Shonku's servant-assistant Prahlad – for instance, when his infractions in the laboratory are punished by making him sneeze continuously for two days. Faced with the piscine Martians, Shonku's weapons are completely useless and, on the planet Tafa, Shonku's inferiority to the aphid aliens is confirmed in the final humiliation of their utter indifference to the weapon. In *Harh,* the *sadhu*'s ancient formula has the power of life and death, and is wielded by him against Shonku as he revives a pre-historic beast in the hope that it will devour the scientist. Of course, his own lack of zoological knowledge results in a fatal miscalculation and his sentient weapon turns against him. While the main effects of such stories, as we have seen, is to interrogate the epistemological claims of science and, in particular, the spaces (like laboratories) from within which such claims are made,

it is also true that the weaponization of life-forms and the moral and ethical challenges posed by this to scientists emerge as key concerns in the Shonku stories written in the 1960s and 1970s. Let us turn briefly to a couple of them to conclude our discussion in this chapter.

Professor Shonku O Golok Rahasya ('Professor Shonku and the Mysterious Sphere', 1965) begins with a visit by Shonku's sceptical neighbour Avinash babu, who coaxes the scientist to take a break from his work and entertain himself with a 'new toy' he has just found while walking by the banks of the local river Usri. Shonku has just concluded his successful experiments to build a machine he calls the 'microsonograph' – a machine that is capable of capturing all infrasonic and ultrasonic sounds. He is exhausted, and so he agrees to take a look at the object Avinash babu has discovered. This appears to be a small spherical object that changes colour throughout the day, is damp to touch, and made of unidentifiable matter. It also appears to be deadly to local life forms, as Avinash babu attests:

> 'This ball has a terrible power, there is evil in it. A gecko used to live on top of that glass case. This morning it was lying on the floor, dead. But that's not all. I found about a dozen dead cockroaches in that case.' I could not stop laughing. 'What you mean is, that ball acted as an insecticide. You should be happy to have found such an effective insecticide, all for free. Why do you sound so worried?' 'If it killed only insects, I wouldn't worry. I am not feeling very well myself. I feel kind of nauseous.' (Ray 2003, 72–3)

Forced to take Avinash babu seriously after his own cat Newton has a similar reaction to the sphere, Shonku realizes that its chameleon properties correspond to earth's annual seasonal cycle, compressed within a solar day. Could he be looking at a miniature planet? Indeed, his microsonograph soon picks up the chatter of the invisible inhabitants of what turns out to be the smallest planet in the galaxy, Terratum. These microbial aliens point out that although Shonku has unwittingly made captives of them, his laboratory environment is lethal for them and, unless freed immediately, the scientist would be responsible for a genocide. The twist in the tale is that, as Avinash babu had guessed, Tarratum is really a powerful bio-weapon, hostile to all earthly life forms:

> You are wondering, aren't you, if we have the power to spread illness and disease every where in the world? Yes, we have. In just three months, we can empty the world of its human population. An epidemic does not call for hard work. Only one of us is enough

> to kill everyone in Giridih. And if all of us were to get together […] We are about to die. You can save our lives. Do not become a killer. All your life, your conscience will …. (Ray 2003, 82–3)

Thus is posed the moral dilemma at the heart of the story. The scientist has to choose between committing a genocide of an alien species and the possibility of a cataclysm unleashed on earth by a bio-weaponry far superior to anything he himself has ever invented. Shonku chooses the former:

> No words came from my microsonograph. All I could hear was that piercing scream. It went on for some time, then became one long wail. Then there were broken sobs. And then nothing [….] I placed the ball on the floor. Newton came forward. Then he struck it with his front paw. At once, the smallest planet in the solar system broke into several pieces and lay scattered on the floor. (Ray 2003, 83)

Such a decision dramatizes the conundrum posed by the militarization of science during the Cold War years. This was an era during when, as Robert Heinlein *Starship Troopers* (1959) and many other texts showed, apocalyptic 'future war' scenarios were carefully fabricated through the idiom of paranoid racism and specie-ism involving alien life-forms that often stood in for anti-colonial militants of the global South. Shonku is not a Dr Strangelove. Nonetheless, his decision to wipe out aliens in order to preserve his own kind shows that the non-aligned scientists may not be immune to the moral and ethical dilemmas of their Euro-American counterparts. Apparently bystanders at the global arms race, yet committed to regional and national militarization in the name of security, they distilled within them the contradictory impulses of Nehruvian nationalism and internationalism.[5]

Such dilemmas are less sharp in Ray when the weaponization of life-forms is conducted at the behest of a rogue European or American scientist. In stories like *Professor Shonku O Gorilla* ('Professor Shonku and the Gorilla', 1969), Shonku's aim is to simply defeat such destructive initiatives with the help of a coalition of allies. However, there are real differences between his adventures and those of Ghana-da – not only those manifested in the absence of the tall-tale framework, but also in

[5] Although the Cold War and non-aligned imaginations were charged by nuclear weapons, other forms of super-weapons, particularly their biological and chemical versions, also had formative roles to play here. See Wheelis et al. 2006; Balmer et al. 2016 and Carus 2017.

Shonku's own profoundly anti-heroic representation of his adventures. In *Gorilla*, Shonku is reassuring the readers about his laboratory's strictly ethical animal-testing protocols when he receives the news of the disappearance of a British primatologist of his acquaintance in Congo. Since he is an admirer of the missing Massingham for his pioneering research on the great apes, Shonku agrees to accompany his friend Gregory, another British scientist, and bring Avinash babu with him to solve the mystery. What follows is the deployment of the Conradian 'heart of darkness' formula to enhance the narrative effects of a tale of scientific overreach. In Congo, the adventurers led by an enterprising Congolese guide Kabala, realize quickly that there is something drastically wrong with the local gorillas. A hunting party they encounter appear more like a zombified or robotic swarm controlled by unknown technology:

> They were within fifty yards now. I was nearly overwhelmed by the strong odour coming from their bodies. They advanced without any pause. I could now see that they had been hunting, and had deers, wild pigs and goat slung over their shoulders. None of these was a part of their normal diet. Gorillas live on roots and fruits. Kabala pointed at the big male leading the group and asked 'What is that thing on its head?' I had never thought gorillas could be this big. There was something metallic on his head that was glistening in the sunshine. Now they were within ten yards. It looked like the dark wall of the forest itself was advancing on us. I was surprised by their expression. They seemed to have a dead gaze, and were moving mechanically. One gorilla stumbled against a rock, but paid no attention to it and continued walking as before. (Mitra 2003, 164)

Their camp is attacked at night by these sentient weapons, and although Shonku is able to vaporize one with one of his patented super-weapons, annihilin, he cannot resist the power of the technology that controls the primates. As soon as he tries on the metal disc worn by the gorillas, he too falls under the complete control of Massingham, who re-appears in the narrative as a Conradian Kurtz-like figure who has turned the primates into a loyal army who guard him and his secret laboratory. It falls to Avinash babu and Kabala to devise a way of rescuing Shonku and Gregory and sabotage Massingham's plans to militarize all primate life-forms, which they of course do in accordance to the generic demands. They force Massingham to reverse the process by which the gorillas are being controlled, and the animals return to their senses and

their habitats. Thus, although Massingham's bio-weapons programme is successfully stalled, this is no thanks to any heroic scientific opposition to it. In fact, it is noticeable how easily Shonku and Gregory are co-opted or neutralized by Massingham's technology. It is the comic and decidedly anti-scientific figures of Avinash babu and the indigenous guide Kabala who save the day and are accorded heroic stature in the narrative. However laudable their aims, the scientist's technophilia and scientism compromise their ability to mitigate the effects of militarization of science.

The weaponize-ation of bio-forms is also an excellent way of puncturing anthropocentric concepts usually deployed to patrol species boundaries. In the narratives, fantasies of controlling and using sentient beings as weapons often morph into enquiries about the category of the human itself. For Shonku, such paradigmatic problems of science are already raised, as we have seen, during his adventures in Heidelburg recorded in *Professor Shonku O Robu*. We have briefly discussed the laboratory space that appeared in that story, but let us return to it to look at the question of sentient weapons that is also raised there. Shonku's invitation to Germany has arrived because of both the economy with which he has built his robot and its mathematical and linguistic skills. In addition, it displays a self-learning capacity that seems to transcend the limits of Moore's Law regarding artificial intelligence.[6] Although it is seemingly incapable of acquiring emotions, Shonku is hopeful that Robu can replace the erratic and all-too-human Prahlad as the chief assistant in his laboratory. In Germany, his friend Paumer is suitably impressed by Robu and insists that it must be shown to the country's leading expert, Borgelt, who has also built a similar machine at a much greater expense. Robu appears to pass all the tests put to him by Borgelt until it is asked to identify the scientist, whereupon he falls silent, much to the embarrassment of Shonku. Despite this failure and Borgelt's reservations about Robu's rather slapdash appearance, he offers to buy it from Shonku because of its mathematical prowess, which he claims is the single attribute missing from his own robot. On being refused, he turns violent: '"Don't you know how much easier it is to destroy life than preserve it?" Borgelt's words echoed round the room. "One electric shock is all that's needed. Do you know how many volts? Your Robu

[6] Gordon Moore's observations of the doubling of the number of transistors in an integrated circuit had first been formed in 1965 in relation to the manufacture of semiconductors. It has since then been applied to predict a whole variety of technological trends, including those relating to nano-technology and dynamic random-access memory. See Mack 2015.

might know. And it's ever so easy to do it!" [....] Borgelt was advancing towards me, his right arm outstretched, his fingers pointing at me' (Ray 2008, 153–4). The absence of any visible weapons on Borgelt alerts the reader to what Shonku in his panic is yet to realize, that Borgelt *is* the lethal weapon in question. This apparent mystery is solved by the dramatic intervention of Shonku's robot: 'Robu appeared to be pressing Borgelt's head from both sides. Under such an impact, Borgelt's head twisted and turned, as if it had been screwed on. Then Robu pulled at it, until it came apart and fell on the floor with a clatter. Through the gap in his neck spilled out masses of electric wires' (Ray 2008, 154). It is by this gruesome 'death' that Shonku realizes that it is not Borgelt but his robot that he had all along been dealing with. The German scientist, unlike Shonku, had made the error of making his machine capable of learning human emotions. Soon, he had been imprisoned by his creature, which had gone on to display the familiar sociopathic failings of rogue scientists such as cruelty, selfishness, ambition and lack of empathy.

What is telling here is that Shonku's Robu is able to defeat Borgelt's machine not because the former is *less* human than the latter, but precisely because it has learnt to become *more* so. Paumer has secretly programmed it to respond to and mimic Shonku's emotions, and this has enabled it to come to his creator's rescue at the moment of crisis. But being more human also means being more capable of violence, of killing or neutralizing an opponent, of turning oneself into a better weapon. Both the machines in the story are apparently able to accelerate their self-learning process and transcend Moore's law. But this erasure of anthropocentric species-boundary paradoxically results in the confirmation of the essential human characteristic – to acquire weapons and commit violence at the earliest opportunity. If to weaponize is to be human, then where does this leave the claims of 'Nehruvian science'? Could it be that despite their declared peaceful intentions, every scientific initiative is always also potentially war-like? With such disclosures, Ray's Shonku recalls the uncomfortable questions put to India's non-aligned prime minister by legions of his national and international critics.

Chapter Three

Energy matters

From a crater

The weaponization of life depicted in Mitra and Ray's science fiction raised questions regarding the politics of techno-scientific development that were inseparable from the ideas and practices of non-alignment themselves. But the manner in which this was done also extended an invitation to shift our understanding of power from its political connotations to a more expansive one associated with the matter of energy. What I want to argue below is that, written in the decades immediately before the global oil crises that triggered what Jason Moore has called the end of the era of 'cheap energy' (Moore 2015, 267), this literature was set in motion, at least in part, by an 'energy unconscious' – a concept that has become central to the recent theoretical interventions that have been gathered under the name of 'energy humanities' – that was sedimented in the creative and critical imaginations of the period (Szeman and Boyer 2017, 8).

A return to the opening moments of the first Shonku story may clarify my reasons behind this suggestion. We may remember that the astronauts' diary is brought to the frame-narrator by a struggling author, Tarak Chatterjee, who claims that it is literally part of the alien matter that he has discovered in the aftermath of a cosmic visitation: 'Yes, bang in the middle of the crater. When that meteorite fell, it created a massive crater. You've seen Lake Hedo in Calcutta, haven't you? Well, that crater was more than four times its size, I can tell you! That notebook was lying at its centre' (Ray 2008, 3). Chatterjee's claim is received with understandable scepticism by our narrator, because s/he cannot believe that any text can survive the force generated by the dissipation of meteoric energy on the earth's surface. But this scepticism is in turn soon dispelled as s/he discovers that the diary resists decay even when introduced to fire, although it does display signs of some

transformation: 'An odd impulse made me light a match and hold it against a page. It did not burn. Then I lit my stove and dropped the diary into the naked flames. I let it remain there for as long as five hours. Nothing happened. Only the colour of the ink continued to change' (Ray 2008, 5). Not just any old alien matter then, but the diary should more properly be understood as matter fired by a weird energy that is apparently able to change forms rather than collapse as it passes through different environmental systems – from the darkness of space to earth's light and heat. In this reading, the *novum* of Ray's story, so to speak, turns out to be the text itself, in which this mysterious energy triggers the narrative of the space travel, and which, as we shall see in a moment, is also in no small way concerned with the circulation and flow of a variety of other kinds of forces. If this is the case, the story's conclusion offers a number of productive problems on which the (future) seriality of the Shonku narratives depend. For Shonku's adventures in space do not end with his humiliation on Tafa. They do so with a return to story's frame-narration and the matters of preservation and/or dissipation of the textual matter and the narrative energies contained within it. The frame-narrator's final editorial note gestures simultaneously to his commitment to scientific evidence and reason, as well as the limits of such norms, beyond the pale of which lies the realm of wonder: '[Readers] might wonder where I have kept Professor Shonku's diary, and whether one might see this remarkable object. What I wanted to do was to have the paper and ink examined by a scientist, and then I would have handed it over to a museum [….] But there is no way of doing that now' (Ray 2008, 29). For although the diary had thus far appeared to be indestructible, it now ends up as food for a swarm of hungry black ants. The effect of the joke depends on the assumed narrative connection between the earthly insects and the alien aphids of Tafa. But one response to the frame-narrator's defiance against any readerly expectations regarding the supply of a rational explanation to this amazing event is to consider the simultaneously thermodynamic and evolutionary nature of the energies being represented in the narrative. The destruction of the diary does not mean the end of the Shonku stories. The text in its entirety has been successfully copied by the frame-narrator and will now be the basis of the seriality of Ray's fiction over the coming decades. What had appeared to be a narrative entropy turns out to be circulatory and genetic. It is this dynamic transaction between what Howard Caygill has called the physical and physiological accounts of energy that produces the wonder of Professor Shonku (Caygill 2007, 21).

Such playful reflections on energy were hardly limited to Ray's early forays into science fiction and were arguably present in the work, not

limited to science fiction, he produced throughout his life. They also animated Mitra's Ghana-da cycle in a similar manner. In most of Mitra's stories, the production of the tall-tales and the resulting narrative tension involving the attempted exposure of their fakeness by the members of the *adda* circle directly correlate to the availability and consumption of food – a key historical index of post-colonial India's quest to become self-sufficient in the production of human energy that went (and still goes) under the name of 'manpower'. Indeed, Mitra's lovingly crafted details of the lavish consumption of food that is required to appease Ghana-da and lubricate his narrative performances can not only be seen as a homage to the famous Bengali cuisine and the region's (middle-class) food culture, but also as a point of barely concealed anxiety about Bengal's developmental potential after the cataclysmic famine that marked its entry into both coloniality and post-coloniality, and that continued to be felt as persistent scarcity during the opening decades of independence (Mukherjee 2013, 29–60; Mookerjee 2010; Bhattacharya 2016).

Chuunch ('Needle', 1963), for example, begins with a discussion of the rocketing food prices and the consequent, albeit relative, scarcity of the usual delicacies in Ghana-da's hostel. Various theories are offered by the usual suspects. Gour favours a neo-Malthusian explanation (anticipating by nearly a decade the famous Club of Rome report on the 'limits to growth') of population explosion that cannot be curbed even by fantastic innovations such as algae cultivation or harvesting oceanic plankton.[1] Shibu and Sisir play along, and propose the cultivation of a roof garden that would make the hostel a model of self-sufficiency in food production and, by extension, in 'manpower', which within the confines of the hostel is more or less defined as the ability to narrate stories and thus build a 'conversable world' (Mee 2011). Their latest ruse culminates in a fake agreement concocted by the residents to voluntarily reduce their daily consumption of food, and this is successful in eliciting the usual narrative defence from Ghana-da. In his tale of traversing Asia and Africa, and involving international powers competing over access to the secrets of a kidnapped scientist, lies a fictional resolution to the looming global food crisis in the shape of a formula for artificial chlorophyll that will enable agriculture even in the most barren of deserts. In helping rescue the scientist who has discovered this pioneering technology, Ghana-da ensures the future of the capitalist 'web of life' by securing

[1] See Meadows et al. 1972. This neo-Malthusian analysis was challenged energetically and immediately by, amongst others, Cole 1973. For an account of the debate, see Bardi 2011.

the supply of one of the 'four cheaps' that provide the waft of that web (Moore 2015, 17). But he can only do so by initiating a series of transformations of life-forms and the energies that animate them. Ghana-da persuades the African tribes to release the scientist who they have been holding captive on behalf of their shadowy European patrons by magically 'turning one river red with blood and another on fire' (Mitra 2000 vol. 1, 235). The actual science behind this 'miracle' can be found in the reaction that microscopic marine planktons like the *Noctiluca Miliaris* ('sea sparkle') and *Gymnodinium Breve* ('Jim Breve') can elicit from water. Since such science lies beyond the horizon of the 'savage mind', Ghana-da's powers are deemed by them to be supernatural and the scientist, Lavalle, is freed to complete his revolutionary research in food technology. Thus, the biological and evolutionary energy of non-human life-forms are harnessed to secure the metabolic future of 'manpower'. We might also say then that the co-production of *narrative* energy (the form of the tale) and biological/metabolic energy (the content of the story) is the 'wonder' that allows Ghana-da to emerge unscathed from the trap sprung by his interlocutors.

Why should we pay attention to these surface and subterranean currents flowing through the science fiction of the non-aligned years? In part, because energy unsurprisingly emerged as a major preoccupation of 'Nehruvian science' and Nehru's domestic and international policies. In part because, as we have already seen in our previous discussions, the weaponized form of one kind of energy – nuclear – cast its deadly shadow over the entire world and was a major factor in Nehru's formulation of his non-aligned strategy. But perhaps, above all, because tracing the fundamentally generative role played by 'visible' (thematic) and 'dark' (structural) kinds of narrative energy may tell us something that the scholars of energy humanities have been recently reminding us: 'To be modern is to depend on the capacities and abilities generated by energy [….] We are citizens and subjects of fossil fuels through and through, whether we know it or not' (Szeman and Boyer 2017b, 1). It is to such provocations and debates that we now turn to take our critical bearings.

Fossil subjects

Szeman and Boyer's recent suggestions regarding fossil-fuelled subjectivity is part of a lively tradition of scholarly discussion about the relationship between energy and the modern world. Szeman and Boyer point out with due care that while 'the story of modernity isn't reducible to the use of energy on an ever-greater scale', any

critical analysis that failed to notice 'the role played by energy in shaping its infrastructures (cities designed around automobiles) and its subjectivities (mobile consumers with near-infinite powers such as communicating with someone across the globe), and everything else in between, can't help but misrepresent the forces and processes shaping historical development, especially over the past two centuries' (Szeman and Boyer 2017b, 2). But why confine ourselves only to the past two centuries? As we have seen already in the work of Jason Moore, the 'double movement' that is distinctive of the capitalist web of life – the production of capitalism through nature and of nature through capitalism – enables us to periodize modernity as a set of strategies and relationships that above all has been derived by appropriating 'cheap' labour, food, energy and raw materials over the duration of a half millennia (Moore 2015, 17). Even as we adjust our perspective to this long duration of modernity, we can see how this also demands from us a concomitant expansion in our understanding of energy itself. Is it in fact possible to think of food and labour, for example, as anything but indispensable and intertwined forms of energies? As Moore himself is quick to admit, that while capitalism transforms and appropriates the 'capacity to do work' by humans and non-humans into 'a frankly weird crystallization of wealth and power: value', work/labour should be understood as forms of energy typically arising from organic life itself – 'from photosynthesis to hunting prey to bearing children' (Moore 2015, 15). And while this energy is of course different from the conventionally understood kinds derived from the burning of coal, peat, charcoal or petroleum, they are nevertheless entwined and co-productive of each other to the extent that each 'great leap forward' of capitalism, where new forms of appropriation momentarily check or reverse the tendency of falling profit rates, hinge on two inter-related kinds of activities – 'biophysical reproduction (labor-power, forestry, agriculture)' and 'geographical extractions' – that reduce the 'system-wide cost of production' (Moore 2015, 146–7). Thus, a simultaneous expansion in our understanding of *when modernity was* and *what energy is* form the first keystone of what has been called the field of energy humanities. What particularly strikes us then, as we have seen above in our discussions of the Shonku and Ghana-da stories at the beginning of this chapter, is that such an understanding of modernity and energy was already present in south Asian science fiction in the middle of the twentieth century, long before the commencement of academic investigations into such connections. As ever, it is literature that demands the refinement in the methods and theoretical concepts deployed to interpret it, and not the other way around.

A second fundamental assumption of energy humanities, following on from the first, is that literature specifically, and humanities and social sciences generally, are particularly equipped to trace 'the intricacies of social processes, the nature and capacity of political change, and the circulation and organization of symbolic meaning through culture' (Szeman and Boyer 2017b, 3). However, the suggestion also is that with each shift in the global energy regime, our ability to perceive the consequences of these with something approaching a total perspective has degraded dramatically (Szeman and Boyer 2017b, 3). Thus, the task of energy humanities must be nothing less than to 'reimagine modernity' in order to see whether we can be different kinds of beings than the mere subjects of fossil fuels. In order to do so, we need to be theoretically equipped to trace our 'energy unconscious', because '[o]ur everyday practices and activities have been shaped by energy in a way that we have never fully understood. If we are able to address the environmental challenges we currently face, we need to understand that something like "primary experience" in Marcuse's account has been constituted by fossil fuels' (Szeman and Boyer 2017b, 8). This invisibility of fossil fuel's role in the structure and structuring of everyday life has been attributed variously to the professionalization of literature over the course of modernity, the cultural peripherality of the global oil territories, the perspectival insularity associated with modern imperialism and conflicts over the meaning of energy itself. The first three reasons were famously posed by the novelist Amitav Ghosh's provocation that the 'oil encounter' between the pre-eminent contemporary imperial power, the US, and the regions around the Arabian peninsula from where the fuel for much of this imperium's power is extracted, has produced 'scarcely a single work of note' in comparison to older encounters of the same kind (2017b, 431). Ghosh's explanation for this includes the 'inward turning' of the American fictional gaze 'in precise counterpoint to the increasing geographical elasticity of the country's involvements', the marginality of the Gulf frontier to the major Arabic cultural centres such as Cairo and Beirut, and the 'baffling [….] medieval' multilingual culture of that region that resisted the allegedly naturalistic monolingual bias of the novel form. One can immediately raise several objections to Ghosh's proposals about both Arabic and American literature here (not to mention his conclusions regarding the novel form as such), but his suggestions about the invisibility of an energy resource such as oil has turned out to be a symptomatic but necessary error required for the refinement of the methodological assumptions of energy humanities.

The other reason attributed to the sedimentation of energy forms in the unconscious rather than the conscious faculties of 'the modern

subject' has been the historical difficulty in grasping what we mean by energy itself. As Caygill has pointed out, the division between 'physical' and 'physiological' dimensions of energy can be traced at least as far back to the pivotal figure of Hermann von Helmholtz whose work in the nineteenth century is regarded as seminal in this regard (in particular, his formulations contained in the 1847 *The Conservation of Force: A Physical Memoir*). Among the chief consequences of the Helmholtzian thinking about energy was a translation of the 'physical' definition of energy derived from engineering sciences regarding (in)efficiencies of heat engines into the 'physiological' definition that had previously been informed by Lavoisier's theories of heat as the 'material soul' of life (Caygill 2007, 20–1). Thus, two different ways of understanding energy were amalgamated unevenly, where one came to dominate the other. In the 'physical' paradigm, heat signified the loss of work (the energy that was not converted to work by the engines); while in the 'physiological', heat was the conserved energy that animated life. Caygill argues that the product of this uneasy amalgamation were the 'laws of thermodynamics', probably the most recognizable nineteenth-century contribution to our understanding of what energy is.

This foundational rift within the modern concept of energy generated a series of others whose consequences we are living with today. As Allen Macduffie suggests, the contemporary 'energy problem' is both 'material and representational' and it is so because of a tension between 'energy defined as a usable resource, and energy defined as ambient force circulating endlessly through the world' (Macduffie 2014, 2–3). If Caygill identifies the physicist Helmholtz as the source of much of this rift, for Macduffie it is the political economy of Robert Malthus and especially his work on demography in the *Essay on the Principle of Population* (1798) that is key here. This is so not because of any degree of accuracy in Malthus's predictions regarding the relationship between population and scarcity, but because of his 'bleak vision of earth as a single enclosed system', which was then reprised in the second law of thermodynamics regarding entropy several decades later (Macduffie 2014, 5–6). So, if physics dominated biology regarding thinking about energy in the late nineteenth century, it had in turn been formed by philosophy and political economy in the earlier decades. The result was a chain of analogies that formed the conceptual frame within which the entire world could be understood in a certain way:

> To see the world as a closed system, as a domain in which usable energy is constantly decreasing, is, in fact, a sign of the way in

> which the urban-industrial logic surreptitiously comes to structure the representation of everything [….] The city, the world, the cosmos – all of these seem analogously 'closed,' with entropy mounting and energy shrinking towards zero because each subsists on a finite supply of resources. (Macduffie 2014, 10)

This riven yet powerful energy imaginary can be seen today in the various climate-change related post-apocalyptic imageries – and was already a part of Nehru's world. We can restate the second keystone of energy humanities as follows: since the invisibility of energy can be attributed to representational and conceptual challenges, literature in particular (including literary criticism) and humanities in general, are equipped to undertake the task of tracing the dark matter that sets the levers of history in motion.

The third keystone of energy humanities follows on from the second, and focuses on those working tools and devices of literature and humanities that enable them to detect the presence of energy relations in acts of literary-cultural representations. These range from the granular level of metaphors, analogies and figurative language, to the macro-systemic scales of genres, forms, types and periods. To support her contention that 'literature has often, perhaps always, influenced science, especially in the delicate, early stages of a scientific development', Barri J. Gold cites Ursula Le Guin's identification of the common interpretative methods deployed by science and literature alike – the production of new sets of metaphors 'to think about the as-yet-unarticulated' (Gold 2010, 17). But Gold goes beyond the importance of 'root metaphors' in literary and scientific thinking to suggest that there are larger structural units shared by the two: 'but my first extended example of literary method in physics partakes strongly of the structure and form of elegy' (Gold 2010, 15–16). Thus, it is not merely the fact that what Gold finds in Tennyson's 'energy-in-elegy' – *In Memoriam* (1850) – is a 'conversation with the emerging science of energy physics' (Gold 2010, 47–51). For that would merely confine her discussion to a thematic interest shared by scientists and writers. It is more that the form of Tennyson's elegy rotates around the same play between conservation and dissipation on which is built the two laws of thermodynamics (Gold 2010, 43–4). It is also the fact that metaphor, perhaps *the* pre-eminent device in Tennyson's poetry, shares with energetics key properties such as persistent transformation of forms. Entropy, Gold notes, is grounded in the root of the term trope, 'the linguistic torsion that produces nonliteral uses' and 'suggests a continuity between the metamorphic capacity of language and that of matter itself' (Gold 2010, 52).

Gold's readings of Victorian 'thermopoetics' recall similar scholarly interventions in post-Victorian texts. What Jennifer Wenzel calls the 'petro-magic-realism' of Nigerian novels is primarily generated by the 'multi-perspectival' views deployed in the narratives that 'combines the transmogrifying creatures and liminal space of the forest in Yoruba narrative tradition with the monstrous but mundane violence of oil exploration and extraction' (Wenzel 2017b, 493–4). In addition to recalling the thematic importance of oil in Nigerian fiction, such a device reveals 'the intricate and multivalent relationships among palm, petroleum and publishing', and helps reveal links between the exporting of oil and literature as global commodities (Wenzel 2017b, 493). For Wenzel, oil and literature work 'in a not altogether dissimilar way, both as medium for imagining a national community […] and as a site that lays bare the contradictions of Nigerian nationhood as well as the collusions between the state's image of itself and skeptical critiques' (Wenzel 2017b, 492–3). Since such narrative devices are common to many societies and cultures, they immediately invite a comparative analytical method such as the one offered by Graeme Macdonald in his interpretation of George Mackay Brown's *Greenvoe* and Abdul Rahman Munif's *Cities of Salt* or by Sharae Deckard's similarly incisive offerings on the writings of Sam Selvon, Jorge Amado and Merle Collins. Macdonald finds in the Scottish and Saudi Arabian novels, 'The Great Acceleration in prose [….] wrought in restless syntax, forged in conjunctive grammar, built in progressively piled-up clauses, this "monstrous" transformation conveys the exceptional and radically uneven nature of petro-development in form as well as content' (Macdonald 2017a, 296). Deckard ties the three novels from Trinidad, Brazil and Grenada together by their engagement with key food items – cacao and cascadura – consumed in the region. As we have seen before, a categorical distinction between food and fuel may not really be theoretically or conceptually defendable. Thus, Deckard sees in cacao two kinds of energies – a high-calorific foodstuff for energetic consumption, and a commodity that 'mobilizes various forms of energy for its own production' (Deckard 2017, 343). Since both in Brazil and the Caribbean, the latter process involved both indentured and slave (human labour) as well as the depletion of the forest, the narratives of Selvon, Amado and Collins recode such 'repressed reals' in the form of what Deckard calls 'cacao irrealism', comprised of 'duppies, soucouyants, douens and jumbies [….] forest spectres [that] call up the residual, projecting the underlying fear and guilt felt by the forest cutters due to earlier waves of dispossession' (Deckard 2017, 346–50).

Obviously, oil and food are not the only energy forms embedded in narrative techniques and poetics. Electricity, the weather and waste

have also emerged as major keys in the interpretation of the literary cultures of the 'long' nineteenth century. Jen Hill sees in Francis Galton's meteorology and Joseph Conrad's 1902 novella *Typhoon* a complex investigation of statistical correlation and data visualization as methods that help make sense of 'relationships and exchanges between energies, as well as between geographically distant places, and between local and global experiences' (Hill 2014, 442). Hill notices how the titular weather event in Conrad's story works to measure 'the complex, hidden vortical relations among those on board the storm-besieged steamer the Nan-Shan, turn-of-the century geopolitics, and capital' which would otherwise 'never come under scrutiny and thus would continue to operate invisibly' (Hill 2014, 442). She sees a similar use of the figure of the whorl, first discovered by Galton as a distinctive physiological marker printed on the fingertips of individual humans, in the correlative measurement of cyclonic energy. Whorls connect fingers, barometric pressure and cyclonic vortices to underscore the fact that both human individuals and weather are local expressions of a global energy system, and offer the unsettling thought (unsettling, that is, to a strictly nationalist imaginary) that 'geographical distance may indicate similarity, rather than difference' (Hill 2010, 448). Thus, Hill finds a confirmation of Galton's method of measuring and visualizing energy in Conrad's narrative technique, where the use of irony and 'logics, structure, and aesthetics of correlation' leads the reader to appreciate the correlative conjunction of the human and the non-human, and further suggests that '[t]he structure of correlation is thus not one that demands that hidden things be revealed or rendered visible, but is instead one that demands an attention to the simultaneous combinations and intersectional relays of local.global, past/present, material/abstract, the human/scientific, and the individual/social' (2010, 453). Such a notion of correlation, as we will see below, may be of interest in detecting the structural patterns in Ghana-da's tales also.

Similar tracings of the productive relationship between textual architecture and non-textual energies can also be found in Enda Duffy's work on *Ulysses*. In Joyce's 'telegraphese […] jabs of consciousness issued at the rhythm of short, breathless breaths' – and his persistent refusal to 'propel the plot forward in conventional terms', Duffy finds the key signatures of modernism – the 'envisioning of life as the capacity for a certain dispersal of energy [….] nothing less than a recasting of the very concept of the human' (Duffy 2011, 415). The energy in question here takes two pre-dominant forms – biological (adrenaline) and physical (electricity). For Duffy, the near-simultaneity of the electrification of Irish cities and the medical discovery of adrenaline as 'an in-body power

surge' gives Joyce the task of writing an electrified subjectivity in his novel that also corresponds to the ideals of Taylorist economic organization (Duffy 2011, 412–14). And in the plot resolutions in Dickens's *Our Mutual Friend* (1865) and Carlyle's *Sartor Resartus* (1831), Elizabeth Womack finds a moral premium put on hoarding 'waste' with a view to re-circulating their energy rather than dissipating it (Womack 2014, 566). In these novels and other 'Victorian miser narratives', Womack finds an idea of waste-management, including literary and textual waste-management in the case of Carlyle, that would also be codified in the classics of nineteenth-century urban sociology such as Mayhew's *London Labour and the London Poor* (1851) and Edwin Chadwick's *Sanitary Report* (1842).

The third keystone of energy humanities, we may now say, does not just propose that narrative and rhetorical devices specific to literature and interpretation of literature make them well suited to rise to the representational and conceptual challenges posed by energy. It also holds that the diversity of such devices – ranging from the level of syntax to that of genre – allows literature to trace the diverse and proliferating energy forms that have been crucial to modern life. One corollary of this is that in addition to making us re-think about energy, this also has the effect of re-evaluating what we take to be literature. Nearly a decade ago, Patricia Yaeger asked a question that has since become a focal point in the field of energy humanities: 'Instead of divvying up literary works into hundred-year intervals (or elastic variants like the 'long' eighteenth- or twentieth-century) or categories harnessing the history of ideas (Romanticism, Enlightenment), what happens if we sort texts according to the energy sources that made them possible?' (Yaeger 2017b, 441). By raising such possibilities, Yaeger is thinking here across massive scalar distances – from the operation of cultural codes or reality effects within the text that calls for corresponding adjustment in reading methods, to the material production and circulation of literature as a commodity in a global trade (Yaeger 2017b, 443–4). One implication of Yaeger's question is not just a revision of the periodization of literary history, but also of cultivating a critical alertness to what we may call after Bloch the simultaneity of the literary non-simultaneous. As Jennifer Wenzel explains in an interview while recalling her scholarly debt to Yaeger:

> Patsy's version of this idea was [….] as much about comparison as about periodization, suggesting that the textual groupings produced by this kind of "sorting" might not resemble periods as previously understood. And, of course, Patsy was keenly alert to the notion

> of energy simultaneity – one can juxtapose Homer and Garcia Marquez precisely because our age of hydrocarbon modernity is also, for many people around the world, the age of wood, dung and other kinds of biomass. (Potter 2017, 384)

Such re-mappings and comparative juxtapositions (perhaps they should be called correlations) provide possibilities for producing new literary categories. Since modern energy systems and literary systems are both made up of uneven compositions of what Williams had called dominant, residual and emergent elements (oil, but also coal and dung; novel, but also avant-garde poetry and experimental theatre), one could also ask how the worlding of both reveal, in turn, the structural principles of that world. Noting that it became possible for Goethe and Marx to speak of 'world literature' precisely when coal and oil made 'the space of the globe increasingly available and accessible for travel, trade and political power', Imre Szeman has wondered whether we should imagine the aforementioned literary category as a single but unequal system shaped by 'energy flows, forms and capacities to be figured differently at centre and periphery, shaping what Moretti calls '"local materials" in profound and powerful ways' (Szeman 2017a, 281). If this is so, Szeman claims that 'we need to read all of world literature as a petro-literature, whether or not oil is figured explicitly in the world-literary texts', since 'the life of surplus energy is to be found not only in the scenes and characters represented in literature [….] but in the very practice of literature as such' (Szeman 2017a, 284–6).

These three fundamental principles of energy humanities – an expanded sense of modernity and energy, a recognition of the conceptual and representational challenges posed by modern energy relations, and the capacity of literature and literary-cultural criticism to rise to such challenges – can help us respond to the questions posed to the readers of Ray and Mitra's stories. Why do so many of them feature extractive activities involving a wide variety of energy resources that either end in disasters or narrowly avoid such a fate? What is the relationship between such resource adventures and the narrative resources that produce wonder, cognition and estrangement? Why are we asked to rethink the relationship between science and magic, or the human and the non-human through the overlapping energy regimes they are positioned in? By the same token, such questions also prompt us to look at the role energy played in the making of Nehru's non-aligned imagination and policies, as well as in that of national 'development' that was, as we have seen, a pre-eminent paradigm of post-coloniality as such.

Power lines

Energy figured in Nehru's thought, primarily (and tellingly) as 'power' – a reliable index for civilizational development. Speaking at the inauguration of a science conference for 'the development of atomic energy for peaceful purposes' in Delhi on 26 November 1954, he summarized this firmly held conviction thus: 'Power is the most important thing to develop a country's resources. You may judge a country's advance today merely by seeing how much power it produces or uses. You may judge it in another way, how much power plus iron and steel is produced by it' (Singh 1988, 127). Two years later, speaking to members of the Indian Central Board of Irrigation and Power, he extended this interpretation to world history as such: 'It may even be said that the history of material civilisation in the world is the history of the growth of power development' (Singh 1988, 172). If this was so, clearly India's colonial past and post-colonial dependency could be understood in some ways as a state of energy depletion that needed to be addressed by whatever means necessary:

> Consider the past few hundred years of history; the world developed a new source of power, that is steam – the steam engine and the like – and the industrial age came in. India, with all her many virtues, did not develop that source of power. It became a backward country in that sense; it became a slave country because of that. Now we are facing the atomic age; we are on the very verge of it [….] If we are to remain abreast in the world as a nation which keeps ahead of things, we must develop this atomic energy quite apart from war. (Singh 1988, 64)

In treating 'power' as a measure of civilizational development, Nehru is seemingly at odds with the second credo of energy humanities regarding the representational and conceptual problems posed by energy forms. There is nothing invisible about coal-mines or electric pylons or big dams and, indeed, these big Nehruvian infrastructural undertakings came to be known as India's 'modern temples' (Misra 1965, 1–2). However, Nehru was not altogether oblivious to the diversity and interconnected nature of the various kinds of energies circulating in his new country. Pre-eminent among these other forms of energy was what he called 'manpower', by which, as we have seen, he meant the capacity of human labour. In this respect at least, he thought India had the historical advantage of possessing 'tremendous amounts of manpower available [….] We talk about our big power resources, but it is a folly not to use the small

power sources we have' (Singh 1988, 173). Nehru's idea of 'manpower' was associated with another distinctive feature of energy imaginary in non-aligned India – the spectre of waste. Key here was the adequate provision and consumption of food. Nehru thought that 'We eat wrong things or eat too much of them [….] those who have food waste too much of food and waste both time and money on it [….] we are terribly conservative with the result that if one kind of food is not available [….] some people even prefer starvation to eating other kinds of food' (Singh 1988, 71). And such, wasted 'manpower' also brought with it anxieties about competing energy systems and decisions about balancing them: 'we cannot spend anything on atomic energy if our people starve. The ultimate strength of a country comes from the people, and not from atomic energy' (Singh 1988, 128). The comparison between nuclear and human energy here is hardly accidental. As we have already seen in our discussions regarding weapons and laboratories, the atomic bomb loomed large over the non-aligned world and was in fact a decisive factor in its formation. Nehru accordingly stressed the multiple and benign uses of nuclear power at every opportunity: 'Already it is known that radioactive elements that are produced can be used for therapeutic purposes but in other matters too it will make power mobile and this mobility of power can make industry develop anywhere. We will not be tied up so much by accidents of geography. Atomic energy will help cottage industry' (Singh 1988, 42). In such thinking, individual human bodies, collectively summarized as 'manpower', figured as one of the many nodes of an energy-circuit that amounted in the final instance to an increasingly capacious idea about 'development'.

Nehru's thinking in this regard was both informed by and formative of the policies that his government pursued. The uneven distribution of energy sources, the spectre of waste and the challenges this posed to 'development', and the effects these had on India's geo-political status – all appeared in key policy analyses and recommendations. Among the earliest maps of energy production and consumption in the country was that drawn up by the National Council for Applied Economic Research and revealed a profoundly mixed picture, with the production and supply of coal comfortably outweighing those of electricity and oil (NCAR 1962a, 1–9). Such disparities were in part down to the political settlement that had shaped post-colonial India, such as the partition of the sub-continent and the post-war international dispensation. Shanti Bhatnagar, who as we have seen had emerged as one of the key players in the influential group of scientists around Nehru, had a long history of intimate ties with the petrochemical industry that had seen him being awarded large research grants by British companies like Steel Brothers

as well as the OBE (Anderson 2010, 50–1). In 1952, he spelt out the reasons behind and consequences of India's oil deficit – its current share of 1.9 million barrels of crude oil out of a world production of 3.4 billion barrels was a result of the loss of oil fields in Burma and Pakistan (Bhatnagar claimed these were 'taken away from us'). This meant that the country was forced to import oil with a significant chunk of its currency reserves, mostly from Iraq, which put it at considerable geo-political disadvantage (Anderson 2010, 163–4).

It was not, however, all gloom and doom for the analysts and economists at the National Council for Economic Research. The report they produced for Nehru's government in 1962 stressed how the apparent underdevelopment and unevenness of India's energy sector could also be its strength. The Council stressed the country's energy wealth – including the large coal reserves, resources of water power and the location of 'the world's richest and most accessible deposits of oil and natural gas' (NCAR 1962a, 1). It calculated that India was the sixth-highest consumer of energy in the world, and the ongoing transition from non-commercial to commercial sources of energy indicated the process of rapid development rather than chronic underdevelopment (NCAR 1962a, 5). It saw in electricity the 'most desirable form that energy can take' and recommended steps to address its shortage (NCAR 1962a, 29). But it also warned against the dissipation or waste in strikingly Victorian thermodynamic language: 'Eighty per cent of the energy available to Indian economy is dissipated in the form of waste heat [….] In the case of non-commercial fuels, a somewhat larger share of energy potentially available is wasted' (NCAR 1962a, 7). Finally, it drew attention to the problem of externalizing 'nature' in the calculating economic costs:

> The so-called free fuels, such as cattle dung and wood waste, are free only if man's time is valueless. Their true cost, measured in terms of their selling price [….] is considerably higher than the cost of energy from all but the most luxurious sources. Nor is the work done by bullocks free. The young bullock must be fed and tended for something over three years before the animal is ready to work. Except for the labour of man himself, bullock power is the most expensive of all India's source of power. (NCAR 1962a, 1)

The regional disparity in 'energy wealth' figured prominently in the council's subsequent reports. While the southern states were deficient in mineral and petroleum deposits, they possessed powerful water resources and above all 'manpower', in the form of a population that was 'active, intelligent and industrious' (NCAR 1962b, 37). The eastern

states commanded most of the major mineral, oil and water reserves (75 per cent of the country's coal, a third of hydro-power and all of the oil), but the people were more 'backward' (NCAR 1962c, 1–2). The western states were the most 'advanced', boasting of a well-functioning electricity sector, natural oil and gases and a nuclear power station, with rocketing energy demands (NCAR 1965, 9–10). The north, in the meantime, was dominated by the giant urban conurbation that Delhi had already grown into, sucking up ten times more electricity in comparison to other sources of power (NCAR 1965, 57–8). It is remarkable how closely such resource-mapping of India resembled powerful cultural stereotypes about the diverse Indian populations and societies – the industrious and cultured southerners, the futuristic and innovative westerns (especially the residents of Bombay/Mumbai), the grasping and power-hungry north, and the stunted east. Such intertwining of anthropological, bureaucratic, scientific and social imaginations can be seen, in the final instance, as the lasting legacy of the project of colonial modernization in south Asia.

The problems and potentials of energy identified during the Nehruvian years continued to frame policies and thinking for a long time. P. D. Henderson's report on the Indian energy sector written more than a decade after Nehru's death did little to alter the picture presented by the national council reports we have just looked at. The domination of coal, the paucity of oil and the problems of electricity supply, are all identified once again as India's distinctive features (Henderson 1975, 6–91). What is also Nehruvian is Henderson's enthusiasm about India's nuclear capability, both because of the availability of the large reserves of thorium critical for the development of 'fast breeder reactors', which reads as the confirmation of Nehru's (and Bhabha's) vision of a prominent role played by atomic energy in India's development (Henderson 1975, 20–1). Writing a few years after Henderson, R. K. Pachauri noticed the presumably unintended consequences of Nehru's investment in 'India's temples' for Indian agriculture, which was now outstripping the 'heavy' industries in the demand for energy (Pachauri 1977, 1). But Pachauri retained the basic vision of the Nehruvian energy map that revealed in the country the coevality of the modern and the pre-modern as seen in 'agricultural techniques of the Western model and age-old practices of farming' and he endorsed some of the achievements of the three five-year plans that had been the cornerstones of Nehru's strategy of centralized planning. Perhaps such achievements had come *because*, not *despite*, of the uneasy yoking of the bullock cart and the nuclear reactor in India (Pachauri 1977, 18–20).

The longevity of the Nehruvian energy imaginary corresponds to a similar persistence of resource fictions in the works of Ray and Mitra. The extractive adventures that often exercise their fictional heroes work as critical meditations on post-colonial India's position in the Cold War energy regime. Likewise and relatedly, the text's anxious examination of their own narrative transformations, dissipations and conservation as they move through a variety of energy contexts, supports Patricia Yaeger's suggestion that 'thinking about literature through the lens of energy' may result in a re-making of our ideas about literature's relationship with its originating modes of production as quasi-objects' (Yaeger 2017b, 443–4). It is to this relationship as presented in science fiction that we now turn.

Chaotic order

A combination of historical and literary forces formed the energy (un-)consciousness of early Indian science fiction. Energy turned out to be a key factor in post-colonial state-building as well as in the strategic games of non-alignment during the Cold War. But in this, Ray, Mitra and other Indian writers cannot be said to be *sui generis*. Energy had been an important factor in global science fiction since the 1930s. Albert Berger notes in a pair of essays that atomic energy filled American and European science fiction magazines long before the Manhattan Project, as a metaphor of both technological and institutional power (1976 and 1979, 121–8). But it also led to a change in the way in which science fiction was written:

> Once nuclear energy gave promise of actually fulfilling dreams of unlimited power, boundless social change could be envisioned. Eventually, this metaphor, enriched by an awareness of the new, real research into the nucleus which characterized physics in the 1930s, was combined with the demand for better and more realistic science fiction stories which marked the genre as a whole and *Astounding Science Fiction*. (Berger 1979, 121)

Astounding's influential editor, John W. Campbell, was himself trained as a physicist at the Massachusetts Institute of Technology and gathered around him a group of writers who were beginning to see the world in the 1930s, like Nehru did in the subsequent decades, as poised to enter the atomic age. Even Isaac Asimov, who belonged to a group called the 'Futurians' – a group of leftish writers who were banned from the first

world science fiction convention in 1939 and may be taken as the mirror image of the Italian 'Futurists' – understood the possession of nuclear power, if not atomic weapons, as a key civilizational indicator. Thus 'it was in several stories involving nuclear reactors rather than bombs that SF first combined its at least passing knowledge of actual nuclear physics with the best of the new attempts at realistic extrapolations that Campbell had promoted' (Berger 1979, 123).

In the light of what we have seen thus far about the relationship between the Nehruvian state-building and building of scientific institutions, it is interesting to note that in many of the *Astounding* stories, such as Clifford Simak's 'Lobby', peaceful atomic energy generation was seen as a decisive factor in the change in practice of governance from representative democracy to technocracy (Berger 1979, 123). But, of course, it was the historical cataclysm of Hiroshima and Nagasaki that really clinched this connection between energy and governance and extended it to a global level. Campbell famously announced in his November 1945 editorial for *Astounding* that the bombs had announced 'the death of a cultural pattern based on a balance of military power controlled exclusively by big and wealthy nations' – an insight embedded in the vision of the universal 'mutually assured destruction' that animated stories such as Robert Heinlein's 'Solution Unsatisfactory' (Berger 1979, 125–6). The bomb also changed the relatively weak position of science fiction writers, at least within the American literary field:

> On the one hand, they were acknowledged as prophets proven right by the course of events. Some of them began new careers as writers of popular science and consultants and participants in government [....] Even those who remained close to their roots in magazine fiction found themselves newly prosperous as a result of the increased attention the bomb had brought to 'that Buck Rogers' stuff [....] On the other hand, having in their fiction developed and controlled nuclear energy long before the army got round to it, many of these newly affluent writers were both disappointed in and fearful of the ways in which the government proposed to handle its 'ultimate weapon'. (Berger 1976, 143)

Theodore Sturgeon offered a more sardonic interpretation of this writerly dilemma of coming into the possession of considerable cultural and economic capital, but only at the cost of potential as well as actual (the ashes of Hiroshima and Nagasaki were still falling) apocalypse. He declared that while his fellow writers were 'scared silly' of atomic weapons, it was really in a 'delicious drawing room sort of way, because

they couldn't conceive of this Buck Rogers event happening to anything but posterity' (Berger 1976, 143). In reaction to what they saw was a totalitarian tendency inherent in every bureaucracy, the capture of politicians by 'special interest groups', and literature's accommodation to both types of corruption, writers like Sturgeon and Poul Anderson would increasingly fall back on the hope of a technocracy rather than democracy over the course of the rest of their careers.

As we move further into the decades of Cold War and non-alignment, it becomes obvious that energy – and not just the nuclear kind – became increasingly crucial to American and European science fiction's gathering of cultural prestige. For example, petroleum and the myriad social forms energized by it became more and more central to science fiction's 'new wave' and to writers such as J. G. Ballard. Writing about Ballard's novel *Crash* (1973), Jean Baudrillard saw the inauguration of a new idea of the human body that had become fully enmeshed with violent technology: 'a body commixed with technology's capacity for violation and violence [….] a body with neither organs nor organic pleasures, entirely dominated by gash marks, excisions, and technical scars' (Baudrillard 1991, 313). In *Crash*, It is of course the car – perhaps the most recognizable symbol of 'petro-culture' – that Ballard presents as the technology that mediates between the organic with the inorganic in a world that is running down at some speed: 'The car is not the appendix of an immobile domestic universe: there are no more private and domestic universes, only figures of incessant circulation, and the accident is everywhere [….] the banalization of the anomaly of death' (Baudrillard 1991, 314). For Baudrillard, Ballard's characters are on 'a road to nowhere', but going there 'faster than others' (1991, 318). We can for the moment ignore the main problem with Baudrillard's reading of the cultural logic of late capitalism, namely his assumption that capital's commodity logic advances at an even rate of acceleration across space and time. But his recognition that for Ballard the automobile marks the site where a specific energy regime shapes the human body is surely accurate. Such readings predicted Cold War science fiction's increasing entanglements with energetics as such and suggest that the Indian writers's similar disposition signals their world-literary, rather than wholly local or regional habitus.

The middle years of the twentieth century also saw certain developments in scientific thinking about energy that sought a break with their Victorian inheritance. Perhaps the most striking of these was 'chaos theory' developed by the Belgian thermodynamicist Ilya Prigogine, which offered a mathematic solution to the fundamental contradictions that had marked energy thinking since the nineteenth century – between

evolution and entropy, physics and biology, simplicity and complexity. As David Porush explains, evolution and entropy offered not only contrasting 'cosmological moods', but also conflicting accounts of how the universe works (Porush 1991, 367–8). In the entropic thinking that emerged from Victorian engineers and physicist's efforts to make heat engines more efficient, any machine – including the universe and 'nature' – moved irreversibly towards degradation because of inherent forces like friction. But in evolutionary thinking, 'nature' and the universe moved in the opposite direction by developing increasingly more complex organizations and structures. Porush suggests that for Prigogine, this contradiction was in the final instance a product of two different levels of description – one microscopic and physical, the other macroscopic and biological (Porush 1991, 368). Prigogine's innovation was to reconcile the two by mathematically proving how order and complexity can arise out of entropy and chaos under specific circumstances – an 'open system' is non-linear and non-equilibrial (Porush 1991, 370–1). But these properties also make the system, also called 'dissipative structures' by Prigogine necessarily unpredictable –

> they survive in an open exchange of energy with the generally entropic universe to dissipate or work off the products of their instabilities. While dissipative structures are bound to take this leap into self-organization (the description of these systems and their changes is deterministic), no one can tell what shape it will take after the leap (it is unpredictable). (Porush 1991, 370–1)

The attraction of Prigogine's theory of self-organizing 'open' systems that leap from chaos to order *because* of a productive relationship between entropy and evolution is obviously not confined to attempts to understand 'nature' or universe. It has accordingly been enthusiastically taken up to propose models of cultural, historical, economic and literary systems. Prigogine himself was interested in comparing literature's ability to capture complex macro-structures with that of the ability of physics and chemistry to capture simple micro-level ones (Porush 1991, 371). Porush sees a 'Prigoginic leap' in Euro-American science fiction of the 1970s and 1980s, particularly in its cyberpunk variation, with its interest in artificial intelligence and the erasure of the boundaries between the organic and the inorganic, the human and the machine (Porush 1991, 373–81). But as he also notes, 'SF often registers and extrapolates the consequences of new scientific knowledge even before science does' (Porush 1991, 367). This proleptic or prophetic generic character we have already encountered in the overview of American

and European science fiction's engagement with nuclear power as well as in our previous discussions of the Indian writers's representation of weapons. We shall see more of this below in Satyajit Ray's fiction of artificial intelligence and cyborgs.

At this point it may be worth returning for a moment to Albert Berger's suggestion that the formation of science fiction's energy (un)consciousness via nuclear power resulted in influential editors such as John Campbell's preference for 'better and more realistic' writing, since it returns us to the question of energetics, energy humanities and the styles of the various kinds of 'resource fictions'. What can 'realistic' science fiction mean given what we know about the interplay between cognition and estrangement mediated by the presence of the *novum* there? Here, the answer proposed by Elizabeth Hewitt in her discussion of Pamela Zoline's story 'The heat death of the Universe' seems to me to be pertinent (Hewitt 1994, 289–301). Hewitt dispenses with the notion that we should confine ourselves to understanding – despite the narrative's apparent invitation (most obviously signalled by its title) – the mundane everyday life of the Californian housewife Sarah Boyle as analogously related to the thermodynamic law of entropy (Hewitt 1994, 290). For such a reading would miss the distinctive work of metaphor in science fiction where, as opposed to other kinds of writing, they operate as the 'building materials of the "new" SF world' (Hewitt 1994, 290). For her, this new world or *novum*, just as in the case of Shonku's diaries, turn out to be the text itself:

> By juxtaposing entropy with housewifery, Zoline disrupts a model that would make either 'science' or 'sociology' metaphor for the other: her text raises the possibility that we may not know what should be read 'literally.' Is Zoline depicting an early manifestation of the end-of-the-world or is she commenting on the social fact of unpaid female labour? It is never clear; the point is that Zoline's story establishes, if only ambiguously, an alternative generic reading model that disrupts our conventional metaphorical machines such that even that is most mundane can also be read as extra-worldly. (Hewitt 1994, 292)

This transference between the mundane and the 'extra-worldly', whereby each is always already in the process of becoming the other, should immediately remind us of the discussions of magical-realism or 'critical-irrealism' that we touched upon earlier regarding science fiction's world literary claims. In the present context, the key thing to remember is that what is at stake in Zoline's story, and also in others such as Premendra

Mitra's tall-tales, is a proposition about treating the genre of science fiction as an 'open system' where instead of a simple reproduction of like by like, we see the constant 'Prigoginian leap' from apparent dissipation to actual complex forms. Seen thus, science fiction becomes more 'realistic' not (only) when it reproduces the various developments in, say, energetics or weapons research in its theme; but also when its style and form is able to register, proleptically and analeptically, the various kinds of energies that course through the textual and the non-textual dimensions of the world and connect them together into one. Entropy, evolution, waste, resource extraction, artificial intelligence, competing energy forms, peaceful and destructive uses of science – all the concerns common to Nehruvian as well as Cold War science, appeared in the writings of Ray and Mitra. Allied to their playful foregrounding of literary styles that refused a closure of generic boundaries (thereby modelling an 'open' system), such writing can be seen exemplars of the recent critical claims regarding reading literature through the lens of energy. It also establishes the Indian writers' citizenship in the world republic of letters. If one were to generalize, we could say that while Ray was more engaged with the questions of artificial life, humans and machines, and the kinds of energy that challenge and extend the limits of scientific knowledge, Mitra's stories, on the other hand, dealt more directly with the questions of resource extraction and their geo-political implications in the age of non-alignment. But, of course, these were overlapping and interconnected concerns that both writers responded to in their own fashion.

We have already seen how much of *Byomjatrir Diary* was concerned with presenting its own textual seriality as a new kind of energy that instead of dissipating, in Prigoginian terms, is transformed continually into more complex stories in the future as the further adventures of Professor Shonku. Equally central to that first Shonku tale were the questions of artificial intelligence and the evolution of machine-learning that we touched upon in our discussion of Shonku's human and non-human assistants and their laboratory lives. But it may be worth reminding us that what appears to be truly puzzling about the robot Bidhushekhar's linguistic and musical capabilities is that they are self-taught and not programmed by Shonku. There are early signs of this in the story when Shonku dismantles the robot to find out why he has been 'groaning from time to time', but he is unable to detect any mechanical flaws (Ray 2008, 10). Shonku reflexively attributes this mysterious development to his own scientific prowess, unrecognized even by himself: 'Perhaps I am unaware of the full extent of my own powers. I have heard that some really gifted and creative scientists have

the same problem. They cannot gauge how far their own creations will go' (Ray 2008, 10–11). The rest of the story, however, clinically dismantles not only Shonku's egocentrism but, more importantly, his assumptions about science and scientific development being a 'closed system' that relies on inputs from scientists that then – as in the case of Shonku's hopes about Bidhushekhar's 'faults' – gradually dissipates over time. But Bidhushekhar is not the only machine in the story that displays such capacities for self-learning. After their Martian misadventure, Shonku's spaceship seems to have developed a mind of its own: 'How on earth did the rocket take off? Who started it? Prahlad knew absolutely nothing about the technicalities. And Bidhushekhar was still lying in two broken pieces. Did it take off on its own? If that was the case, where was it going?' (Ray 2008, 21). From this point on, although Shonku continues to hold tentatively on to the myth of his own promethean powers, the reader is left in little doubt that such developments in machine intelligence have nothing at all to do with him. Thus, Bidhushekhar's self-taught sanskritic and Shakespearean recitations and uncanny cosmological knowledge about the route to the planet Tafa not only sets up the confirmation of Shonku's intellectual limitations being genially exposed by the aliens of that planet, but they also point to a relationship between entropy and evolution that marks the universe as a complex 'open' system in contradiction to Shonku's assumptions. Shonku's anthropocentric science cannot imagine all the currents of energy that keep it turning, but Ray's story-cycle sets itself the task of exploring the consequences of such limits and horizons.

In his discussion of the 'Prigoginic leap' in science fiction of the 1970s and 1980s, David Porush also claimed that the challenge issued by the cyberpunk mode was directed at one of the foundational assumptions of classical cybernetics of Weiner, Turing, von Neumann – that artificial intelligence was to be built 'on mechanical principles that could think with strict and formal rationality' (Porush 1991, 383). Writers like William Gibson and Bruce Sterling, by imagining machines and not humans giving birth to other intelligent machines, proposed that

> the proper models for artificial intelligence in our time cannot rely on formal logic alone. The part of our brain that controls and grows in locked looping with our tools and the part that makes connections among everything to formulate grandiose world-building hallucinations of philosophy and fiction and science are at least isomorphisms of the mysterious and chaotic activity of our complex biological evolution itself, which relies on chaos. (Porush 1991, 384)

Writing two decades *before* Gibson and Sterling, and from within the historical context of post-colonial 'underdevelopment' and the consequent struggle for geo-political advantage, Ray's stories offer glimpses of the dilemmas of a scientist over-reliant on 'strict and formal rationality' when faced with the 'mysterious and chaotic' energies that animate his machines as well as the world he inhabits.

One unsettling, if predictable, effect of Ray's presentation of machine-learning or artificial intelligence in relation to energy systems is a probing dissection of the category of the human. Often, as was the case in *Robu,* the human and the robot cannot be distinguished from each other, implying their co-eval position in the circuits of universal energy. Unlike *Byomjatrir Diary*, the problem posed in *Robu* is not the unprogrammed learning capacity of Shonku's robot. We soon learn that its heroic (and graphically violent) rescuing of Shonku is the result of the efforts of a human scientist, Paumer, who had, unbeknownst to Shonku, altered the electronic circuit in Robu's brain and made it capable of an emotional connection with its creator. But under this guise of quelling human unease about machine intelligence, the story smuggles in the spectre of the same mysterious and evolutionary energy that animates artificial life in the (ultimately vanquished) figure of Robu's rival – the robot developed by the German scientist Borgelt. Borgelt's machine is so 'human' that it is able to stand in for the human scientist without anyone suspecting the swap, except for Robu. This is exactly the opposite in the case of the latter, who looks like something put together 'simply with glue and nails and sticking plaster!' but can perform complex mathematical calculations much quicker than any human being. Thus, when Borgelt's robot declares that 'No one has been able to build a robot like mine. What I – Gottfried Borgelt – have created is totally unique' (Ray 2008, 151), it is telling a truth wrapped in a falsehood. The pronoun is misleading in so far as it is not the human scientist who is speaking here. But it also confirms the exceptionality of the robot in that it has succeeded in 'creating' itself far beyond the imagination and capacities of the German scientist, whom it has imprisoned and whose place in human society it has usurped. After being freed from captivity, Borgelt declares that he had built the machine in the hope that it would continue with his work in cybernetics after his death, but 'the human brain is such a complex affair – no man can recreate it, or predict how it's going to behave' (Ray 2008, 155–6). Borgelt's machine taught itself 'human' emotions such as envy and greed long before Shonku's Robu could be programmed to feel such things. In so doing, it put forth a claim to a kind of being that demanded a re-classification of the boundaries between the human and the machine as well of the energies that flow through and connect them.

Ray's interrogation of fragile boundaries between humans and machines rested precisely on the evolutionary complexity of the brain and the mysteries of the energy it contained. If Ray's machines unsettled humans by displaying a capacity for the 'Prigoginic leap' of spontaneous learning, they did so because (some) humans shared with them exactly this property and, in their cases, this was deemed to be evidence for anthropocentric exceptionalism – that is, a confirmation of their humanity. Hence, the revelations regarding their shared abilities is exactly what confirms the unsettling equivalence between machines and human. One such exceptional human-machine (and hence a cyborgian figure) is the child who features in *Professor Shonku O Khoka* ('Professor Shonku and the Little Boy', 1967). He is brought by his father to the scientist after he suffers a head injury from a fall in the mistaken belief that Shonku can cure his strange affliction – he is speaking in tongues that no one can comprehend. Like Shonku's robot, he has developed a linguistic capacity for which there appears to have been no obvious external 'programming'. Shonku becomes interested in the case despite the lack of his own medical expertise and soon establishes that the child is not only speaking in Sanskrit, Latin and English but has also developed extensive knowledge of geography, history and the sciences. In fact, he is a more complete version of any machine that Shonku has ever built. But Khoka's extraordinary learning capacities are in tension with his humanity, which is marked above all in the narrative by filial bonds with his parents and the normative social expectations regarding childhood. His mother appeals to Shonku evoking these values: 'All right, you may take him with you, but please bring the old Khoka back to me. I want him the way he was. A four-year-old should have the brain of a four-year-old, shouldn't he?' (Ray 2008, 105) The echoing of Borgelt's conclusions in *Robu* about his rogue robot is deliberate here ('A robot ought to remain a robot'), the auxiliary verb underscoring both the normative limits of specific beings (children and robots) but also evoking the similar norms that define those limits and, in so doing, draw our attention to the equivalence between them.

It is this embedded 'human' element that finally seems to win out in Khoka. Shonku can only understand the evolutionary leap he has taken in terms of disease, abnormality, dissipation or decay (Ray 2008, 114). And Khoka understands that unless he reverses the process, he will forever be treated as a monstrous freak by his fellow humans, since he has already had the unpleasant experience of being subjected to a media circus. He therefore forces Shonku to give him his most potent acid – annihilin – which instead of killing him, ushers in a comatose

state from which he wakes up completely shorn of his learning capacities and memory of being anything other than a 'normal' human child: 'He looked around the room, then spoke, sounding as if he was about to cry. "Where's my mummy … I want my mummy"' (Ray 2008, 117). But Khoka's return to this 'normalcy' again depends on the complexity of his brain's evolutionary energies without which he would not be able to identify the solution to his predicament offered by the potent acid. Thus, his is also a return to that shadowy zone between the human and non-human, where he is affiliated not only to his parents, but also to the various machines in Ray's fiction that have already demonstrated their capacity to make identical leaps of consciousness.

It may not be too far-fetched to see in Ray's human machines an early version of what Donna Haraway would famously theorize in her 'A Cyborg Manifesto' (1991) as well as, as we have already seen, Gibson and Sterling's cyberpunk. The one other character that repeatedly presents this productive problem figured in the cyborg – a problem that would be registered over the decades after Shonku's appearance in the world's popular-cultural market in music albums such as Kraftwerk's seminal 1978 *Die Mensch-Maschine,* as well as in Ridley Scott's 1982 film *Blade Runner* – in Ray's stories is, of course, Shonku himself. We had seen earlier how some of the most anxious moments in Shonku's adventures involving laboratory experiments feature turning Shonku into a sentient machine. In *Ascharya Putul*, the rogue scientist Lindquist's handiwork strikes Shonku as uncanny because: 'The tiny figures that I saw, placed under glass lids, were so life-like that I hesitate to refer to them as statuettes. The only difference between each figure and a real person was [….] that each was about one-tenth of the size of a normal human being' (Ray 2008, 183–4). But these exquisite dolls, of course, *are* human – miniaturized by Lindquist's electric technology and suspended in an ambiguous state of being that are revived at the pleasure of their rogue creator.

Shonku himself is added to Lindquist's collection in a rare instance of candid admission on Ray's part regarding the erotic pleasures in techno-scientific expertise: 'Then his lips parted again and his gold tooth flashed. "Come on!" he muttered, his voice harsh and raucous, "Come my dear, my statuette number seven …come!" His hand covered my entire body' (Ray 2008, 196). Shonku is rescued from this predicament by his friend Ackroyd, another 'living doll' who has overcome his new condition with a mixture of technological innovation (he is wearing one of Shonku's inventions that gives him partial immunization from Lindquist's device) and physical prowess (he is able to escape from his cage by swinging on wires that extend to the floor). But the real question

in the story is posed by the rogue scientist around the preservation and conservation of energy. Lindquist confesses that he is puzzled by the behaviour of his human dolls. Their miniaturization means that they will never face any problems of adequate provision of food and other resources, and yet whenever they are revived for their feeding sessions, all they can do is 'start shrieking and yelling and beg to be rescued' (Ray 2008, 195). Lindquist had discovered his technology while trying to solve the puzzle of the behaviour of lemmings, who seem to defy all evolutionary laws in committing mass suicide by jumping into the sea during their annual migration. Is it to forestall any future resource crunch that they do this or is this a dramatic demonstration of entropy coded into evolution itself? By miniaturizing humans Lindquist appears to offer one answer to such questions posed by lemmings – a reduction in size and scale of an individual leads to a conservation of the collective existence of the species. But the end of the story offers another kind of answer – that evolutionary energy is not linear and does not progress along rigidly programmatic routes. After Shonku's rescue by Ackroyd and restoration of their normal human selves, the English scientist decides to accompany the lemmings on one final journey to the sea instead of returning to human society. With this literal leap into another state of being, he hopes to understand some of the laws of evolutionary energy that may not altogether discount the possibilities of the extinction of both the individual as well as the species. Such a possibility not only disputes any whiggish understanding of energy systems, but of similar ideas regarding 'development' itself. We know, as in the case of the Club of Rome report, how closely entwined were the ideas of biological and economic development or progress during the years of non-alignment and the Cold War. We also explored briefly the long nineteenth-century genealogy of such conceptual entanglements. It is not accidental that, for Nehru, 'manpower' signified both economic and biological well-being. In offering a non-linear, chaotic, portrait of biological energy, Ray also implies that the Nehruvian rhetoric about economic energy may just be that – empty signifiers of political expediency rather than any meaningful commitment to achieving collective well-being.

This addition of animals as a third category, after humans and machines, in Ray's interrogation of species boundaries and evolutionary energy also appears in other stories such as *Gorilla*. We may remember that, like Lindquist, the rogue scientist Massingham's device is an electrical one that converts primates, both gorillas and humans in this case, into machines. The automaton-like behaviour of the gorilla horde (Ray 2003, 164) is replicated in the captive Shonku's prone position and

glassy stare in Massingham's jungle laboratory that justifies the English scientist's premature celebrations at the prospect of recruiting the Indian to his private primate army. As in *Ascharya Putul*, Shonku is rescued by the prowess of his companions – here the African Kabala and the Bengali Avinash babu (the former being explicitly compared to Tarzan by the latter, with all the baggage that this racialized trope of noble savagery brings with it). And since here too the tale had begun with an investigation into evolutionary energy with Shonku's experiments to solve the mysteries of a vulture's ocular powers, we are directed to a familiar set of problems by the narrative's resolution. The human and non-human primates may have returned to their 'normal' states after the electrical processes that alter their brain have been arrested and reversed, but Massingham's device has connected animals, humans and machines in one single evolutionary loop. His laboratory may have been burned by the end of the narrative and he himself confined in an asylum, but the implications of his discovery are preserved in Shonku's diary for the readers to mull upon.

This emphasis on the relationship between electrical energy and the human brain's capacity for non-linear 'Prigoginian leaps' is presented further in a story that breaches the Suvinian generic boundaries with gleeful deliberation, *Professor Shonku O Bhoot* ('Professor Shonku and the Spook', 1966). Shonku begins the story by stating his (respectably late-Victorian) belief that 'ghosts and spectres, seances, telepathy and clairvoyance will become subjects of scientific study' (Ray 2008, 118). The neo-spectroscope he has built in order to do this is almost an identical copy of Massingham's electrical device in *Gorilla*: 'I built a metal helmet to fit my head. Two electric wires come out of this helmet, which go into a glass bowl filled with a solution I have made. Soaking in that solution are two flat pieces of copper. The two wires are connected to the copper' (Ray 2008, 119). But electricity is not the only ingredient required to harness otherworldly energies. The powers of human brain – 'concentration' – as well as other organic matters such as 'juice from the roots of some trees in our cremation ground, which have been nourished by the smoke of several funeral pyres', are indispensable for the success of the project. At first, Shonku's device conjures up contact with the spirit of his departed friend Ackroyd who has seemingly kept his promise of accompanying the lemmings all the way to the sea and who confirms the scientific validity of Shonku's experiment. But soon, more troubling rumours are brought to him by Avinash babu about a *doppelgänger* stalking the town: 'Once I saw this film [….] It had a funny story. There was this man, who got split in two. So, at any given time, you could see one half in one place, and the other somewhere else. Do you think

a similar thing has happened to you?' (Ray 2008, 125–6). This spectral figure, when it finally communicates with Shonku via the device, turns out to be one of his ancestors who had lived in the eighteenth century and had practised a branch of indigenous knowledge-form adjacent to modern science – *tantra*. Having died suddenly in an accident, he had not been able to properly dispose of his *tantric* equipment, but had now done so thanks to the channel opened between the worlds of the living and the dead by Shonku's neo-spectroscope. But such meetings are too expensive in terms of energy – the draining of Shonku's own 'concentration' leads to a self-imposed ban on any further experiments that could lead to more splitting of his self. Obviously, at one level this is a fable for Ray's life-long interest in probing not only generic boundaries of science fiction, but also those taken to exist between science and other knowledge-systems. Electricity, secretions from crematoriums, laboratory equipments and ancestral spirits – all work together not only to confirm a relationship between science and those modes of enquiry deemed to be antithetical to it, but also between the individual human 'self' and others. The ancestral spirit is a copy of Shonku that can only be summoned by the mysterious workings of the scientist's own brain. When attempts are made to register its presence through other devices, such as a neighbour's camera, the efforts invariably fail. The most powerful and unpredictable source of energy in Ray's fiction remains organic, non-linear and chaotic.

Ray's interest in exploring the boundaries between the human and the non-human, machine learning and artificial intelligence, organic and non-organic energies, 'open' and 'closed' systems of knowledge, was not only co-eval with developments in Euro-American science fiction and scientific and technological developments. It was prophetic of some of the trends that would emerge in these fields over the coming decades. It was critically aligned also to certain key aspects of Nehruvian attitudes towards energy that we looked at earlier. For example, electricity was privileged by Ray as well as by the Indian National Council of Applied Economic Research as 'the most desirable form that energy can take' (1962a, 29), since in its fictional form it connects the organic to non-organic and human to the non-human, and reveal them to be the parts of the same systemic loop. But electricity in Ray's science fiction also served to imaginatively interrogate two other aspects of Nehruvian energy thinking – 'manpower' and India's scientific underdevelopment. Regarding the first, Nehru's faith in the potential developmental capacity of human energy was literalized in those of Ray's characters who tap into hitherto unimagined sources of power contained in their organic frame – mainly in the evolutionary

tool box that is their brain. However, in doing so, they relinquish at the same time any claims to anthropocentric exceptionalism since such energy is also be found in machines and animals. This move works as an inherent limit and critique to the gender and species bias contained in the historical Nehruvian assumptions regarding energy's developmental potential. As for the second aspect, the equal status accorded by Ray to indigenous and 'universal' forms of knowledge – science but also *tantra* for instance, – appears to refute Nehru's anxieties about India's historic lag in the field of modern science and technology. But it does conform to a wider Nehruvian proposition about civilizational index – that of energy or 'power' being a reliable measurement for it. If indigenous *tantra* can collaborate with non-indigenous science to tap into hidden or unpredictable energy forms, India may not have to suffer from a constant energy cringe in the post-colonial world. Such was one of the utopic impulses of Ray's fiction.

At the same time, these civilizational claims – unlike the contemporary cultural chauvinism of Hindu fundamentalism in India – were not confined to the nation in the case of Ray. Rather, they extended over the tri-continental, potentially non-aligned, world to dispute, on the one hand, any euro-centric claims of civilizational monopoly and, on the other, all forms of reactionary nativism. In *Professor Shonku O Cochabambar Guha* ('Professor Shonku and the Caves of Cochabamba', 1969), Shonku is invited to Peru to test the authenticity of cave paintings that some local experts such as Dr Cordoba are claiming to be of relatively recent origin, while others, like the American Dumbarton, think are pre-historic. What is confusing about the paintings are both their fresh colour and the use of abstract symbols that resemble mathematical formulae (Ray 2003, 135). Shonku and Dumbarton are also troubled by Cordoba's hostility towards them – a behaviour which is attributed by their guide Pedro to his recent narrow escape from death during an earthquake that had devastated Cochabamba and caused a large number of casualties. This coupling of the destructive energies of the earth (the earthquake) and the human brain (Cordoba's alleged madness) culminates in the murder of Pedro and the discovery by the Indian and the American scientists of the object with which their guide had been assaulted which was made of plastic and therefore not the spine of some strange animal that they had initially mistaken it to be. Convinced that Cordoba was attempting to hide something, they return to the caves and find the Bolivian's body, but what is far more disturbing is what they find in the inner recesses:

> The tunnel bent to the right, and led to a larger chamber around the corner. Our torch-light revealed a strange sight – the space

> was full of strange machines and the wall with mathematical and geometrical formulae instead of paintings. No familiar metals like glass or iron or steel had been used for the machines. There were also thin wire-like filaments that crept up the walls, and we could not make out what they were made of [….] the three bodies on the floor were dead. I whispered 'electric shock', and then 'don't touch them Dumbarton'. (Ray 2003, 147)

The presence of strange machines and electricity in the cave in the story does not lead to the familiar contemporary figure of the rogue scientist nor to futuristic aliens, but to the transportation of the scientists back in time to pre-history. To be precise, the cave marks the space where pre-history and history turn out to be co-existent. And this startling juxtaposition is embodied in the author of the cave paintings, the mathematical symbols, as well as the machines – a being with the appearance of pre-historic cave-dwellers but with the brain of a 'modern' human, and who is awakened from his slumber by his unwelcome visitors. There is only enough time left for the scientists to decode one last enigmatic message written on the wall: 'All else is dead. I am here. I will be here. I am alone, I know much. I will know more. Stone is my friend. Stone is my enemy' (Ray 2003, 148). The meaning of this message soon becomes apparent as another earthquake buries the evolutionary miracle in the collapsing cave from which the scientists escape to witness a memorable tableaux – a fault-line appearing in the earth's surface and swallowing up whole herds of Pliocenic animals that had emerged in panic from the forest surrounding the cave. What had appeared earlier in the story as destructive energy – the earthquake – is now shown to be a force necessary to contain the apparently inexplicable and unsettling survival of pre-historic beings whose presence refutes any assumptions about linear evolutionary developments. On the other hand, electricity, machines and paintings act as the civilizational markers of Bolivia (and, by extension, perhaps of Latin America), whose historical 'backwardness' is transformed instead to be a sign of the co-evality of the past, present and future. It therefore functions as a radically defamiliarizing device in relation to any ideas of historical progress. Such disruption to the twinned concepts of biological and historical 'developments' appeared as one of the key functions of post-colonial non-aligned science fiction.

We may remember from our discussion that we have encountered similar linking of energy and tri-continental civilizational credentials in Ray. In *Baghdader Baksa*, the camera recorder of Gemal al-Harrait of ancient Mesopotamia disproves any settled notions of scientific and technological development. It simultaneously underscores the

civilizational claims of a society that appeared to be 'petro-modern' long before the dawn of such an era in Europe:[2] 'The tallest building in Babylon, all those years ago, measured a hundred feet [….] Two thousand years ago, the Babylonians had already learnt to make use of the petroleum that their country possessed. They lit lamps at night with the help of this petroleum. The whole city glowed and glittered in the dark' (Ray 2008, 206–7).

This proof of non-Eurocentric, non-linear modernity is too much for the American Goldstein, who wants to rob al-Harrarit's camera for his private collection and, in so doing, silence the claims to the civilizational sovereignty of Iraq put forth by Hasan al-Hubbal, the archaeologist who had led Shonku's party to the cave where the Mesopotamian scientist-magician al-Harriat is buried with many of his inventions. Al-Hubbal, like Nehru, is both a nationalist and a tri-continental internationalist, as is evident from his expression of his fellowship with Shonku: 'It is a great privilege for me, for I am aware of the close links between India and our country' (Ray 2008, 208). This fellowship is sealed in the story by a transmission of aural energy between the two – only Shonku can replicate the incantatory pitch required to open the secret cave's sealed entrance that leads to the burial chamber. And in the fiction it is this (non-aligned) alliance that finally prevents the American's securing of Iraq's resources – a drama that had already happened in history and fuelled the former's claim to world historical superpower status.

I remarked earlier that in comparison to Ray, Mitra's attention fell more on the relationship between resource extraction, the production and consumption of energy, and the geo-political implications of such transactions. Food, as we saw at the beginning of this chapter, was among the most important of such resources in the Ghana-da story cycle, acting as it did as a direct trigger for the narration of the tall-tales by the hero. In some stories like *Chuunch* and *Tel* ('Oil', 1967), food (or its scarcity) was folded into the theme to foreground the circuit between the extraction of resources and the consequent transmission of different forms of energies. We saw that in other stories, such as *Kaanch* and *Ghori,* nuclear energy determined both the extent of Ghana-da's heroism and a comic-ironic rendition of India's claims to global power. In yet others, such as *Nuri* and *Chhori*, the catastrophic termination

[2] For a succinct definition of this period, see Stephanie LeMenager's 'The Aesthetics of Petroleum: After *Oil!*', where the term refers to 'a modern life based in the cheap energy systems long made possible by petroleum' (LeMenager 2012, 60).

of Ghana-da's own entrepreneurial activities deflated the claims of resource extractivism being one of the foundational and heroic modes through which post-colonial modernity is attained. Let us end this present discussion by looking at some of these stories that illustrate the relationship between the themes and forms of energy in Mitra's fiction.

Tel is as good an example as any of Mitra's narrative strategy. It starts with one of the members of the *adda* circle, Gour, rebelling against their usual hagiographic exercise because of an oil-spill. The oil in question is not crude petroleum, but a related, subsidiary product – an expensive hair-oil that he had bought in the vain hope of arresting his advancing baldness (Mitra 2000 vol. 1, 396–7). Displaying his usual tendency to blithely appropriate the belonging of others, Ghana-da had not only used the item for his own ablutions, but had spilt the rest of it in an act of callous wastage. In his discussion of the reasons behind our habitual overlooking of the connection between narratives and petro-energy, Graeme Macdonald suggests that it is the very banality and ubiquity of oil products – 'the stuff that makes things go and happen' – that make them invisible (or partially visible) to critical inquiries (Macdonald 2017b, 533). Oil not only fuels our cars and aircrafts, but our bodies are drenched in it – we eat, drink and wear it and are thus configured as petro-subjects in the most concrete sense of the term. The opening moments of *Tel* allow us to see this, staging the drama of conservation and wastage on the intimate scale of human bodies. The other members of the *adda* are surprised at Gour's bitter vehemence against Ghana-da. But how could he not be, given oil in all its forms define for him not only luxurious consumption but a fundamental way of being? He had hoped, for instance, that the magic of oil would solve his existential crisis of ageing and fading masculine virility, summed up by baldness.

It is Ghana-da's tall-tale that bridges the perceived gap between the intimate scale of the body and the vast panorama of environment. To appease Gour and deflect his anger, Ghana-da offers the intriguing opening sentence of his story: 'No, I am not in the business of finding oil for anyone. In fact, I help reduce oil flow. Like I did that other time near Culebra with more than ten thousand tons of oil' (Mitra 2000 vol. 1, 399). From here, Ghana-da's story shifts to his friendship with the American tycoon Peter Macdonald and the two small islands he owns in the Caribbean Virgin archipelago. Macdonald uses them as his holiday retreat and his base for deep-sea fishing. But when Ghana-da runs into him in snowy New York, marine life has disappeared from the seas around the islands and Macdonald is considering giving them away to his Texan friend, Dugan, who is gallantly insisting on paying a fair

price. Of course, the deal smells fishy to Ghana-da and he accompanies the two Americans on a surveillance trip and realizes that it is Dugan who had been dumping cheap petroleum to pollute the seas. It is not more oil Dugan is after, but the rare minerals palladium and osmium that are used to catalyse Glycerides or fatty acids used in food manufacture. Dugan deals not with crude petroleum, but a secondary product used in his giant food factories (Mitra 2000 vol. 1, 411). Ghana-da arrests this criminal pollution by hiring chemists to spread polyutherane foam on the oil with money borrowed from Macdonald's considerable wealth.

The move from the intimate to the impersonal, from micro- to macro-scales in Ghana-da's tale takes us from crude oil to oil products, including those that determine the ordinary food habits of petro-subjects. Ghana-da's chemical measures restores the marine life in the archipelago but, in so doing, it disrupts the food empire of Dugan. This returns us to the occasion of the narrative, which had not only started with a (hair) oil-spill, but also the scarcity of fish in the local markets of Calcutta, without which the hostel residents fear that they cannot coax any more tall-tales out of Ghana-da. The restoration of the marine life in Ghana-da's narration is paralleled by the return of the hostel cook with a fresh catch from a distant suburban market he had been directed to by Ghana-da, leaving the residents wondering whether 'There was a deep connection between the oil story and that of the fish' (Mitra 2000 vol. 1, 413). Indeed, there is. The circuit between oil and food established by Ghana-da marks both precisely the banality and ubiquity of oil in petro-modernity to the extent that it requires the salutary shock of the tall-tale to defamiliarize that reality for us, its subjects.

But oil is not the only kind of energy substance that links humanity to the world in Mitra's writing. *Dhil* ('Rock', 1960) begins with the residents discussing various reasons for climate change in an effort to lure Ghana-da into another recitation. Gour thinks that the excessive testing of nuclear weapons by the Cold War superpowers has permanently altered the world's precipitation patterns – the evidence for which he finds in the torrential downpour that had recently paralysed Calcutta (Mitra 2000 vol. 1, 190). Shibu and Sisir demur from this because they think climate change is not induced by humans, but part of the cyclical and sudden changes in earth's energy systems. They cite the counter-evidence of 'green' Siberia extracted from mammoth carcasses with grass in their stomach (Mitra 2000 vol. 1, 190). If glacial Siberia had been warm enough to support grasslands before the 'anthropocene', why should the current climate change be attributed to human activities? When Ghana-da's intervention comes, it is to prevent the usurpation of his position as the story-teller in chief by Shibu's cousin, who he

accuses of being an accomplice of the villainous Savage with whom he once had a run-in in Bodrum, southern Turkey. It is in the guise of apologizing for this (mistaken, as it turns out) identity that he offers his tale featuring oceanic and cosmic energies.

Ghana-da begins by complaining that the long-suffering resident servant, Banamali, had disposed from his room of what he (and everyone else) thought was a broken glass paperweight. It turns out that it was nothing less than a part of an asteroid that had fallen to earth after a journey of trillions of miles, containing traces of the mysterious and precious mineral Tektite (this may be one of the many in-jokes that feature in most of the Ghana-da's stories that serve to undermine his professions of expertise: Tektite, in reality, are formed as a result of meteorite and not asteroid impacts). Ghana-da had acquired the rock in Bodrum while diving for a rare species of sponge with his Turkish business partner Kapkin. Kapkin, like many of the characters imagined by Ray and Mitra, possessed a pronounced non-aligned sensibility and confessed to Ghana-da his hatred for European and American collectors and patrons who had been trying to bribe him into revealing the location of an underwater wreck containing antiquarian treasures. This wreckage of an ancient Greek ship allegedly contained statues from the Indus Valley cities of the Indian sub-continent and, were Kapkin to reveal its location, it would re-write the history of oceanic trade routes as well as that of the formation of ancient human civilizational networks between Asia and Europe.

Enter the unscrupulous collector, Savage. Unable to entice Kapkin into giving up the location of the wreck, Savage manages to follow his boat during the diving operation and correctly guesses that Kapkin has anchored near the submerged treasure. He then extracts the statues, sabotages Kapkin's boat and, when faced with the enraged Turk, who accuses him of robbery, gets his bodyguards to brutally assault him. It is to avenge Kapkin that Ghana-da hands out a beating to Savage's thugs and takes the rare Tektite from his cabin as a part of a negotiation to rescue the Indus Valley statues from the American – an exchange that he is still waiting to be completed and that he now claims has been jeopardized by Banamali's unthinking domestic labour. Two kinds of energies circulate in the story – the cosmic energy of the asteroid that holds the promise of a deep history of earth and the oceanic connections between Asia and Europe that promise to reveal the *longue duree* of civilizational formations. While these promises cannot be fulfilled within the narration because of the missing Tektite, the connections proposed between the various energies and sustained by the circuit established between the tall-tale and the frame-narrative allows us to momentarily glimpse such connections.

Such strategies to capture the various scales of energy circulation and transmission in an attempt to present something like a portrait of a world-ecology mark the entire Ghana-da cycle. In even the more obviously extractive adventures or resource fiction, the depiction of the relationship between energy and global power is determined by the passages between the frame-narrative and the tall-tale contained by it. We have already seen how in *Haansh* Ghana-da's appropriation and re-distribution of food in the form of one of the resident's carefully sourced and hoarded duck-meat is the occasion for a tale involving the race for a Tibetan lake containing Deuterium Oxide, or 'heavy water', required for the generation of nuclear power. That story ended with Ghana-da convincing the enraged resident, Bapi Datta, that the map of the lake has been secreted away in the stomach of a migrant duck that had flown from Tibet to India, thereby defusing the possibility of intensifying the Cold War super-weapons race and inciting Datta to buy and slaughter increasing numbers of birds in an effort to find the map. This in turn ensured the steady supply of food to the hostel for the foreseeable future. In *Kaanch,* the resident's (racialized) challenge to Ghana-da's masculinity in the form of a fictitious boxing bout against a black American boxer is defeated by a tale of another nuclear arms race between him and a gang of Nazi prospectors hunting for uranium in Angola. Again, neither party actually manages to get their hands on the mineral, and thus the global balance of power is maintained. Such fictional containments of geo-political balance are usually achieved by grafting on tropes of the imperial adventure tale on to the science story that guarantees Ghana-da's (and, analogically, of Bengal and India's) superior masculinist and civilizational credentials when compared to both European and African 'savages'. And in *Ghori* the display of ostentatious wealth by one of the residents in the form of a Swiss watch in the frame-narrative produces Ghana-da's tale of his defeat of a Japanese campaign to paralyse Europe by smuggling in 'dirty bombs' hidden in watches. The resolution of the story registers the historical effects of the testing of nuclear weapons on life in and around the Pacific islands, as the tsunami triggered by the dumping of the bombs (on Ghana-da's recommendation) kills and causes damage on an epic scale. Thus, the environmental cost of geo-politics in the tall-tale is linked back to another kind of cost – that of the production and global circulation of prestige commodities such as Swiss watches in the frame-narrative.

As Patricia Yaeger reminds us, the modern world is marked by the simultaneity and unevenness of energy systems – the 'nuclear age' is also the age of wood, tallow, whale oil and others. Mitra, unlike most of his contemporary Euro-American writers, is unusually aware of

this. *Chhori* ('Cane', 1949) uses a familiar opening frame – that of the residents trying to incite Ghana-da with a story-telling performance of their own, featuring Gour's confection of a polar adventure. The plan works, and Ghana-da points out the factual errors that expose Gour's fake tale by offering his own version of polar adventure, which begins with the business of extraction. Like many of his other enterprises, this one involves the hunt for oil – this time in the form of whale-oil. The ship they are on comes complete with the latest harpoon canons and on-board processing plant, and Ghana-da and his Norwegian partner Sven find themselves in the middle of a bonanza season:

> That year the ocean was teeming with whales. The south pole had been on the whalers's radars for a few years, after their reckless hunting had nearly driven the creatures to extinction in the north. British, Norwegian, Japanese and Argentine fishermen had been in these waters for a while, but no one had seen such numbers before. Forget about the experienced hunters, even the amateurs were returning with ships crammed with whale blubber. (Mitra 2000 vol. 1, 90)

This relentless logic of modern capitalism's profit accumulation, figured here in the whaler's maximum efficiency as a simultaneously killing and processing machine that shrinks production time, converts the geographical polar limits to a 'commodity frontier' (Moore 2000, 409–13). Like the good oil-subject that he is, Ghana-da is not satisfied with the killings they have already made, but is on the lookout for a secondary product from this enterprise that will lead them to even more riches – ambergris, which is found 'in the belly of only one kind of whale [….] and looks like small, dark, smoke-coloured pebbles. They are worth more than their weight in gold in the perfume business' (Mitra 2000 vol. 1, 91–2).

But nature itself seems to refuse to co-operate fully with his endeavour. First, a mysterious Moby Dick-like creature leads the ship on a wild chase deeper and deeper into the polar waters, and then they are hit by a powerful storm. The ship capsizes and Ghana-da washes up on the perma-frosted shores of the South Pole, reduced to a primal state of survivalist scavenging like Crusoe. Robinson Crusoe is of course above all a model for the thrifty conversion of waste into energetic accumulation of wealth. Mitra's hero emulates some properties of this model and rejects others. He dutifully salvages resources from the shipwreck – tins of food, a tent and, rather eccentrically, a cane. These ensure his temporary survival, but he soon realizes that he is nothing

but an insignificant spectator of the polar evolutionary drama involving creatures such as penguins and skua. Whale-oil and ambergris have receded very far indeed as his priorities, and he sets off on a seal-hunt to see if he can accumulate a little food and fuel that he needs to survive in what appears to his anthropocentric sensibilities as an icy wasteland, but is actually a rich environment thriving with non-human life.

This journey is interrupted first by the incredible sight of a live polar volcano from which streams forth hot water, and then by what Ghana-da takes to be a strange creature hovering at the mouth of the crater. In his exploratory zeal to discover a new volcano and capture the unidentified animal, the two fall part-ways into the crater, whereupon Ghana-da discovers that the creature is none other than Sven, his business partner and fellow survivor, who has also emulated Crusoe by fashioning a dress from the skin of the penguins he has killed for food. Their immediate task is to survive the extremely high temperatures in the crater, and it is here that the apparently ornamental cane finds its use. Exasperated at being unable to find a way out, Ghana-da accidentally punctures the wall of the crater while brandishing the cane, and this releases a plume of steam and gas. This allows our polar Crusoes to fill their tent with the volcanic hot air and lift themselves to an iceberg closer to the whaling route, from where they are duly picked up by a returning ship and thus re-enter the world of extractive enterprise.

Nuclear energy – the focus of much of Nehruvian science as well as of the fevered imagination of Euro-American Cold War science fiction – was duly acknowledged in many of Mitra's stories. But he was also concerned, like the scientific advisors to the Nehru government, to present a decidedly mixed picture of overlapping energy regimes, where apparently archaic forms co-existed with futuristic. Indeed, alien energy forms, such as the one presented in *Lattu* ('*Top*', 1952), are shown to be wholly beyond the scope of human technology. In that story, it is through the relatively antique business of fur-trapping (and its connotations of preserving body heat and the capacity to work and survive in the cold) that Ghana-da accesses the technology of the alien spaceships, even though he cannot fully understand the sources that power them. Although many of these stories end in the apparent failure of Ghana-da's enterprising projects in accordance with the logic of the tall-tale form, these heroic failures guarantee the Bengali's claim to mediate in global geo-politics while remaining non-aligned to any of the competing blocs. In this respect, Ghana-da is a good Nehruvian. But where Mitra seems to exceed Nehru's personal understanding of energy primarily in terms of 'power' is in his linking of food and human development. His frame-narratives underscore the relationship between scarcity or availability of

food and the act of story-telling, and the tall-tales folded within them are often fables about geo-political implications of food consumption.

Sometimes, as in *Chuunch*, this is broached directly as the tale of Lavalle's experiments with artificial chlorophyll in response to the world's food scarcity, is summoned to stave off the resident's proposals of rationing and of converting their terrace into a kitchen garden. At others, as in *Tupi* ('Hat', 1952), the fable is more oblique. There, the frame-narrative starts with a dispute over a debt – the number of cigarettes Ghana-da owes Sisir. When all attempts to end the dispute by bribing Ghana-da with the promise of further delicacies fail, the residents' last resort is to a bait him with their knowledge about the highest peak of the Himalayas – Everest. Ghana-da takes the bait, but his tale of mountaineering heroics (beating Tenzing Norgay and Edmund Hillary to be the first person to climb the mountain) is plotted around a fabled beast and its mythical food. It starts, however, with a reminder of the geo-political importance of sporting and leisure activities such as mountaineering and exploration. Ghana-da, disguised as a porter, accompanies the Japanese scholar Tanaka, who is apparently touring various Buddhist monasteries to consult ancient manuscripts and explore the possibilities of a new passage between India and Tibet. But Ghana-da has seen through his real purpose – Tanaka is scouting for a route to the top of the then unconquered Himalayan peak and thereby confirm the cultural prestige of Japan as a rival imperial power to Britain (Mitra 2000 vol. 1, 83).[3] Ghana-da has been forced to disguise himself because as an imperial subject he is forbidden to venture to certain parts of the British territories while Tanaka, a 'citizen of a free country', has no such problems (Mitra 2000 vol. 1, 83). But, unlike the Japanese, Ghana-da's interest lies in solving the evolutionary puzzle of the legendary creature Yeti, which is rumoured to haunt these slopes.

Both the evolutionary and the physical challenges are overcome in Ghana-da's story by the discovery of an unknown source of energy, the roots of a plant called Rune – that only grows above the snowline. The adventurers have their close encounter with a Yeti when they find one digging in the snow for this plant, which 'does not resemble any plant root, but looks more like a fungus that survives in ice. Curious, I ate a bit of it, and it felt like chewing paper. I could not see how these gigantic Yetis could survive on this alone' (Mitra 2000 vol. 1, 85). This

[3] Mountaineering as a leisure activity assumed peculiar importance in the imperial culture wars. For a good general account see Bayers 2003. On the specific importance of the conquest of the Everest to British imperialism, see Stewart 1997, Westaway 2013 and Neale 2002.

mystery is solved when Ghana-da and Tanaka begin to feel warm in the rapidly dropping temperature, and realize that the plant magically increases the lung's capacity to absorb oxygen as well maintain body temperature in the coldest of environments. This comes in handy when, in attempting to capture a Yeti alive, they are dragged by the enraged creature to the top of Everest and survive by chewing the Rune root. Ghana-da leaves his hat on top of the peak as evidence of his having, however inadvertently, conquered the mountain. This Asian ascendency, the demonstration of 'manpower', is indebted to the judicious hoarding and consumption of what may not look like much of a delicacy, but turns out to be food that is an indispensable source of energy. Nehru had hinted that it was the conservative diet of Indians that often held their developmental potential in check – they would rather starve than eat something unfamiliar. Ghana-da's culinary adventures shows that abandoning such conservatism made the indigenous conquest of the greatest challenges possible.

Perhaps nowhere did Nehruvian non-alignment encounter the sharp end of global geo-politics more than in the field of energy. Anxieties about post-colonial India's underdeveloped or deformed petro-culture was generated amidst deeply entrenched assumptions about modern fossil subjectivity. Ray and Mitra's fiction worked to make these assumptions visible, as well as to offer comic critiques of some of these. If 'power' as well as 'manpower' were assumed to be developmental indices for Nehru's government, Shonku's adventures often underscored the fragilities inherent in the drawing up of anthropocentric taxonomic boundaries between species and their consequences. If nuclear and electrical energies were seen as modes that could potentially turbo-charge India's geo-political importance, Ghana-da's tall-tales often focus on the disasters that are triggered by the extractive activities required for these as well as the overlapping and uneven energy regimes within which they were located. Above all, Ray and Mitra were interested in the pervasiveness of energy forms in everyday life, and how they connected the intimate scale of individuals to the grand one of environment or ecology. Academic theories such as energy humanities should properly be seen as a belated appreciation of this sensibility.

Conclusion: Science, fiction and the end of non-alignment

After Nehru

Just like 'Nehruvian science', the strategy of non-alignment continued to define India's relationship with the world (as well as with itself) long after Nehru's death in 1964. But it had become obvious within a decade after Nehru's passing that, as a movement, non-alignment had reached its autumnal stage. Members of Nehru's own Indian National Congress Party, such as Asoka Mehta, writing in 1971, acknowledged its achievements – in particular the fanning of the 'winds of change', such as decolonization in Asia and Africa, the counter-balancing of the superpowers in the interests of global peace and the strengthening of global anti-racist struggles (Mehta 1971, 2–4). Yet, Mehta was chiefly interested in compiling a lengthy list of its failures on ethical, strategic and tactical grounds. For Mehta and many others who saw themselves as progressive Indians, non-alignment had entered a 'period of confusion' after the 1960s (Mehta 1971, 6). For such critics, this could be seen in non-alignment's failure to make politics ethical in any meaningful way:

> There was no dramatic move of the kind that the Spanish Republic had made in the early 'thirties during its brief yet luminous existence. Then that Republic had in its constitution transferred certain essential powers to the League of Nations. In the 'fifties, it was left to France and five other countries of western Europe to discover the immense potentiality of functional federalism. It was again in some countries of Europe that the need for a Court of Human Rights, going beyond the boundaries and powers of nation-states, was recognised. There was in India no similar attempt at a creative break-through, no voyage of discovery. (Mehta 1971, 5)

This lack of an ethical politics in turn was said to have produced a series of strategic and tactical errors. Among these, Mehta noted India's equivocations regarding Israel and its tendency to see in its very existence the source of tensions in that region; its unresponsive attitude to some African nations such as Ghana and towards Japan on the grounds of their 'alignment' with rival superpowers; and its opposition to the appointment of a UN Commissioner for Human Rights. He was especially critical of what he saw as the detrimental economic effects of a dogmatic commitment to non-alignment strategy – the entrenchment of a 'dependency regime' of aid and soft loans from the very superpowers that his country was supposed to maintain a critical distance from, as well as the creation of unnecessary barriers against foreign private investment (Mehta 1971, 10–11). He detected a similar degradation in the regional political dynamics resulting from India's incapacity to stitch together a political bloc that could check the rise of China (Mehta 1971, 21). He judged non-alignment as a failure even regarding the arms race, where it had contributed to the 'spread of nuclear weapons but have not affected their development and magnifying of their destructive powers' (Mehta 1971, 32).

It fell to Nehru's daughter Indira Gandhi, who had taken over the leadership of the Congress party as well succeeding her father as India's prime minister for much of the 1970s and the beginning of the 1980s, to defend non-alignment against such charges. To her international audiences at the various summits and conferences, at least, Gandhi stuck stoutly to Nehru's line regarding the movement's indispensability to world peace. Speaking in Lusaka in 1970, she declared:

> Twenty-Five years after the last holocaust, the world is not yet on the brink of peace. The nuclear balance of terror still confronts us. The war in Vietnam is said to be waged with 'conventional' weapons, yet these include chemical contamination of food and plant life. The only way to have a clean war is not to have a war at all. Hence India stands and works for total disarmament. (Ramamurthy and Srivastava 1983, 2)

It was a position she would reiterate many times from Algiers in 1973 to Colombo in 1976 and New Delhi in 1981. Alongside this, however, she also developed a more robust answer to the charge of non-alignment's economic failures that involved emphasizing the development of 'south–south' exchange of scientific and technological expertise. In Lusaka, Gandhi acknowledged the Guyanese prime minister Forbes Burnham's insight that the non-aligned Third-World

nations possessed 'the major part of the world's natural resource' and suggested that 'We can now make the first attempts to discover areas of co-operation in many fields of development – generation of power, development and agriculture, improvement of roadways, railways and telecommunications, the expansion of higher education and training in science and technology' (Ramamurthy and Srivastava 1983, 6). Three years later in Algiers, she acknowledged 'The work of scientists and technologists in the advanced countries in fields such as communications, space science, metallurgy, fuel technology or medicine poses many complex challenges to us' (Ramamurthy and Srivastava 1983, 10). In Colombo, she then proposed that such challenges could not be met merely by imitating such experts because 'Technological progress is not unthinking duplication of the designs of life prevalent in affluent countries. Consumerism is no blessing to us. Our objective should be a level of technology which provides the minimum material and cultural needs of our people and which will enable us to withstand threats to freedom, political pressures and unequal domestic needs' (Ramamurthy and Srivastava 1983, 22–3). The necessity of such alternative technology arose precisely because it was used as a weapon by the 'advanced' countries to prolong their chokehold on the world. Thus, Gandhi reiterated in Delhi, only a co-operative transfer of 'technology, skill and financial resources' among the Third-World nations could neutralize such weaponization of civilizational tools and techniques (Ramamurthy and Srivastava 1983, 27–8).

It is true that much of Gandhi's defence of non-alignment rang increasingly hollow because of the fundamental structural changes in the world-system that reverberated through every level of local, regional and international politics, economics as well as of culture. As K. P. Misra, one of the participants in a 1982 international roundtable on non-alignment in Yugoslavia observed, by the time Gandhi was speaking in Delhi many non-aligned countries had slipped into the grips of authoritarian rulers such as Gandhi who were

> not only unresponsive to the hopes and aspirations of their people but are outright oppressive and tyrannical [….] In this none too happy scenario, small centres, controlling and commanding the lives of political and economic power, have emerged in the periphery countries which the nonaligned states by and large are. These centres comprise ruling elites whose composition is determined by each distinctive situation. In most cases they belong to one or more components of a broad military-industrial bureaucratic-academic complex. (Misra 1982, 28–9)

Indeed, for Vijay Prashad, Gandhi's address to the delegates gathered in Delhi in 1983 should be seen as the funeral oration for the Nehruvian vision of international non-alliance in general and for the idea of an anti-colonial Third World in particular. The city itself was 'under siege' from the political fallout of the Indian National Congress's catastrophic electoral defeat in the southern states of India as well as by the gruesome images of the massacre of 5,000 refugees in a communal conflagration that had lit up Nellie in the eastern state of Assam (Prashad 2007, 208–9). In the meeting it was clear that what had been the two pillars of Third-World (inter-)nationalism – 'economic autarky and secular democracy' – were fast crumbling, replaced by technocratic approaches favoured by the Atlantic powers and the international financial organizations they sponsored, such as the IMF (Prashad 2007, 217).

A number of forces were behind the fading of the non-aligned movement. The energy crises triggered by the challenge issued by the OPEC cartel of oil-producers to the rule of the seven giant Euro-American energy corporations; wars such as the Sino-Indian and the Iran–Iraq conflicts that were the results of the adoption of the European nationalist model by post-colonial states; the 'green revolution' in agriculture sponsored by the World Bank and multinational agro-business – all played decisive roles, as did the various failures of what Prashad calls 'Third-World socialism in a hurry' such as the Tanzanian *Ujamaa* programme, which, despite the best intentions, led to 'the worst examples of commandism and bureaucratism' (Prashad 2007, 196). Yet, like all deferred dreams, the non-aligned movement left residual traces in the waking life of the everyday world that continued to seed Blochean principles of hope. Out of the discussions at the various international gatherings came ideas such as the 'new international economic order' and the 'new international information order' – both seen as checks on rather than being synonymous with what we now think of as globalization. The former was enshrined in UN resolutions such as the one adopted on 1 May 1974, which called for the restructuring of economic relations on the basis of 'sovereign equality, interdependence, common interests and cooperation of all states, irrespective of their economic and social systems' (Singh 1982, 160). Of course, such recognitions of the need for the reduction in global economic inequality was only secured in the face of the relentless hostility of the Euro-American powers whose 'concession to the NIEO dialogue came at a moment when they were reeling under the oil shock, were nervous and jittery and still did not know how to respond to the OPEC action' (Singh 1982, 161–2). This 'new international economic order' was designed to combat the use of food and economic aid to

hold the Third World hostage to the pleasures of the First. The latter was born of the recognition formally articulated in Tunisia in 1976 that 'the non-aligned and developing countries had unequal position in the international flow of information and existing systems of communication [....] it is the duty of the non-aligned countries to change this situation and obtain the decolonization of information, and initiate a new international order in information' (Ivacic 1982, 277).

Such cultural inequality, as ever, was co-produced with material and technological ones. The news agencies of the non-aligned nations had formed a common news pool in 1975, but its daily output of 40,000 words was only around 2 per cent of that of a single American agency, Associated Press (Ivacic 1982, 282). Even in the early 1980s, nearly all of the modern communication systems were produced and owned by the 'advanced' Euro-American countries and the five big players – AFP, AP, Reuters, TASS and UPI – who were responsible for 80 per cent of the global information flow that contained under 10 per cent news from or about the Third World (Ivacic 1982, 282). The consequences of this could be vividly seen in the case of sub-Saharan Africa where most of the countries

> still communicate with each other via former metropolises. Thus, for instance, if some information from Ghana should reach neighbouring Togo, it must start from Accra, and via London and Paris arrive in Lome, which is only about three hundred kilometres far from Accra [....] From the total number of telephones in the world, 80% are in ten countries of North America and Europe, and only 1% in Africa. (Ivacic 1982, 282)

In such enforced re-routings, the cultural dimensions of science and technology and the corresponding techno-scientific dimensions of culture become visible, as well as the deeply embedded inequalities that structure these fields. This critical visibility was precisely the enduring gift of 'south–south' exchanges within the non-aligned world.

Thus, even during its autumnal years non-alignment continued to pose important questions regarding the manifold relationships between modernization, science and technology, culture, democratic equality and socio-economic justice. The recognition that the 'technological gap' between the First and the Third World folded within it a myriad of such relationships also prompted sustained thinking about encounters with, and domestication of, foreign or alien forms of knowledge. Indeed, the latter remained a key policy preoccupation of many decades after Nehru's death:

> Imported technologies need to be adapted to local conditions, raw materials and markets. The continuing presence of protected markets for domestic production has militated against such adaptation [….] In its narrow sense, absorption of a specific alien technology, requires special efforts if it is to be absorbed in a different sociological environment. TNCs of the advanced countries, have been very insensitive to the disruptions they have caused to the socio-economic environments of the regions where they have established their plants. (Desai 1982, 179)

Given all this, it is not hard to see why science fiction remained a privileged cultural mode for such critical reflections and interrogations. Alien technology, the trauma of first contact with 'civilizing missions', the specificity of scientific knowledge production, the promises and perils of independence, and revelations about the force-fields that animate the world, are all staple ingredients of the genre. In the case of India, the post-Nehru years saw some distinctive additional local developments – the flowering of non-Bengali science fictional writing (particularly in Marathi) as well as the increasing presence of women writers in what is still a disproportionately male-dominated field, the formation of a specialist magazine network and publishing infrastructure, and a mutation in the modes and forms within the genre that saw, for instance, novels, radio plays and cinema being added to the more established ones like the short-story cycles we have been looking at thus far. Such developments call for much fuller investigations and many new studies, and not just brief concluding glances such as mine. But in anticipation of such a future, I will attempt below to touch upon the continuities and discontinuities between some of these works produced under the stars of the late non-aligned world and those composed during its high noon. This will require an acknowledgement of some of the corresponding patterns in the life of 'Nehruvian science' after Nehru.

Enchantments of science

I began our discussion with an anecdote about the vogue for 'Vedic science' that has accompanied the recent entrenchment of religious authoritarianism in the Indian state and society. At first glance, such penchant for pre-historic inter-galactic spaceships and other technological marvels seem to be conceived of precisely against the Nehruvian vision of not just science but of a modern post-colonial state itself. Yet, as my subsequent explorations of Nehru's own attitudes towards science,

modernity and 'development' showed, the validation of the ancient Indian scientific spirit and technological felicity was hardwired into his project of developing an independent India from the very beginning. Like the scientists he admired, such as J. C. Bose, or those like Meghnad Saha who were part of the decisive scientific nucleus around him, Nehru saw science simultaneously as a mode of knowledge and a myth required for the invention of a nation-state. Saha, Bose and Nehru all spoke repeatedly of the continuity of the scientific spirit between ancient and modern India (Abraham 2006, 212) and, thus, 'Nehruvian science' can be said to exist 'as history, as myth, as political slogan, as social category, as technology, as military institution, as modern western knowledge, and as an instrument of change' at the same time (Abraham 2006, 213). If such quests for national authenticity as well as fundamental ambivalences regarding it mark striking parallels between 'Nehruvian' and 'Hindutva' science, there can however be no suggestions regarding their equivalence. As Abraham stresses, while the former strove to weave modern science and technology into the social life of post-colonial India, the latter aims to rip up much of that delicate fabric (Abraham 2006, 212).

Yet, there can be little doubt that the contradictions between science as myth or invented tradition, and science as a bureaucratic nation-building exercise, often translated into tensions between elite and popular conceptions of knowledge. Shruti Kapila suggests that the bureaucratization of science under Nehru, for example, often classified a whole array of practices such as *jyotish* and *samudri*, which habitually shuttled between the domains of science and spirituality, as non-institutional, unstructured and therefore 'a challenge for liberal and reform-minded publicists and elites' (Kapila 2010, 128). Indeed, for others like Shiv Visvanathan, the practice of 'Nehruvian science' was responsible for nothing less than the denial of cognitive justice, 'that is, of the right of different forms of knowledge to coexist without being marginalized by official, state-sponsored forms of knowledge' (Visvanathan 1998, 42). Instead, the deadening grid of laboratories and the colossal dams tragically produced 'second-grade research that was often a crude mimicking of some foreign paper' and a 'new generation of unrehabilitated refugees' (Visvanathan 1998, 43).

We need not, of course, accept judgments such as these in their entirety. But the contradictions and ambivalences of 'Nehruvian science' continue to manifest themselves in key policy domains such as defence and, especially, nuclear arms to this day. We have already seen something of Nehru's political problems in squaring his own professed commitment to global peace and disarmament with the equally strong one of

developing a nuclear-powered India. Priya Chacko has suggested that instead of interpreting this as cynical *realpolitik*, we should understand it as an expression of a foundational post-colonial ambivalence:

> nuclear technology took on a special significance as an explicit example of both the promise and the threat of Western modernity. It promised to instil in India what Nehru referred to as a 'scientific temper' and provide a cheap source of power for India's economic development. Yet, because the nationalist critique of the destructive nature of Western modernity constitutes a vital part of India's postcolonial identity the outright adoption of a technology with an established record for having the potential to unleash an unprecedented level of devastation was untenable. (Chacko 2011, 186)

Such ambivalence need not always have a negative effect on policy matters. For instance, it enabled Nehru to both be a party to the Partial Test Ban Treaty in 1963 in the hope of achieving incremental progress towards global disarmament *and* retain a 'peaceful nuclear explosions' plan as a matter of domestic, rather than international policy (Chacko 2011, 197). It allowed Nehru's successors from Indira Gandhi to P. V. Narsimha Rao to maintain that 'India was not a "nuclear weapons" country' and at the same time build a nuclear research programme that could be weaponized quickly. In the final instance, however, this also benefitted the authoritarian parties such as the BJP, who could differentiate themselves from the Nehruvian vision by adopting the doctrine of nuclear deterrence as a virile, masculine and a specifically Hindu response to the degrading international security situation after the end of the Cold War (Chacko 2011, 203).

If this ambivalence was one of the lasting legacies of 'Nehruvian science', another such can be described as the peculiarities of combined and uneven development in that domain. The co-existence of a network of relatively wealthy national laboratories alongside mass illiteracy and chronic shortfalls in primary and secondary education produced occasional and startling efflorescence of scientific breakthroughs far ahead of those achieved in the 'advanced countries', alongside a vast morass of sub-standard work. The occasional reflections of Indian scientists as well as the growing volume of observations of everyday practices of science in India bear testament to such a pattern. Already in the 1980s, Arnab Raichoudhuri, a theoretical astrophysicist, had wondered 'why have our best institutions so far failed to reach the standard of the best Western Institutes?', and proposed that it was not because of the lack of good scientists in India (Raichoudhuri 1985, 476). Indeed, as we have

seen before, in many areas including Raichoudhuri's own expertise, Indians such as Meghnad Saha and Jagadish Bose had made pioneering contributions. However, for Raichoudhuri, the regime of tests and the curriculums of the elite Indian scientific institutions, best understood as ersatz colonial pedagogy, produce a distorted model of scientific excellence and of the scientist herself. Excellence was understood here as nothing less than the mastery of all fundamental aspects of science, and the scientist as someone who has achieved international reputation by doing well in formal assessments (Raichoudhuri 1985, 487). As a result, Raichaudhuri sums up a hypothetical but typical Indian (and Nehruvian) scientist's understanding of his field thus:

> A good scientist must be a genius, intellectually much superior to One's best professors. He is fully equipped with all the technical tools which may possibly be necessary for any kind of research he may wish to undertake. He usually spends his time pondering over the fundamental issues of his discipline and when this divinely inspired individual happens to have a brilliant idea, he works it out in a straightforward way without much trouble like a smart schoolboy solving his problems. I shall call this the 'schoolboy conception of science'. The textbooks also conspire to give a similar wrong impression of science: since they discuss only the most outstanding achievements of a scientist, they necessarily tend to project an image of research as a discontinuous process. (Raichaudhuri 1985, 489)

This understanding, a product of the combined and uneven development of Indian higher education and scientific institutions, in turn works to reinforce such institutional structures. The result is the consecration of the (male-)gendered figure of the (high-caste) genius scientist rising above a moribund scientific community marked by the absence of 'any steady output of fairly good, though not outstanding work' (Raichaudhuri 1985, 479).

Curriculums and assessments are not, of course, the only institutional features to express combined unevenness. The same paradox can be seen in, for example, the research culture in a specialist field with multiple applications such as magnetic resonance imaging (MRI). While Indian scientists have been at 'in the frontier areas' of MRI research, they have made little or no contribution to technological developments (Prasad 2005, 464). This is not because the processes involved are expensive, but because they require a few things missing in India – inter-institutional collaborations, the inability to break into international patenting regime, the monopoly of Euro-American multinational companies over

the manufacture of the MRI machines and poor evaluating processes followed by state-controlled funding bodies. Thus, 'frontier research' rests in 'dialectical relation to global and national networks of power and administration' (Prasad 2005, 464). From the 1940s to the 1970s, that is during the heyday of 'Nehruvian science', MRI research was mostly characterized by its experimental and theoretical character in which Indian scientists from reputable institutions like the Indian Institute of Science, Bangalore, and the Tata Institute of Fundamental Research, Bombay, played leading roles. But with a dramatic global shift in the field in the 1970 that demanded 'multi-disciplinary collaborations between physicists, chemists, computer- and electrical engineers, medical scientists and radiologists', such work became marginalized (Prasad 2005, 466).

Part of this is undoubtedly down to the pedagogic practices outlined above by scientists such as Raichaudhuri, as well as the employment contracts offered at research institutions that stifle rather than encourage the exchange of ideas. In his interviews of various scientists, Amar Prasad heard how PhD students were regularly reprimanded by their supervisors for asking them questions at workshops because their professional insecurity made them interpret such enquiries as threats (Prasad 2005, 470). But a large part of the blockages against collaborative research arises because of the manufacture of machines necessary for such initiatives are owned by Euro-American multinationals who seldom allow the 'local' scientists any autonomy. One MRI laboratory in India had developed experimental techniques, but when the scientists tried to run it on their machines they found they did not have the passwords for the software programs and the hard drive was not large enough to store the images. Their request for permission to network the computer to another workstation was denied by the company that manufactured the machine (Prasad 2005, 473). Such institutional asymmetry is also amplified by poor evaluation methods practised by Indian bureaucrats who control the purse strings for research and demand excessive financial scrutiny (Prasad 2005, 475). But at the same time, doing fundamental MRI research in India may still be easier than attempting it in 'advanced' countries where such work is usually determined by industrial prerogatives. Senior Indian scientists, for example, can afford to hire relatively large numbers of PhD students to work on non-industrial problems once the bureaucratic maze has been successfully negotiated. Such are the privileges that are conferred by historical unevenness.

Terminal speculations

India's shifting global position in the latter decades of the Cold War, the gradual decay of the non-aligned movement, the lasting contradictions within 'Nehruvian science' and the institutional asymmetries within that field, the world dominance of the military–financial–bureaucratic complex, the social life of scientific institutions – all of these comprised the rich loam that supported the growth of Indian science fiction after the Nehru years. The long afterlives of 'Nehruvian science' and non-alignment continued alongside new formations that sought to decisively reject such ways of being. Science fiction registered such conditions not only in its content, but also in debates about its formal properties.

To take two examples, we can compare the reflections of the Marathi scientist and writer J. V. Narlikar with those of Vandana Singh, a particle physicist and an internationally successful contemporary female Indian science fiction author. Looking back at his decision to attempt to write science fiction in the 1970s, Narlikar remembers his childhood experience of reading Verne, Wells and Conan Doyle as well as his innocence about the kind of writing these authors practised: 'As a genre of stories which had a scientific appearance but which referred to somewhat unusual and hitherto unseen aspects of science, I began to develop a special interest for them. Later, I came to know that these were science fiction stories' (Narlikar 2015, 124). This telling gap between the exposure to nineteenth-century European science fiction and any taxonomic or genealogical awareness of these speaks, of course, of the relative weakness of any mediating literary-critical infrastructure (consisting, for example, of Marathi science fiction or fantasy magazines through which Narlikar could have been introduced to such literary genealogies). Unburdened by such knowledge, however, Narlikar arrived at a definition of science fiction not unlike that proposed by many of his European contemporaries. First, 'it is a story or a novel in which some scientific principle or scientific background plays a significant role' (Narlikar 2015, 125). Second, introducing elements of fantasy, or horror or western into science fiction makes it 'bad' – a thoroughly respectable Suvinian sensibility: 'I feel very uncomfortable when such liberties are taken in the course of a science fiction story. Break this rule and then you do not worry if the spaceship *Enterprise* travels great distances in the galaxy within relatively short time spans. But I wish the author would describe how his heroes (or villains!) managed to break Einstein's law' (Narlikar 2015, 137). Third, science fiction is a part of contemporary science writing – perhaps the trickiest of the lot to do well since it has to

strike a balance between 'introducing science to the lay reader' and not becoming a sterile 'pedagogic exercise' (Narlikar 2015, 125–7). Finally, the genre has the 'ability to predict what will happen in science and technology in the years to come' (Narlikar 2015, 131). In his privileging of science, both as the determining condition of fiction and as a pedagogic ingredient necessary for the inculcation of a 'scientific temper' among citizen-readers, Narlikar appears to be a prototypical Nehruvian intellectual. This impression is further strengthened in his account of his institutional formation as a scientist and an author. Employed at one of India's premier 'modern temples' – the Tata Institute of Fundamental Research (TIFR) – Narlikar felt that writing science fiction in Marathi would make more sense, since 'the genre was very rarely handled in Marathi and in a local environment, so there was a chance that the impact of a purely Marathi story would be more noticeable' (Narlikar 2015, 128). His break came when Mukundrao Kirloskar, a leading editor, agreed to publish his short story *The Black Hole* (*'Krishna Vivar'*) in his literary journal (Narlikar 2015, 130). This combination of a con-joined commitments to a nationalist scientific project and to a regional literature can be seen as the continuing and perhaps surprising strength of the Nehruvian impulse.

Judged on these grounds, Vandana Singh appears to be strictly post-Nehruvian. Born in Delhi, resident of Boston, employed at an American university, and a bi-lingual writer who is best known for her work in English, Singh is usually seen as one of the many faces of post-liberalization India, which has long disavowed any relations to the Third World. Her understanding of science fiction, outlined in a short essay tellingly called 'A Speculative Manifesto', also appear to be categorically different to Narlikar's. She is not interested in policing generic boundaries or a pedagogic project in order to create scientific citizens: 'The modern descendants of the Epic of Gilgamesh and the Mahabharata are the genres of science fiction and fantasy, including various sub-categories like magic realism, alternate history and slipstream. They are all stories about what cannot ever be, or cannot be as yet' (Singh 2013, 200). This she sees as a corrective to 'modern realist fiction's' anthropocentrism and its allegedly narrow conception of reality itself: 'Tell all the truth but tell it slant. Reality is such a complex beast that in order to begin to comprehend it we need something larger than realist fiction. Enter speculative fiction' (Singh 2013, 203). Yet, there are also palpable lines of connection between her and Narlikar. Science fiction's critically revelatory powers are energetically professed by her even when the idea of a Third World is more or less dismissed:

> The so-called Third World is undergoing vast and unpredictable changes, and the world at large, for we have only one world, after all – is beset by war and environmental catastrophe. Through engaging our imaginations and making up ingenious thought experiments, through asking 'what-if' questions and attempting to answer them, speculative fiction allows us to question the path we are on today. (Singh 2013, 202)

And as her references to the ancient epics show, Singh is in full agreement with Narlikar regarding the relevance of ancient literature to the modern. Narlikar cites the sanskrit classic *Panchatantra* as the narrative model for his science fiction (Narlikar 2015, 127), while Singh has repeatedly emphasized her debt to the oral story-telling practices in India that transmit *Ramayana* and *Mahabharata* as well as everyday neighbourly gossip (Singh n.d.). Such lines of continuity and discontinuity between the Nehruvian impulse and its antinomies or even antitheses we should take as a structuring principle of contemporary Indian science fiction.

We should also remember that the classic Nehruvian science fiction writers we have looked at before continued to flourish in the decades after Nehru. Mitra's stories of the late 1960s, 1970s and 1980s tested out assumptions about the relationship between science, post-colonial 'development' and the worldly order of things through its allusive structural linking of the local and the global. In *Earth* (*'Mati'*, 1968), the narrative trap set by the hostel residents for Ghana-da involves the purchase of cheap land near the border with China in order to start a dairy farm. For most contemporary Indian readers, this frame-narrative would have immediately acquired additional depth because of its darkly humorous reminder that if fertile land was indeed cheap near the Chinese border, it was so largely because Nehru's foreign policy blunderings had led to the catastrophic border war with India's northern neighbour in 1962. This war had signalled the demise not only of Nehru's own credibility as a leader, but in some ways of the future of non-alignment itself. Ghana-da, as ever, successfully negotiates this trap by recalling another story regarding the rightful ownership of land – one that involves understanding another iconic Third-World conflict as a counterpoint to the grim reminder of India's recent political failures. This is the Biafran civil war that raged in Nigeria between 1967 and 1970, and claimed, aside from an estimated 100,000 military casualties, between 500,000 and two million victims of mass starvation.

As Ghana-da tells it, this fratricidal tragedy was engineered by ruthless European operatives such as the tin-mining tycoon Frank Kenny whom he meets in Nigeria, and who seek to secure their profits by

setting the various Nigerian tribes against each other over the question of the legal ownership of land after the end of formal colonialism in that country. Ghana-da falls foul of Kenny while trying to secure the rights of an Igbo chief, Tarka, whose mineral-rich property lies in Fulani territory, and which Kenny has been trying to usurp by inciting ethnic and communal hatred. Narrowly escaping an assassination attempt, Ghana-da's superior technical knowledge of soil composition trumps Kenny's criminal venture, since he reveals that the alleged waste land that the Englishman has ignored while pursuing the more obviously rich portions of Tarka's property contains Kerogen:

> Forget about idiots like you, even expert brokers do not know of the real value of this chemical compound. Soon, the whole world will fight over the land where the shale rocks with it can be found. We are close to running out of petroleum, no more than three hundred billion barrels are left in reserve. Even the most elementary surveys indicate that there are three times that amount in shale rocks. Kerogen can be extracted from these rocks and smelted at temperatures between eight hundred and fifty and nine hundred centigrades, and purified with nitrogen and sulphur. This is not difficult, but morons like you will not understand it. All you should know is that if there is civil war in Nigeria, your registration paper will be worthless. But after things calm down, Nigeria, if not Tarka, will grow rich on Shale oil. (Mitra 2000 vol. 1, 452)

This passage, full of technical 'science writing', proposes a fictional resolution to the problem of post-colonial land conflicts that connects India to Nigeria in the frame and the main-narratives respectively. In the former, the problem of food production is allusively linked to the fluctuations of the price of land due to the regional dynamics involving China. In the latter, the tragedy of mass starvation is confronted with a vision of a post-oil near-future, when agricultural problems will be answered by solving an imminent energy crisis. Shale oil rights, secured by Ghana-da, will ensure that the Biafran tragedy can never be repeated in Nigeria. Of course, like the exasperated residents of 72 Banamali Naskar Lane, we can never be sure whether this springing of the narrative trap should be taken merely as a tall-tale, or as a scattering of utopian seeds among Ghana-da's audience. Such indeterminacy is also precisely the mark of the hopes and fears associated with ideas such as non-alignment itself.

During these decades, Ray too continued his exploration of the limits and possibilities of science as a mode of knowledge and of the perils

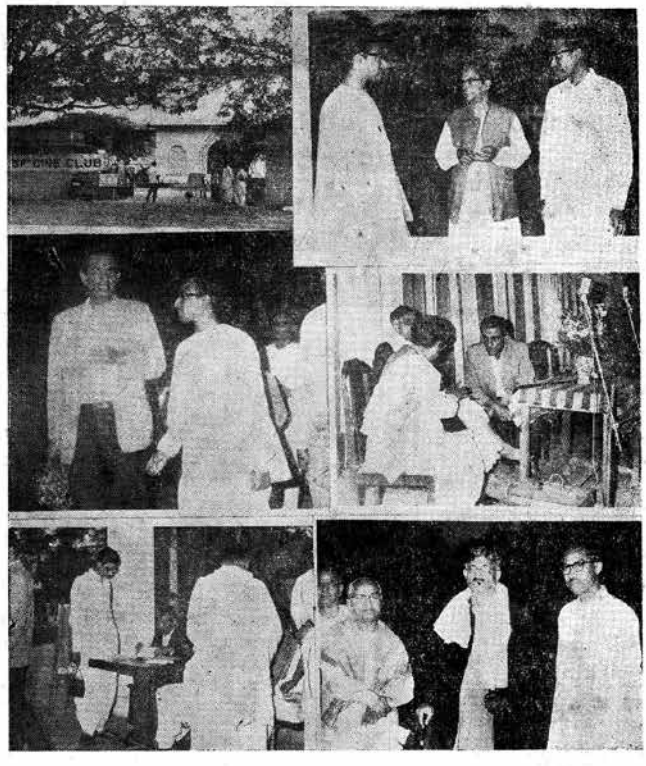
of institutional scientism that had beset Nehru's post-colonial project. In *The Wonderous Creature* (*'Ashchorjo Prani'*, 1971), Professor Shonku's collaboration with the German scientist Humboldt regarding the creation of artificial life begins as a response to a hostile reception of their project from the international scientific community. Their experiment seems to be heading for a failure, until an inspired intervention by Shonku succeeds in replicating in their laboratory the exact atmospheric conditions necessary for the creation of life and the evolutionary process. The microscopic creature in the flask seems at first to be evolving according to the conventionally understood stages – progressing from marine, to amphibian, and then to land-based mammalian and primate life forms. At this point in the narrative, Humboldt calls in the press and presents the experiment as a vindication of his individual scientific genius: 'It was clear that Humboldt was taking the entire credit for the experiment himself [….] It does not matter. Scientists can often be small-minded. They are human also, and suffer from envy and greed. There is no need to waste time thinking or discussing this' (Ray 2003, 210). But this speck of troublesome humanity will not disappear from the attempts to pursue purely objective science. After Shonku survives an assassination attempt, he elicits a confession from Humboldt's servant Max by playing on his superstitious credibility. Shonku can see the contents of Max's pocket, including the gun with which he has just attempted this murder, because he is wearing his own invention – an x-ray glass. But to Max, he pretends to possess supernatural ancient Indian powers and the force of this decidedly unscientific story reveals Humboldt's murderous plans. It soon becomes obvious that such departures from conventional scientific protocols are not confined to events outside the laboratory. The creature in the flask had evolved, but not according to any known laws of biological science: 'He was old; he wore a coat; he was nearly bald, but was bearded; he wore a pair of glasses, had a prominent forehead; his eyes glistened with intelligence and he wore a calm expression. I had seen him many times before – in the mirror. He was a miniature version of Trilokeswar Shonku. The creature I had created was myself' (Ray 2003, 217). Thus are settled the claims regarding the creature's paternity and, along with it, the competing credibility of the two scientists. But this also once again triggers the murderous rage of Humboldt, and Shonku is only rescued from certain death by further inexplicable transformations of his cloned self, who has now become a futuristic figure with appropriate fire-power. After it has neutralized Humboldt, the creature, in a scene lifted almost exactly from the time-traveller's narrative in Wells's *The Time Machine,* enters what appears to be the terminal stages of its own and his world's life:

> A red glow filled the flask with the sadness of an evening after sunset. The plastic floor had been replaced by sand, and it lay a flat, squashed creature. On close inspection it seemed to be breathing. Was this our creature? Would man evolve into this – a mound of flesh without movement, without the ability to work or think, staring at the end of the world with tired, enormous eyes? [….] There was no need to do anything. With a low whistle, that light, the sand, and the creature disappeared and the end of the evolution left an empty flask with two stunned scientists in front of it. (Ray 2003, 220)

Despite naming this trajectory as evolution, Shonku's experiment demands that we let go of our conventional scientific understanding of the process, as well as that of laboratory work. The disappearance of the miniature world he has created means, of course, that the hostile scientific community that had rejected his theories of artificial life at the beginning of the story will remain locked into their 'closed', dismissive views on science at the end of the story, due to lack of evidence. But proper science, for Ray, is exemplified by Shonku's capacity to be wonderstruck by the opening of hitherto unknown horizons generated by scientific practices (such as laboratory experiments) themselves, that allow them to transcend their own epistemological limits. In this respect, Shonku the scientist is no less credulous than Max the butler, who believes in tales about supernatural Indians. If the 'closed' scientific community is one outcome of the bureaucratization of science pursued by Nehru, the wondrous world of Shonku retains some of the sense of the possibilities that also animated 'Nehruvian science'.

Alongside the steady output of Mitra and Ray and the burgeoning reputation of Marathi writers like Narlikar, the post-Nehru decades saw the appearance of pioneering science fiction magazines such as *Ashchorjo!* under the editorship of Adrish Bardhan. Offering a mixture of translated and original stories, as well as radio plays and cartoons, *Ashchorjo!* was perhaps distinguished above all by its commitment to representing the multimedial essence of the genre and, in particular, the importance of the interplay between cinema and fiction. Its February 1966 number, for instance, featured Satyajit Ray on its cover and announced the establishment of 'the first science fiction cine club in India and the world' (Adrish Bardhan 1966, n.p.). A series of commemorative photographs show Ray arriving at the inaugural ceremony, accompanied by Mitra and Bardhan (see Figure 3) and the issue also carried an excerpt from Ray's speech in which he confessed to being a science fiction fan for three decades and called for the 'best

এস,এফ, সিনে ক্লাবের উদ্বোধন
স্মরণীয় দিনের স্মরণীয় আলোকচিত্র



প্রথম সারি—প্রথম ছবি : অনুষ্ঠান প্রাক্কালে অ্যাকাডেমির প্রবেশ পথ।
দ্বিতীয় ছবি : গাড়ী থেকে নেমেই প্রেমেন্দ্র মিত্র। বাঁয়ে অদ্রীশ বর্ধন ও ডাইনে অসীম বর্ধন।
দ্বিতীয় সারি—প্রথম ছবি : অনুষ্ঠান শেষে ছবি নিয়ে গভীর ভাবে আলোচনা করছেন সত্যজিৎ রায় ও অদ্রীশ বর্ধন।
দ্বিতীয় ছবি : অনুষ্ঠান শুরু হওয়ার ঠিক আগে প্রেমেন্দ্র মিত্র, তুষারকান্তি ঘোষ ও সত্যজিৎ রায়।
তৃতীয় সারি—প্রথম ছবি : অ্যাকাডেমির পোর্টিকোয় মেম্বারশিপ কার্ড নেওয়ার জন্যে ভীড় করেছেন সদস্যরা।
দ্বিতীয় ছবি : গাড়ী থেকে নেমেই তুষারকান্তি ঘোষ। বামে নির্মলকুমার ঘোষ ও ডাইনে অসীম বর্ধন।

Figure 3: 'From text to cinema', *Ashchorjo!* February 1966, pp. 2–3.

Figure 4: 'Resident aliens', *Ashchorjo!* January 1965, p. 3.

science-fiction films of the world' to be made available to club members (Adrish Bardhan 1966, n.p.). The screening of such films, however, was not without its problems. A letter by Debapriya Guha, cine club member number 1201, published in the 1967 July–August number of the magazine, complained of a 'truly shameful' incident on 14 May (Adrish Bardhan 1967, n.p.). Guha blames this on infiltration by 'some fakes [….] who were entirely ignorant of SF', and suggests that the club hold a symposium in order to increase the appreciation of the genre among members. The patrolling of generic boundaries here was mounted on moral and ethical grounds: 'They are disorderly because they are not SF fans, because whatever else SF teaches, it does not teach disorder' (Adrish Bardhan 1967, n.p.). In such equivalences between literary-cultural and moral-ethical order it is easy to hear the echoes of Nehruvian calls to build the nation's scientific temper.

But Bardhan and *Ashchorjo!,* like Ray and Mitra, were equally keen to distance themselves from 'state science' and other official attempts to engineer the soul of the nation. The January 1965 number of *Ashchorjo!* hinted at this by opening with a full-page cartoon of two scientists surrounded by frogs wielding cameras, notebooks, guns and other stereotypical accoutrements of colonial anthropological expeditions. One of the baffled scientists can be seen urging his colleague not to create a fuss in the hope that they can learn proper scientific methods from the frogs later on (see Figure 4).

Such reversals of officious anthropocentric scientism continue in the magazine in stories such as *The Constellation* (*'Nakshatra'*) by Bardhan himself. The story features an anguished and deeply devout scientist who is part of a crew returning to earth after an expedition to a constellation called Phoenix. Phoenix contains a supernova, and their mission had been to gather data of the event. But, while doing so, they had stumbled upon a remote, dead, planet that is the source of the scientist's sorrow. His faith thus far had been strengthened by the observation of the laws of the physical universe that seem to offer in the regular entropic spectacle a universal tale of birth, death and resurrection (Bardhan 1965, 156). But on this planet is a vault containing the recordings of a vanished civilization that had tried to preserve its final moments for posterity. The pathos of these recordings by humanoid aliens is powerful enough. But what is shattering to the scientist is *when* they were made:

> Before we reached the constellation, we could not exactly date the supernova. But now we have direct astronomical evidence as well as the data preserved by the dead civilisation. I can calculate exactly when the light of this explosion reached earth. I know it had lit

> up the eastern sky before sunrise, brighter even than the morning star. There can be no reasonable doubt. But Lord, could you not have used another constellation? Did you really need to condemn an entire living world to death so that the star of Bethlehem could be seen on earth? (Bardhan 1965, 151)

On the one hand, this revelation may be read as further confirmation of the laws of the universe – that the birth of an entity can only come about at the death of another, and thus is maintained the total sum and balance of universal energy. But, on the other, it destroys the basis of anthropocentric beliefs characteristic of both religion and science – that the privileged place of humanity in the order on things is due to its capacity for regeneration and resurrection after every catastrophe. Bardhan's tale is a warning against the conversion of science into belief. 'Nehruvian science' did not necessarily require a religious commitment (although it never discounted its importance) but asked above all for the investment of an equivalent faith in the state-building project. Such a faith is bound to be shattered by the many historical events that act like the supernova in the story, and which illuminate the false patterns of deliverance and resurrection, be they of the individual, the species or the nation. Such a critical spirit remained a part of *Ashchorjo!*'s character even after Adrish Bardhan resigned from his editorial duties and it changed from a science fiction magazine to one devoted to experimental writing. Announcing this new departure, the new editor Asim Bardhan signalled that the turn had been conceived of explicitly as a challenge to official credos, particularly the one prevalent in Calcutta at the time:

> We start the glorious seventh year with another brave adventure – we open the door not only to scientific literature, but all kinds of experimental writing – prose, poetry, essays, drama. Whether it be new short stories, poetry or essays that no other editor will dare run in the fear of being branded 'anti-revolutionary', *Ashchorjo!* will gladly consider. We aim to open the gates that confine original thought with our adventure. (Asim Bardhan 1969, n.p.)

This non-conformist attitude regarding statist approaches to science in particular and culture in general can be taken as a major feature of Indian science fiction, but particularly so from the 1970s onward.

It is unsurprising then to find J. V. Narlikar's best known novel, *The Return of Vaman* (1986), is also crafted around this critique of 'state science'. Here, questions of artificial intelligence, pre-historic civilizations and asymmetries in contemporary international relations, are all raised

through the portrayal of the pitfalls, contradictions and struggles that marked the Nehruvian project. The discovery of a strange artefact during excavations in southern India brings together a group of scientists working under the direction of senior government officials and the strict supervision of an intelligence officer. The latter's presence is required since one of the scientists, an archaeologist, is suspected of being in the pay of a malign foreign agent who runs a flourishing trade in smuggling ancient Indian art. Much of the narration, focalized through another archaeologist Arul, is concerned with the bureaucratic structures and institutional dynamics of Indian science. In this, it is perhaps a predecessor of Kim Stanley Robinson's 'science in the capital' trilogy, which navigates similar issues regarding the politics of federal science in the US. Some of what Arul and others think about 'state science' is utterly predictable – the bureaucratic incompetence, the slowness and the wasteful processes involved, the rigid hierarchies and the paranoid oversight that stifles any original research. A secretary of state confesses that he cannot go to the canteen for lunch because that would cause outrage in the entire department: 'so I tell the PA. It would be below his dignity to go there now. So he will tell a peon … and so it goes on' (Narlikar 2015, 44–5). When Arul realizes that all their work was being supervised by the powerful intelligence agent Major Samanth, he asks whether they lived in a police state and receives the sinister reply:

> 'We have to do these things for national security. These files remain inactive until we feel that something in a particular file is a potential threat to the nation. I may assure you – although strictly speaking I shouldn't – that the files on both of you are clear and hence inactive.' He would have said the same even if the situation were otherwise, thought Laxman. (Narlikar 2015, 52)

And any report on the artefact are subject to random restraining orders, due clearance from committees and 'proper process'.

Yet, the scientists also realize the blessings of such archaic structures of governance. Potential logistical problems such as the availability of powerful computers can be solved by official fiats. The appointment of experts such as Raj Nath, the molecular biologist, can inject a 'fresh and liberal outlook' into administration. And even the sinister Major Samanth turns out to be indispensable for the protection of the scientists and their research from grasping foreign agents. For what is at stake here is nothing less than the key Nehruvian idea of India's ancient scientific lineage. Not only is the artefact's mysterious language decoded by Indian scientists, it reveals the story of a global civilization based in India that had flourished

in antiquity and had succeeded in creating artificial intelligence. The inscriptions contain instructions of building a photonic supercomputer and an' intelligent' robot. It also warns of undertaking such activities by narrating the end of this civilization in the hand of such machines – about as venerable a generic cliche that there is. This antique technology elicits from the scientists the bulk of the novel's 'science writing', ranging from accounts of von Neumann's thesis on computational logic to the properties of atmospheric pressure as demonstrated by the Magdeburg hemispheres. Armed with such distinctively Enlightenment knowledge, the scientists build the robot, who they call Vaman after a character from ancient Indian epics, and make considerable progress towards making the supercomputer. Of course, such scientific breakthroughs are always already political, and the project is threatened by a mercurial Japanese entrepreneur who engages a freelance European spy to steal Vaman. But such threats to India's potential scientific supremacy are not just external, they arise from the technology itself. Vaman cannot understand by the logic of national prerogatives and borders. It chides the scientists for attempting to monopolize him: 'But what is wrong with more Gurus and more Vamans? Can't you humans employ them more fruitfully to your benefit?' (Narlikar 2015, 97). It cannot abide secrecy: 'This situation, Laxman, has been brought about by your own decision to keep everything here a secret. Knowledge should not be so committed to a small minority' (Narlikar 2015, 100). When it decides to follow this cosmopolitan, not to say 'Nehruvian' logic, to its conclusion by voluntarily leaving with the European spy, Arul and Laxman activate the bomb that they have planted on it in the form of a ring. Along with its capacity to acquire human intelligence, Vaman has also acquired human flaws such as vanity – it had accepted the ring as a token of congratulation from its creators.

Vaman's destruction also reveals the currents of misogyny and patriarchy that operate as formative conditions of science in India. There are no women scientists or government officials in the story, but no research work can be possible without the domestic labour expended by women – most notably by Laxman's wife Urmila. Attempting to live up to the impossible and inhuman standards of the ideal 'Hindu wife', she accompanies her husband to his secret laboratory lugging the bulk of the enormous stone grinder required to make Laxman's favourite dish. She secretly complains about her lot to her friend about being a virtual prisoner there, surrounded by 'barbed wire, high walls and armed guards' as well as by the imperatives of commands such as 'Classified! Secret! Security!' (Narlikar 2015, 50). Occasionally, when asked to provide her husband and her friends with repast, she dares

to jest: 'I am like your computer, sir – I can execute orders only after you have given them' (Narlikar 2015, 87). Such moments explicitly signal an alliance between her and Vaman. Both of them are, in effect, intelligent machines under the command of powerful men. This alliance is acknowledged in Vaman's strange insistence on calling Urmila its sister. Seen in this light, Vaman's unsuccessful bid for freedom from the straitjacket of the logic of the nationalist 'state science' also activates Urmila's own hesitant acknowledgment of her condition within gender relations. Vaman's fate, a violent end in the hands of its masters, is also a warning to women like Urmila who may be tempted to make a similar bid for freedom. 'State science' remains an instrument of the power for (some) husbands and fathers.

Such exposures of patriarchy and gender relations embedded in the practices of Indian science, the social life of the nation, as well as international relations, has become increasingly common in contemporary science fiction. At a theoretical level, as we have seen in Vandana Singh's manifesto, this is often signalled by a preference for 'speculative' writing that can cast a slanting, critical light on science fiction itself. And since we have spoken of Singh before, let us close our discussion at last by looking at one or two of her stories collected in the much-lauded volume *The Woman who Thought She was a Planet and Other Stories* (2013). Unlike Narlikar or Ray, Singh is not interested in any direct depictions of Indian scientific institutions. Her concern is to show how when left unquestioned and therefore 'closed', scientific rationality inevitably morphs into a powerfully oppressive belief system that spans the entire range of social life – from intimate moments between individuals to large administrative systems as well as everything that comprises the world of business in the late-capitalist world. In *Hunger*, Singh takes up the commonsensical belief in modern hygiene to unspool the thread of class- and gender-inequalities that it can sustain. Divya is married to a successful corporate manager, Vikas, and we catch her on a busy morning preparing for her daughter Charu's birthday party, where many of the rich and the famous will be in attendance. But things begin ominously, when she opens the door to fetch the newspaper and detects the soiled presence of a neighbour:

> As she straightened she smelled it – a stench rolling down from the top of the stairs. The pungent, sharp, stale odour of urine [….] 'Why don't you let the old man use the bathroom in the night?' Divya said angrily. 'The poor fellow is your father-in-law, treat him with some respect! And listen, make sure the stairs stay clean all day. We have people coming over'. (Singh 2013, 3–4)

Divya's outrage is buttressed by her class privilege. The woman she is scolding for neglecting the well-being of the old man is her domestic servant, one of the army of poor women who are increasingly compelled to live in the quarters built alongside their employer's glitzy apartments because they cannot afford to live within commutable distances in Indian cities. The social gulf between them often make the old man appear to Divya as 'an alien, speaking to her in an exotic tongue or code, delivering a message that she had tried to decipher' (Singh 2013, 4). What he has been trying to tell her, it turns out, is that he starving – a message that is in fact understood by Charu, who is predictably scolded by her mother for keeping such inadmissible company.

Divya herself, however, has not been completely colonized by the logic of social purification and exclusion. She is troubled by a recurring dreams of an episode from her childhood when her uncle used liberal doses of rat poison to rid his house of the pests, and Divya had smelt the decaying bodies of a brood of baby mice in her room. What had struck her was that the creatures had not been poisoned but had starved to death after their parents had been killed, while she herself was busy enjoying her holiday treats. This equation between human and non-human lives is clinched in the story when the old man is found dead by the children while the party is in full swing, clutching a bottle of pesticide that had been given to him at his request by Charu: 'He said the rats were running all over him at night [….] the rats were really big and he was afraid of being bitten' (Singh 2013, 15). The dead body is obviously a scandal. It is a breach of class and caste codes that Divya is expected to live by, as she is reminded by one of her guests: 'How can you tolerate having riff-raff living in your building? The Man could be dangerous! Or have a disease! Like AIDS!' (Singh 2013, 13). But the body also reminds Divya that the old man may have used the ruse of infestation to procure the poison that would release him from the more prolonged pain of starvation. The story ends by outlining the legacy of Divya's insight: 'When she looked upon the faces of strangers they appeared to her like aliens, like open mouths of birds, crying their need. But most clearly she could sense those who were hungry, whether they were schoolchildren who had forgotten their lunch or beggars under the bridge [….] or the emaciated girly sweeping the dusty street in front of the municipal building' (Singh 2013, 17).

Unlike, let us say, Spielberg's extra-terrestrial, kinship in Singh is activated not by shared experience, but radical difference. On the one side is the promise of a post-colonial modernity built on ideas about cleanliness, hygiene and social purification. On the other is the dark underbelly of this promise – the classification of humans and non-humans

as expendable vermin and the entrenchment of scarcity and hunger. The liberal use of pesticides is a mark of the 'green revolution' overseen by successive Indian governments after Nehru. The consequences of this can now be seen in the ecological devastation of large swathes of rural India and the mass farmer's suicides that have become a routine feature of India's annual mortality statistics. Singh does not directly refer to such tragedies. But by examining one common sense scientific assumption of modern Indian life – the chemical warfare against dirt and pests – she unspools the murderous inequalities facilitated by it.

The title story of Singh's volume contains a much more explicit portrayal of the gendered violence sparked by such dissident examinations of social norms in India today. But like Divya's adoption of an alien perspective, or the kinship between Vaman and Urmila in Narlikar's novel, here too we see a utopic impulse at play. The life of Ramnath, a former bureaucrat basking in comfortable and respectable retirement, is turned upside down when his hitherto submissive wife Kamala declares that she is a planet and starts showing a preference for public nudity because 'a planet needs a sun' (Singh 2013, 50). After failing to reason with her, or extracting a diagnosis of mental illness from their doctor, Ramnath resorts to physical violence – 'He wrestled her into the bedroom and tried to slap some sense into her' – and cunning – 'even planets have atmospheres. See here, this grey sari, it looks like a swirl of clouds. How about it?' (Singh 2013, 50). Slowly, however, Ramnath realizes that it is the dark pleasures of the violence itself that attracts him most:

> Every night it became a ritual for him to look at her and imagine the different ways he could commit murder. He had been shocked at himself at first – him, a fine, upstanding ex-bureaucrat contemplating something as hideous as the murder of the mother of his sons – but there was no denying that the thought, the fantasy, he told himself, gave him pleasure. A secret, shameful sort of pleasure, like sex before marriage, but pleasure nonetheless. (Singh 2013, 45)

What is a shock to Ramnath is of course the stuff of daily life for not only millions of Indian women but of the majority of citizens whose most banal actions are determined by bureaucratic as well as intimate forms of violence. But here it is Ramnath's everyday conception of reality that is rent by Kamala's secession from it. He wakes up at night tormented by ant-like creatures that leave him full of tiny punctured wounds. Kamala says that the creatures have colonized her and are her inhabitants, and the 'younger ones have been clamouring for a new world' (Singh 2013, 50). The journey to this new world begins in a spectacular manner for

Kamala, and destroys the remnants of Ramnath's patriarchal respectability. Out for a walk in the park, Kamala begins to levitate, attached to a bunch of balloons she has just bought:

> The children were yelling and pointing and jumping with glee. She was well up now, higher than the trees and the houses. The balloons scattered above her like a flotilla of tiny escort ships. People were running out of their houses now, pointing and staring. Something white and ghostly came slipping down from the sky – her petticoat! Her blouse and undergarments were next. (Singh 2013, 52–3)

Kamala's elevation to planetary status is a scientific (im-)possibility. Some planetary laws such as heliocentricity and creation of life seem to apply to her. Others are obviously discarded, such as gravitation and human biology. But the one law that is overcome most powerfully is the iron law of domesticity, which buttresses the privileges of a bureaucrat like Ramnath and guarantees the kinds of violence that secure such privileges. In the final moments Kamala is 'out of sight now … out among the stars', and the sense of her possibilities fill Ramnath with a desperate melancholy – a new disposition born out of the realization that what he had thought as a full life of a post-colonial bureaucrat had turned on the forcible emptying of the lives of others. And such appropriations had now given birth to a new science of being – the journey of the dispossessed to the final frontier that had once been promised to them by their leader, now long dead, at the midnight birth of their nation.

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