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Places of pharmaceutical knowledge-making: Global health, postcolonial science, and hope in South African drug discovery

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Abstract

This article draws on ethnographic research at iThemba Pharmaceuticals, a small South African startup pharmaceutical company with an elite international scientific board. The word 'iThemba' is Zulu for 'hope', and so far drug discovery at the company has been essentially aspirational rather than actual. Yet this particular place provides an entry point for exploring how the location of the scientific knowledge component of pharmaceuticals – rather than their production, licensing, or distribution – matters. The article explores why it matters for those interested in global health and postcolonial science, and why it matters for the scientists themselves. Consideration of this case illuminates limitations of global health frameworks that implicitly posit rich countries as the unique site of knowledge production, and thus as the source of unidirectional knowledge flows. It also provides a concrete example for consideration of the contexts and practices of postcolonial science, its constraints, and its promise. Although the world is not easily bifurcated, it still matters who makes knowledge and where.

Keywords

global health, pharmaceuticals, postcolonial science, sociotechnical imaginaries, South Africa

Introduction

Pharmaceuticals have long travelled the globe, but pharmaceutical knowledge-making has become concentrated in just a few places. Pills themselves are highly mobile, and the

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need to increase the reach of essential medicines has become a priority for improving global health. Pharmaceutical knowledge-making, especially at its most fundamental stages, is not so mobile or dispersed.

Although Africa was an important site of pharmaceutical research in the colonial era, when research and therapy were more intimately connected (e.g. Neill, 2009), the complex infrastructures used in most pharmaceutical research and development today are highly geographically concentrated. Thus, Africa has become an obvious place for thinking about global health, but it plays a peripheral role as a site of global pharmaceutical science. This exemplifies what Jean Comaroff and John Comaroff (2011) have called the 'epistemic scaffolding' of 'Euromodernity', in which the West is the locus of 'refined knowledge' and the non-West merely provides 'reservoirs of raw fact' (p. 1). Here, sympathetic to their call to subvert that scaffolding, I explore, 'what if postcolonial Africa were to become a prominent place of not just raw materials and end users, but of the basic science of pharmaceutical knowledge-making?'

This article draws on ethnographic research at iThemba Pharmaceuticals (pronounced ee-TEM-ba), a small South African startup pharmaceutical company with an elite international scientific board, which was founded with the mission of drug discovery for tuberculosis (TB), human immunodeficiency virus (HIV), and malaria. This particular place provides an entry point for exploring how the location of the scientific knowledge component of pharmaceuticals – rather than their raw materials, production, licensing, or distribution – matters. I will explore why it matters for those interested in global health and postcolonial science, and why it matters for the scientists themselves. Consideration of this case illuminates the limitations of global health frameworks that implicitly posit rich countries as the unique site of knowledge production and thus as the source of unidirectional knowledge flows. It also provides a concrete example for consideration of the contexts and practices of postcolonial science, its constraints, and its promise.

The time is ripe to turn to the laboratories of the Global South, not just the metaphorical 'laboratories of modernity', (Arnold, 1993; Mitchell, 1988; Rabinow, 1989; Wright, 1991) but those that have things like beakers and target molecules and nuclear magnetic resonance imaging machines. *Place* figures much less explicitly in laboratory sciences than it does in the field sciences, and laboratory sciences have long been the more privileged sites of knowledge-making (Kohler, 2002). Most scholarship on science in Africa has been on field sciences, and on labs that seek to isolate and verify field findings, whereas iThemba is a synthetic-chemistry-based company. This matters for the way in which the scientists there want to participate in global science as peers of elite scientists elsewhere. That is, they do not want to be limited to providing the Global North with problems to be solved, raw materials, or clinical trial subjects. They want to participate in global knowledge creation. At the same time, the problems and possibilities they face are rooted in their local context. Analysis of their project thus provides an opportunity for distinctive engagement with place.

In comparison with vast literatures on perspectives of patients and physicians, perspectives of pharmaceutical makers generally have been given insufficient attention (Van der Geest, 2006: 312). Of course, in the case of pharmaceutical science in Africa, this has some empirical justification: as Kristin Peterson (2012) points out, the continent's pharmaceutical capacity has been in important ways 'emptied out' in the processes of

dispossession of contemporary biocapital.[1] My focus in this article is on the perspectives of iThemba's drug discovery scientists, who comprise two groups: members of the company's management and scientific advisory board, who are internationally trained and based in the United States, the United Kingdom, Switzerland, and South Africa, and bench scientists, who are trained in South Africa and working in Johannesburg. Since beginning my research on this project in 2010, I have interviewed several members of iThemba's management and scientific advisory board – some in the United States and the United Kingdom, some in South Africa – and I have taken four ethnographic trips to iThemba's labs in the outskirts of Johannesburg. All of the scientists at iThemba agreed to participate in multiple open-ended interviews, and I also attended their lab meetings and did participant observation onsite.

Analysis of iThemba problematizes Global North/South divides, illustrating ways in which the worlds of scientists are not so neatly bifurcated at the same time that it highlights how much is at stake in who makes knowledge and where. Global North/South bifurcation is necessarily slippery terminology because although it usefully captures the role of geography and colonial history in structuring development, it can obscure the mobility of scientists across the divide and the heterogeneity within the south – since countries like South Africa are 'home to both world-class research institutions and understaffed ill-equipped' ones (Bradley, 2008: 764–765). Just as Europe itself has always had 'major centers, minor centers, and peripheries' of science (Chambers and Gillespie, 2000: 223), Africa is not merely undifferentiated periphery: South Africa, and Johannesburg in particular, is a node in networks of global science. Yet 'Africa' is very much an actors' category, and marks inequalities that cannot be ignored. There are many ways to characterize the most fundamental divide here – between rich countries and poor ones, between the first world and the third world, between the metropole and the periphery, between the Global North and the Global South. All of these mappings are problematic and incomplete, yet relevant nonetheless.

South Africa is an interesting intermediary in Global North/South bifurcation because its particular postcolonial context is shaped by its legacy of settler colonialism and the struggle against apartheid. South Africa is a relatively young democracy, resource poor by global standards, with a large population of impoverished Black Africans with urgent unmet health needs and robust activist communities that have mobilized around demands for access to medicine. Thus, it is an obvious locale for the interventions that tend to travel under the rubric of 'global health'. At the same time, South Africa is highly developed by African standards, with a rich history of innovation in biomedicine – such as the world's first human heart transplant, in 1967 – and a now-multiracial middle class with the education, resources, and global connections to plausibly participate in global science. In contemporary aspirations for South African science, a potential exists for those two South Africas to come together through science in the service of the people.

One of the slogans that came up in many of my interviews was the idea of 'African solutions for African problems'. A South African company is of course a very problematic stand-in for the continent as a whole, but that moniker does important work. It is strikingly flexible, able to incorporate South Africans of diverse ethnicities, as well as (Black) Africans from other parts of the continent who are working there (a rhetorical move that has a long history in nonracialist antiracist politics in South Africa, see

Gillespie, 2010: 73). Importantly, in this notion of 'African solutions', 'African' refers to African labs and scientists, not African plants or traditional healers. The endeavor of these scientists is not African in any ethnoscience sense, but it is rooted in place.

The name 'iThemba' means 'hope' in Zulu, and most of what I describe are aspirations rather than actualities. So far, iThemba does not make any drugs. Indeed, it has not made much of its own: a large portion of the scientists' time has been spent generating revenue by synthesizing molecules on contract for pharmaceutical companies elsewhere. Amid South Africa's instability, and amid a time of transitions in the global pharmaceutical industry and at iThemba Pharmaceuticals itself, it is not clear whether or how this potential for science in the service of the people will be realized. Science and technology in South Africa remain dominated by extraction industries, and fledgling efforts to foster drug discovery there are highly tenuous. Nevertheless, tracking these efforts provides insights for science and technology studies and beyond. As Sheila Jasanoff and Sang-Hyun Kim have argued, imagined possibilities matter; what they describe as 'sociotechnical imaginaries' are vital sites for thinking through not just what technology should be, but also what the nation should be, because 'technoscientific imaginaries are simultaneously also "social imaginaries", encoding collective visions of the good society' (Jasanoff and Kim, 2009: 123). A sociotechnical imaginary organized around locally discovered, innovative drugs for infectious diseases articulates South African scientific research and society in ways distinct from a range of alternative imaginaries – of aid complexes or plant-based therapies; or of extraction industries; or of colonial or apartheid-era science in which African populations were not seen as the principal beneficiaries of biomedical innovation.

The structure of this article is in three parts: Part 1 explores iThemba as an intervention in the bifurcations of place in global health discourses; Part 2 describes iThemba's emergence in the shadows of apartheid and mining; Part 3 engages with iThemba bench scientists' perspectives on why it matters that drug discovery take place in South Africa. The article's conclusion argues that although the world is not easily bifurcated, it still matters who makes knowledge and where.

Part 1: Questioning the bifurcation of place in global health discourses

I first learned about iThemba Pharmaceuticals at a human rights conference at Emory University School of Law in 2008, in a panel about 'International Access to Medicines'.[2] One of the speakers was an Emory chemistry professor, Dennis Liotta, who is a prominent drug discovery scientist. Liotta and collaborators discovered the key components of second-generation antiretrovirals, the ones used in rich countries today. In a panel focused on access to drugs in poor countries and to a crowd that was overwhelmingly of the opinion that solutions would require reform of intellectual property (IP) laws, he described an interesting alternative approach. Liotta made a case that the problem was not intellectual property per se, but the fact that IP owned by those in rich countries is unaffordable to those in poor ones. Liotta argued that if drugs were discovered in developing countries and companies based in those countries owned the IP, the drugs would be affordable to the poor and relevant to their

Figure 1. ithembapharma.com, accessed 8 August 2013.

needs.[3] He described two ways in which he is trying to make it possible for African scientists to discover innovative drugs.

The first way is perhaps a predictable model of knowledge transfer, exemplified by a postdoctoral program bringing South African scientists to Emory to be trained in drug discovery. Yet, Liotta pointed out that if the training were to happen without regard to the South African economy, it would only exacerbate brain drain. Thus, I was intrigued by his discussion of a second initiative with which he was centrally involved: a company that he co-founded, called iThemba Pharmaceuticals, which was doing research on diseases of the poor in South Africa.

The main web page for iThemba (Figure 1) is addressed to diverse audiences: South African bureaucrats and scientists, and plural international publics. For an audience in-the-know, this web page highlights the global prestige of the company: the North American and European-based scientists on its boards include some of the most elite drug discovery scientists in the world. Other readers of the page can take as they like the site's claim that they are 'world-renowned'. But the page also highlights the South Africanness of the project: the Zulu name of the company, its focus on diseases that are urgent in Africa, and its support from the South African government – the South African government owns a 50.1 percent share of the company. iThemba's founding mission, 'inexpensive therapy for infectious disease through innovative chemistry', is a distinctive one. In order to illuminate this, I will contrast iThemba's approach with that of the three most prominent discourses of pharmaceuticals and the Global South: access to medicines, traditional knowledge, and clinical trials. Doing so reveals the common ground between those disparate discourses and puts iThemba into comparative relief with them.

Placing pharmaceutical knowledge-making: beyond access to medicines campaigns

In Liotta's comments at the human rights and the law conference, I was struck that iThemba's approach differed from most approaches to solving the urgent health needs of Africans, all of which frame the lack of access to drugs in poor countries as failure to meet the needs of the Other. This bifurcation of the world between (1) knowledge creators who have a moral duty to create and share knowledge and (2) those in desperate need pervades advocacy of access to medicines broadly.

Social movements around generics are an example of taking the North/South bifurcation for granted. Generic producers in India are often lauded, most prominently by Doctors without Borders, as the 'pharmacy of the developing world' (Karunakara, 2012), but generics are far more complicated than this laudatory framing implies (Ecks and Basu, 2009; Greene, 2011; Hayden, 2007, 2010). Because South Africa was treated as a developed country under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), it did not have the option of learning-by-copying that the industries in many other countries, especially India and Brazil, were able to take advantage of. More fundamentally, relying on generic production of First World drugs means that the developing world can only get copies rather than novel drugs, and thus that the needs of the poor will not set the priorities for novel drug discovery.

This geographic bifurcation between places of knowledge production and places where the only question is access is pervasive. For example, Universities Allied for Essential Medicines emphasizes the moral emergency of the lack of access to existing drugs and lack of research into diseases of the world's poor.[4] Their solutions center on sharing knowledge from North American and European research universities with the Global South. Their motto – 'our drugs, our labs, our responsibility' – is at once compelling and peculiar. The 'our' locates but also circumscribes, implying that the only place that knowledge can be produced, and the only place that responsibility can be located, is in the Global North. Drug discovery becomes an exemplar of the broader phenomenon that Noémi Tousignant (2013) has articulated:

> One of the ways in which colonial policies, geographical imaginations, global economic inequality and intellectual property rights have helped to create and maintain peripheries is by reserving certain kinds of scientific practice for locations in which wealth and power is concentrated. (p. 747)

Bill Clinton's history of involvement in this area illustrates the limitations of imagining that the moral stakes of access only concern whether or not rich countries share their discoveries with poor ones. During Clinton's presidency, the bombing of the Al-Shifa pharmaceutical factory in Sudan showed the low value that his administration placed on African capacity for pharmaceutical production (Chomsky 2001, 45-50). Today, the Clinton Health Access Initiative (CHAI) emphasizes access to essential drugs through brokering and subsidies. This does nothing to reorient research priorities toward the diseases of the poor, but it also effectively props up high prices for drug companies in the Global North (for further discussion, see Pollock, 2011).

Another key difference between iThemba and CHAI is the emphasis on research. In addition to 'inexpensive therapy' and 'infectious disease', there is an additional 'i' phrase in iThemba's mission: 'through innovative chemistry'. The goal is not just to subsidize or lower the cost of existing drugs, but also to discover new ones. In this sense, iThemba's efforts are aligned with those of another Bill, Bill Gates, whose philanthropy supports both drug distribution and drug discovery. While Bill Gates has paid scant attention to *who* is making the science, his and other philanthropists' preference for funding scientists with 'track records' provides a tremendous advantage to scientists in the Global North, and the Gates Foundation has prominently partnered with big pharmaceutical companies for neglected disease research (Torsoli and Kitamura, 2012). The Gates Foundation's grants exemplify the presumption of the unidirectionality of global knowledge flows. The overwhelming majority of grants given through Gates' Grand Challenges Initiative have been given to scientists working in North America, with the next largest portions given to scientists working in Europe, then Asia, then Africa, and then South America.[5] In the system of global flows that Gates has participated in creating, geography is central to organizing technological *objects*: the system is designed such that cheap drugs and cheap computers flow to the Global South without disrupting high prices in the Global North. But the geography of technological *subjects* has no role in Gates' model.

Again, what unites all of these philanthropic and activist movements for global access to drugs is that their critique has overwhelmingly been framed in terms of failure to meet the needs of the Other: scientists and drug companies in the Global North failing to rise to the humanitarian challenge of meeting the needs of the Global South. This assumes an immutability of the nature of the global flows: knowledge will be made in the Global North, and the challenge is to spread the benefit. But what if we do not take the direction of knowledge flows for granted?

Placing pharmaceutical knowledge-making: beyond bioprospecting

Whenever I speak about this project in rich countries, audiences always either assume that the company does bioprospecting, or they suggest that a good place for this pharmaceutical company to start would be to look at plants and traditional knowledge and look for ways to turn those into medicines. This would exemplify one type of 'translation' model: translating local knowledge into global science. It is not what iThemba does.

In addition to the global health literature, the other major discussion of pharmaceutical knowledge with regard to the Global South involves traditional knowledge, botanical products, and bioprospecting (Hayden, 2003; Langwick, 2011; Wynberg et al., 2009): intertwined topics that have a long history rooted in colonial relations (Hokkanen, 2012; Osseo-Assare, 2008). These accounts reveal how traditional knowledges and biomedical ones are mutually constituted, and yet one of the things that this literature brings to the fore is the conflict between *local knowledge* and *global science*. This conflict is not simple: traditional African botanical knowledge was never as local as the discourses of 'indigenous knowledge' and 'bioprospecting' have implied (Osseo-Assare, 2014), and traditional knowledges and biomedical knowledges in African places inform and shape one another even as they remain incommensurable (Langwick, 2011). Yet a fundamental tension of these accounts is between biomedical scientists (including African scientists)

and traditional healers. Cooperation and conflict between traditional healers and biomedical scientists occurs amid a hierarchy: insofar as traditional knowledge of plants constitutes Global South knowledge, it is only local knowledge rather than science, unless it is brought into a scientific rubric. In the case of pharmaceuticals, a key step is transforming 'raw materials' into 'active ingredients' through laboratory practices. This transformation allows botanical products to become the basis of pharmaceutical knowledge and, relatedly, to become globally mobile pharmaceuticals.

Importantly, the knowledge that iThemba seeks to create is not based on traditional knowledge or plant-based therapies. Its methods and materials are drawn from mainstream synthetic chemistry. Of course a promising plant-based lead molecule would not be rejected. Indeed, the previous company of iThemba's former chief commercialization officer, David Walwyn, sought to find novel lead compounds against HIV by using chemistry methods to test the efficacy of the botanical products that traditional healers used in their treatment regimens. The products were originally brought to the government-run Council for Scientific and Industrial Research (CSIR) by the healers themselves, who wanted scientific verification of their claims. As Walwyn told me in an interview in 2010, that company, Arvir, was a failure for reasons that had nothing to do with IP: although the plant compounds had some efficacy against HIV, none had potent enough efficacy to be made into a pharmaceutical. iThemba acquired Arvir's technologies and its last two employees in 2010, and the employees have since moved on. Other iThemba scientists also raised the prospect of botanical products as a resource in interviews. A few of the scientists mentioned interest in the model of *hoodia*, a plant traditionally used by the San people and the origin of a compound patented by South African government researchers as a potential appetite suppressant drug – a case analyzed by Foster (2011) and Osseo-Assare (2014); notably, the scientists did not seem aware of the controversies around biopiracy in that case (Wynberg et al., 2009). However, local plants and traditional knowledge are probably no more central at iThemba than they are in the pharmaceutical industry more broadly.

iThemba's notion of the value of African research is thus discontinuous with what historian Helen Tilley (2011) has described as the early 20th century Imperial sense of Africa as a 'living laboratory'. In Tilley's account, doing science in Africa was argued to have particular value because of specific and intimate access to the phenomena of nature there. The 'living' quality of the laboratory in Tilley's account comes from the field sites of science, rather than being grounded in laboratory-based scientists and their practices. Whereas ethnographic exploration of efforts to pharmaceutically exploit botanical products and traditional knowledge foregrounds the conflict between local knowledge and global science (Hayden, 2003; Langwick, 2011), iThemba offers an opportunity to explore a Global South site that seeks not to translate local knowledge into global science, but to participate in global science itself.

Operating as if *the* problem of southern knowledge is managing traditional knowledge and natural resources is another side of the epistemological bifurcation that has pervaded analysis of IP and medicines in the Global South. In global health discourse, the assumption has been that global knowledge will be made in the North and shared (or not) with the South. In traditional medicines discourse, the assumption

has been that local knowledges already exist in the South and will be exploited (or not) by the North. Neither recognizes the capacity of the South genuinely to participate in the creation of new global knowledge. Analysis of iThemba thus complements new work on genomics in the Global South (Benjamin, 2009). To an even greater degree than in that genomics research, which relies on locally derived biological materials, the Global South knowledge-making at iThemba is place-specific without being autochthonous.

Placing pharmaceutical knowledge-making: beyond clinical trial research

Furthermore, the basic science done at iThemba is also epistemologically distinct from the other well-analyzed area of pharmaceuticals and the Global South: clinical trials (Geissler and Molyneux, 2011; Kelly and Geissler, 2012; Petryna, 2009; Sunder Rajan, 2007). In transnational clinical trials, people in the Global South are generally *objects* of science (the ones about whom knowledge is made), rather than its *subjects* (the ones making knowledge).

In clinical trials in the Global South, it is generally the claims of scientists in the Global North that are being tested on bodies in the Global South. This state of affairs reflects the broader postcolonial discourse in which Africa is not fully part of the human project but rather 'an object of experimentation' (Mbembe, 2001: 2). Insofar as African physician–researchers participate in making knowledge through clinical trials, it is overwhelmingly not at the research design stage. Sometimes the subjects are stand-ins for Global North consumers and patients, not configured as future consumers and patients themselves (Sunder Rajan, 2007). Other times, the studies are meant to reveal whether 'already established treatments' might work in 'resource-poor settings' (Crane, 2010: 846). In either case, the inequalities studied by global health become, as Johanna Crane (2013: 7) points out, *valuable inequalities*:

> Within global health, the very characteristics that once led some Western experts to dismiss HIV treatment in Africa as unwise – impoverished patients, poor infrastructure, understaffed health facilities – are now those that make many African countries attractive 'resource-poor settings' that can offer 'global' research and educational opportunities unavailable in 'resource-rich settings' like the United States.

African clinician researchers have much to gain in these relationships, but their role is highly circumscribed.

The scientists at iThemba seek to participate in the creation of the original knowledge claims at the very beginning of the drug discovery enterprise, at its most scientific level. They want to be at the beginning of pharmaceutical knowledge-making, in both time and space: forming the initial hypotheses about novel compounds, synthesizing them, researching them pre-clinically, and overseeing rather than implementing downstream study. The knowledge created would not only be practical, technical knowledge, but conceptually driven technoscientific knowledge at its most basic. It would be able to go out into the world in the same way that knowledge created by any other drug discovery enterprise would, whether at GlaxoSmithKline or at Emory University. This presents

very different epistemological issues from the kinds raised in exclusive focus on late-stage clinical trials.

Part 2: Making a place for pharmaceutical knowledge-making in the shadows of apartheid and mining

iThemba's pharmaceutical knowledge-making project is placed in a very specific post-colonial context – one that is post-apartheid. As Dennis Liotta told me in an oral history interview in 2012, he became involved in South Africa in 1999 through a British friend and colleague, Tony Barrett. Barrett, who is a prominent drug discovery scientist based at Imperial College London, wanted to set up a consortium for an exchange program. As he and colleagues toured South Africa's research facilities, Liotta was impressed with the quality of science education but discovered that there was very little drug discovery going on. He came to believe that this was a consequence of the former South African regime in a couple of ways: first, sanctions that had been imposed on South Africa had precluded international pharmaceutical companies from putting research and development (R&D) centers there, and second, South African scientists with synthetic chemistry skills did not like the system, were relatively mobile, and left. Thus, his assessment was that there was 'a whole generation … trained without knowing anything about drug discovery and development'.[6] Since it is such a specialized area, it would take 'a well-defined knowledge-transfer program' to 'fill that gap'. He told me,

> So we immediately realized, wow, this is an interesting opportunity, because we, and the network of people that we knew, had the skills. And if we could find an effective way of transferring those skills, we could train the next generation of African scientists to address their own problems. And that just became an instantly compelling driving force for me. It was just like, wow. And I would talk to people, to scientists, and I would describe what we were trying to do, and literally to a person, they all said 'let me know how I can help' …
>
> But in the process of doing this, we also came to this very profound conclusion, which is that if we did this, if we got people excited about this area and gave them the skill sets they needed, but there were no jobs for them, then like many others who preceded us in Africa we would make this well-intentioned blunder of creating a brain drain in essence. So we decided that we'd have to, simultaneous with our knowledge transfer program, we'd have to do something to catalyze the formation of new commercial entities that could hire the people who were being trained and could then make those discoveries. And that was essentially the origins of iThemba Pharmaceuticals.

There were some stops and starts along the way, and the original founding of the company in 2003 did not work out. However, with encouragement from South African government officials, eventually Liotta and his colleagues started again. In 2008, they assembled a board, contributed some potential technologies as their initial investment in the company, received startup funding from the South African government, and iThemba officially launched operations in 2009 (Figure 2).

In Liotta's model, strong local university research matters: scientists based in South Africa are not empty vessels waiting to be filled. Yet, in his framing, both human capital

Figure 2. iThemba Pharmaceuticals, photograph by the author.

and IP need to find space in the commercial sphere in order to be sustainable. This vision of potential synergy between government and for-profit entities to build capacity for pharmaceutical knowledge production is consonant with broader trends in public–private partnerships for drug development (Craddock, 2012), but the foregrounding of employment in addition to markets is distinct. The provision of employment opportunities for southern African chemists is framed as a necessary precondition for the possibility of southern African pharmaceutical innovation. Science and Technology Studies (STS) scholars have tracked ways in which 'brain circulation' can foster Asian bioscience rather than accelerate 'brain drain' (Fischer, 2012: 419; Zweig et al., 2008), and it is an open question whether this model can work in the much less developed context of South Africa. This element of the unknown is precisely part of the appeal, a reason that 'to a person' scientists in Liotta's network asked how they could help. As Itty Abraham (2006) argues, 'postcolonial locations thus include relations of weakness and possibility, valences that cannot be known in advance but that are products of historically situated intersections of the political economy of place and unequal location within transnational circuits of knowledge flow' (p. 217).

The physical site: In the shadow of mining

The company's physical site in a place called Modderfontein provides an entrée into iThemba's postcolonial situatedness. Today, it is a tranquil suburban office park, with narrow streets and eucalyptus trees. The eucalyptus trees are a fragrant relic of colonial history: they were brought from Australia because they grew quickly, but they proved to be too weak for

the mining purposes that drove demand for lumber in South Africa, and now they have become a little-noticed part of the background. The mechanical gates that surround each building in the office park give it a Johannesburg feel; there is a security theater amid no visible threat. The heavy industrial past of the site is visible as soon as one starts to look. The whole suburban office park is at the edge of a huge lot that is a complex of the African Explosives and Chemical Industries (AECI) where explosives are still produced and tested.

At one level, the fact that the company exists on AECI land is a contingent logistical fact. One of the South African cofounders of iThemba and former Chairman of its Board, Frank Fisher, had been a long-time group research manager and project director for the AECI. His own work had been in areas unrelated to drug discovery (paper and plastics), but as research director of the whole AECI group, he had set up a biotechnology function at the Modderfontein site.[7] Fisher had come to know British scientist Tony Barrett, who would become another cofounder of iThemba, because the AECI had hired him as a consultant over the years. Early in the South African democratic era, Fisher was under pressure to hire black PhDs, but he was unsatisfied with the quality of the black scientists produced in South Africa, a legacy of the apartheid education system. He believed that experience in an international university where high expectations were set for all students – black students included – would help to improve the quality of black scientists that he could hire. He organized an exchange program with Barrett's lab at Imperial College that worked out very well. Barrett suggested expanding the program to his friends in Atlanta, including Liotta at Emory. Years later, when Liotta asked Fisher to secure lab space in Johannesburg for iThemba, Fisher organized it in the Modderfontein labs he had participated in building.

On another level, that the company exists on AECI land gives a hint of the situatedness of drug discovery in South Africa: in the shadow of the mining industry. Modderfontein is the site of a historic dynamite factory – the biggest in the world in its early-20th-century heyday (Behrens, 2005). The AECI still maintains a dynamite museum on the property, in the house of an early executive of the Company, and Johannesburg Tourism promotes it as a tourist site (Davie, 2005). The dynamite factory was set up well outside of the city because of the risk of explosions, and a wildlife park provided a buffer. Now the sprawl of Johannesburg is increasingly closing in on the site from the south, and gated communities of single-family homes are quickly covering the hillsides.

In some sense, this explosive history is merely in the background scenery of the site. Yet not only are several of the chemists at iThemba interested in this history, as one pointed out, the infrastructure of dynamite contributes more than old buildings: because of the ongoing manufacture of ammonium nitrate nearby, iThemba's office park never loses power.

Moreover, the history of dynamite in South Africa can provide a window into the contemporary history of pharmaceuticals there. Dynamite was a foundational material to South Africa's colonial economy of extraction, and attention to it can inform understandings of materials of a postcolonial knowledge economy, in this case, pharmaceuticals. I would suggest that there are evocative parallels between the patent and production evolutions of dynamite at the turn of the 20th century and those of pharmaceuticals at the

turn of the 21st: issues of profiteering, quality control, government concessions, and the challenges of manufacturing.

As described in a historical account of the AECI (Cartwright, 1964), in the 1880s, there was tremendous demand for explosives in South Africa to feed the growing mining industry, yet the South African government was concerned about 'native' access to firearms. The government sought to control production and gave a concession to one entrepreneur to establish a factory to produce dynamite locally for perhaps multiple reasons: local production could mitigate the disruption of supply amidst the wars over control of Africa; it would be part of making the colony self-sufficient; and it could lower costs. Instead, the entrepreneur imported dynamite that was produced at Nobel factories in Europe and sold it at a huge markup (Cartwright, 1964: 46). Eventually, the concession was cancelled and a government-run factory began operations at the site of Modderfontein in 1896. Most ingredients were still imported, but local production had its advantages.

Today, mining continues to dominate the chemical industry in South Africa to a degree that chemists in all fields are aware of mining as a possible career option. For many, it is an undesirable option, failing to exploit their creativity and specialized skills. Synthetic chemists in South Africa can choose between a few fields: moving into chemical engineering in mining, doing formulation for production-oriented firms, be they in paint or drugs, joining the tiny ranks of academia, or going into a general analytic field such as banking or consulting. Many consider emigrating to Europe or North America. At present, the mining industry dwarfs the pharmaceutical industry in South Africa. The tiny footprint of this pharmaceutical company on the sprawling land of the AECI renders a concrete edificial illustration of the relative sizes of the industries.

Part 3: Engaging on-site scientists' perspectives on the place of pharmaceutical knowledge-making

The scientists working at iThemba are highly aware of the small size of the company and how it shapes their diverse day-to-day tasks and the fragility of their place in the South African economy. This fragility is striking because, in contrast to the mining industry, iThemba's context is one of resource-scarcity. South African would-be pharmaceutical developers are also resource-scarce, and South African would-be pharmaceutical consumers are resource-scarce as well. Because drug discovery in South Africa cannot rely on philanthropy from the Global North or on profitable consumer products in the short term, it has relied on funding from the South African government and on income from contract chemistry. iThemba seeks contracts from pharmaceutical companies in the Global North to synthesize molecules at a lower cost than those pharmaceutical companies could do themselves. Other means of revenue generation are on the horizon as well, such as low-cost antiretroviral production and process chemistry. The burdens and short-term financial rewards of this routine work have often been in tension with the desire to get to the real drug discovery.

Unlike the management and scientific advisory board of iThemba, the on-site scientists are not public figures, and so I try to make sure that individuals are not identifiable when I quote them below, even though this has the unfortunate effect of making their

Figure 3. The reception desk at iThemba, staff clothing and figurine in honor of the 2010 World Cup, photograph by the author.

voices somewhat disembodied. In interviews with scientists at iThemba, local and global aspirations emerge together. iThemba's organic synthesis methods are indistinguishable from what might be done in well-equipped labs anywhere else, and the work is informed by a network of advisors comprising global experts. Yet, it is tied to place. Scientists talk about the motivation to do this work coming from personal experience with disease, democratic citizenship, and the opportunity to have a job at 'home' (Figure 3).

Medicines 'by the people, for the people'?

iThemba is working to make medicines *for* the people – low-cost medicines for diseases of the poor. But it is also working to make medicines *by* the people. This is something that makes their efforts distinct from the philanthropic initiatives. If drug development takes place in South Africa, it is 'for' chemists in South Africa as much as it is for desperately poor patients co-infected with TB and HIV. The scientists are themselves part of the southern African people, albeit a relatively privileged part, and they are trying to help themselves, too. As a racially diverse group of highly educated people, there is a tension in whether the scientists at iThemba are themselves 'the people' or are 'serving the people'.

Rooted in personal experience and intimacy with disease

A distinct aspect of doing research on TB, malaria, and HIV in South Africa rather than in a site in the Global North is that the scientists have personal experience and intimacy

with the diseases that they are researching. Several of the scientists mentioned personal experience of disease as motivating their work. For example, I asked one scientist who was from a country neighboring South Africa to the north whether he/she had always wanted to be a scientist, even as a child, and the answer was the following:

> Yes, yes. Actually, my interest in drugs started when I was about 15 or 16. I got struck by malaria the first time ever. And I was so sick I thought I was going to die. I had never been so sick in my life. So I thought, after I recovered, I thought I'm going to make a difference to helping people.

Beyond personal embodied experience of disease, the scientists at iThemba speak of intimacy with the diseases being inextricable from urgency. For example, when I asked one scientist why it was important that drug discovery take place in South Africa, the scientist answered,

> Well why it's important to me is that it means I can still stay here. But it is, there's just a feeling that it would help move the country forward. And we are the ones who can see the people dying. We know the people who have HIV. We are very much in the thick of it, so we can, we know that there's pressures given us. Sometimes, not often, but sometimes I go home and I think – oh I'm tired I just want to go home, and then you think of the side of it where we are meant to be working on this cure, and how can we possibly slack off for a moment, the need is so obvious?

As another scientist put it,

> I think that it is important that people who are being affected are the ones who are doing the research. Because if you have seen someone suffer, you make all the effort to ensure that whatever you are doing gets out and ordinary people can benefit from it. You clearly understand the importance of doing it. Even people from other countries, they still understand, but the fact that it has affected you, you feel the strong need of intervention, the strong need of finding something that will be helpful and will be accessed in a cheaper way.

I asked whether the scientist had felt that impact of malaria, TB, and HIV, and received the following answer:

> Not malaria, but HIV, yes, absolutely. There are many people who have died of HIV and TB who are very close to us. Especially HIV. They always say that if you are not infected, you are affected.

Of course individual scientists in Europe or North America might be affected by HIV or see themselves as members of communities that are, but in South Africa, the prevalence and impact of HIV is of a different order.

Not all of the scientists at iThemba share the commitment to the diseases of the South African poor. In interviews, a couple of them complained that they wished that they could be working on the diseases that have more potential for cutting edge science and for profit. In the words of one scientist, 'these diseases are neglected for a reason'.

Yet for most of the scientists, the articulation of their research priorities always returns to the desperately poor. Many examples came up in the interviews. One chemist

suggested that the activists underestimated how much it would take to extend treatment to the millions of people in South Africa who would need it in the coming years because more was involved than just providing pills. According to the scientist, in order for people to be on treatment for HIV, they needed to have 'special skills'. But what was meant by skills was particular: 'For example, they need an income'. 'Special skills' also includes transport to the clinic, and food to eat with the pills. This attention to the costs of transportation resonates with social science findings, which have highlighted transportation as an onerous burden for impoverished patients accessing drugs, even if the drugs themselves are free (Cleary et al., 2013).

And yet the chemist was not hopeless. Hope was a motivation for working in drug discovery. The scientist suggested that increasing employment was important in effectively expanding HIV treatment, and the scientist also had a pill-based potential solution in the nearer term. The scientist was excited about an idea that was still far off but plausible with the technologies the company has licensed: the prospect of once-a-week treatment for HIV. The South African government procures most of the antiretrovirals for the population, and once-a-week treatment would lower the cost of pills: packaging costs would be less, the pill-production costs would be less, the distribution costs would be less. But a once-a-week pill would also help lower the costs borne directly by very poor people in need of antiretrovirals: they would need transport to the clinic less frequently. And, the chemist pointed out, they would only need access to one proper meal a week.

This scientist's frame is pharmaceuticalized, but it is quite alien to the model of consumerist excess evoked in much analysis of pharmaceuticalization in rich countries (Abraham, 2010; Williams et al., 2011), and yet it is also not the same as the limited one that characterizes access to medicines campaigns analyzed by anthropologists such as Joao Biehl (2007).[8] In Joao Biehl's (2007) attention to the Brazilian response to HIV, he argues that public health has been pharmaceuticalized. As anthropologists elsewhere have pointed out too, promoting affordable pharmaceutical access as the solution to dire health problems renders a very narrow concept of the scope of public health (in India, Das and Das, 2006; Ecks, 2005; in Mexico, Hayden, 2007; and in West Africa, Nguyen, 2005). When access to pills stands in for access to health, it continues systematic exclusions.

This kind of pharmaceuticalization is also happening in this South African case: pharmaceuticals are framed as the answer to the problem of public health – or at least part of the answer, in the form of low-cost therapies. And yet none of the scientists at iThemba suggested that pills alone could solve the problems. HIV and TB in South Africa are overwhelmingly diseases of poverty, and the scientists routinely invoked the need to alleviate poverty and improve infrastructure as well as to provide medicines. This is distinct from the way that pills can seem from the perspective of scientists working at a greater distance. In my first conversation with Liotta in 2010, he lamented his naiveté when he first started working in the HIV field. He said that he thought that if he just discovered the chemical to cure AIDS, the problem would be solved. Of course his chemical was not a cure but a treatment. More fundamentally, once he actually saw the drugs going out into the world in a way that was far from universal, he could see that not all barriers could be breached with chemistry. Liotta said that he realized that if the stigma of AIDS was too great, people would not be tested and so would not have access

to the drug. If the drug was too expensive or the infrastructure was not in place to distribute it, many would not have access. In his telling, he came to realize what the South African scientists cannot ignore: HIV as a social problem is inextricable from HIV as a medical problem. Although this awareness does not necessarily change the science itself – beyond, say, taking cost into account in design decisions – it does affect the way that the promise of a pill is understood. For these scientists, any pharmaceutical can only be a contribution to the fight against AIDS; there is no fantasy of a magic bullet.

For iThemba's bench scientists, intimacy with these diseases is highly varied at the same time that it is shared. For those from further north in Africa, it is childhood bouts with malaria; for others from impoverished rural South Africa, it is community experience with TB and HIV; and for all, because they are residents of South Africa, TB and HIV are understood as at the front and center of national concerns. No matter what their backgrounds, the scientists are themselves part of the southern African people. And yet since they were all now middle-class professionals outside of the malaria belt, there was also undeniable distance. Furthermore, working at iThemba gives these scientists access to global science – as several pointed out, a more direct link to global experts than they would get if they were working in a Big Pharma cubicle in the Global North.

Putting South Africa on the research map

Many scientists spoke of 'putting South Africa on the research map', which is related to the ability to find work 'at home'. South Africa has low-cost carrier airlines that serve much of the region, making it 'close to home' not only for South African scientists but those from nearby countries as well. I asked one such scientist whether it was important that R&D work happen in South Africa:

> I think it's been long overdue. The country has produced a lot of top class scientists, and it's only fair that they should be a lot more involved in research and development. Obviously it puts the country on the global map. But you also want to create employment opportunities for a lot of the students that are studying chemistry. One of the major questions that science students have is, once finished with these studies, what next?

If drug development takes place in South Africa, it is 'for' chemists in South Africa as much as it is for desperately poor patients co-infected with TB and HIV.

In iThemba's work, the importance of space and distance is both palpable and reconfigured. In interviews, references to the 'map' came up all the time. This 'map' is partly metaphoric: iThemba provides 'an opportunity to put the country on the research map'. And yet the map is also importantly literal. South Africa's simultaneous distance from and proximity to Europe shapes the capacity for research. On the one hand, South Africa is in the same time zone as Europe, and the ability of European scientists to speak to South African scientists during the day is framed as a significant value added for contract chemistry work. The capacity for virtual connection collapses some distance between North and South. On the other hand, South Africa's geographic isolation from concentrations of the pharmaceutical industry poses real material constraints. The delays in delivery of reagents slow down South African research capacity relative to other developing

countries, such as India and China, with more robust pharmaceutical sectors. Challenges of securing supplies of reagents underscore the materiality of pharmaceuticals from the perspective of their developers: IP can exist in abstract forms, but in order to become drugs, it must be materialized with ingredients and processes that are unevenly distributed in space.

In many conversations that I had during my time with South African drug discovery scientists, I was often struck by the materiality of pharmaceuticals. Not simply thinginess as a concept (Van der Geest et al., 1996), but how the *stuff* of pharmaceuticals matters. For their developers, the materiality of drugs is inescapable. South African would-be developers face particular material constraints. Costs of packaging and distributing these tiny objects are nontrivial in this context. And the layers of production have costs, too. Active pharmaceutical ingredients (APIs) comprise a key part of pills, not only in terms of their efficacy but also in terms of their simple ingredient composition. Almost all APIs are still imported, and that is one reason that drugs actually formulated in South Africa are still expensive by local standards. If the local chemists are able to develop the capacity to make APIs themselves, they can lower costs. Consideration of costs of production and distribution highlights the complexity of the terrain of neglected disease. The other diseases that this pharmaceutical company researches – malaria and TB – meet the canonical definition of neglected disease, albeit less neglected than many tropical diseases. But context-relevant HIV treatment – that is, new-generation HIV treatment that is easier to distribute and at lower cost in a country that continues to have a large impoverished rural population – can be understood as neglected too: it is something that is not profitable for Big Pharma, but for which there is tremendous need. This context is part of the situatedness of this South African pharmaceutical company.

Both meaning and materiality are wrapped up in the situatedness of South African drug discovery. The first time I was there was during the lead-up to the 2010 Fédération Internationale de Football Association (FIFA) World Cup, and there was a strong sense of South Africa leading the way for Africa. As one scientist put it, ‘who thought Africa would ever host the World Cup?’ Seeing the event’s success would have an impact on how the world understood what Africa was capable of, the scientist argued, and ‘the same goes for the pharma industry’.

Taking responsibility for diseases of the poor

Again and again, the intangibles were inextricable from the tangibles. One scientist’s answer to why there is value in doing drug discovery in South Africa was particularly rich and complicated:

> It doesn’t, to me it doesn’t really matter whether the cure comes out of another country or here, or whether the drugs come out of another country or here. But obviously it’s important for the South African economy in the broader sense. If we are seen to be producing our own drugs for our own diseases, it will increase our standing in international science. I think it will make the South African people feel less helpless towards these diseases. If they know that South Africa is providing something for them, we are looking after ourselves. So kind of I guess. It’s a yes and no answer. I think the difference it will make is if the drugs come out of South Africa,

> there's going to be a difference in the sense people have of South Africa. It's not going to be a concrete difference of it works or doesn't it, because obviously a drug is a drug. But it should help us produce them more cheaply. It should help build international confidence in South Africa, and it should help even the people on the street to feel looked after by their country. Not to feel like a third world country relying on the rich countries of the world.

This quote captures many themes that came up in interviews. Different regimes of value jostle here: ethical value, economic value, and epistemological value comingle (to draw on Ann Kelly and Wenzel Geissler's (2012) evocative triad). Like many of those I interviewed, this scientist was invested in raising the international scientific profile of South Africa. Yet the frame of reference is also local: many of the scientists said that it was important that South Africa do this research because the country needs to recognize HIV (and TB) as its own problem and to take care of its own problems itself. Self-reliance is in no small sense an illusion – the small Johannesburg biotech company has an international board and license agreements with international companies and universities. Anything developed there is also part of a global network of knowledge production. But self-reliance is also an important component of how these chemists in South Africa understand the terrain of raising the profile of their scientific community and their country as a developed one. This is along the lines of what James Ferguson (2006) has argued: what Africans seek is not just independence or reparations, but a place in the world.

The scientist quoted above is simultaneously articulating the technical goals of the company and an aspirational social vision that is a 'sociotechnical imaginary' (Jasanoff and Kim, 2009). For the racially diverse scientists involved, the importance of 'taking responsibility for AIDS' and other infectious diseases is often linked with the moral imperative for South African scientists to focus on the needs not only of the global or even the South African elite, but also of the poor and black South African majority. An African pharmaceutical response is particularly charged in post-apartheid South Africa, a context in which ideologies of neoliberalism, democracy, HIV denialism, and pharmaceutical-based activism all intertwine and contest each other (Cooper, 2008; Fassin, 2007). Ownership of pharmaceutical IP would not only make an economic claim and an epistemological one, it would also locate a moral claim. This suggests that the spatializations of pharmaceuticals' *subjects* and *objects* should be understood together.[9] Ambitious African scientists are striving to be the subjects of medical progress, which is to say, practitioners of scientific research at a global level. Yet, place still matters: these scientists cite their collocation with important *objects* of medical knowledge – impoverished Africans with urgent unmet needs – to make a claim for a role for themselves in global networks of science. Their cosmopolitan aspirations are rooted in their context. It is notable that the hoped-for drugs are context-specific without being expensive, which is a particular aspiration for science in the service of the people.

One scientist, a Black South African who grew up poor, told me,

> I think also we have to do like the First World countries. When you go to the United States or the United Kingdom, they have high investment in research and development. And research in the end of the day works for them. Versus in Africa, of course we have highly talented people

> in this country and in Africa in general, but we haven't seen much of science responding the actual needs. What it means for science to address the needs down in my home town, where they are facing [TB and HIV]. And so that is where my social aspect comes from, is how to do you make science respond. Science and education needs to address what we are facing in this country.

By looking not only at the distribution of pills but also at their design, we can see that pharmaceuticalization is a phenomenon not limited to health. Pharmaceuticals also become the solutions to many more problems: those of transforming an extraction economy into a knowledge economy, stemming brain drain, and raising the profile of the country. It may be that South African science itself is being pharmaceuticalized. When not just the objects of pharmaceutical knowledge but also pharmaceutical knowledge production itself moves to the Global South, we have an opportunity to explore implications for STS and beyond.

Pharmaceutical knowledge production in South Africa is both postcolonial and global, and scientists involved in drug discovery there speak of it both as offering 'African solutions for African problems' and as a way for African scientists to participate in the global networks of innovative science. The ethical stakes of science in the service of the people are inextricable from the epistemological and financial stakes of creating novel IP. The promise of drugs affordable to Africans and relevant to their needs jostles with the promise of global prestige for African scientists. In ways both literal and metaphorical, iThemba's and South Africa's place 'on the map' matters. For the bench scientists involved, the project is rooted in personal experience, a sense of democratic citizenship, and the complicated promise of working at 'home'.

Conclusion: the world is not easily bifurcated, but it still matters who makes knowledge and where

Africa is routinely situated as a vital site for global health, but it is very rarely situated as a vital site of global science. Indeed, given the infamous HIV denialism of key South African leaders early in the post-apartheid era, it has sometimes been situated as its antithesis. Yet, the phenomena of the crisis of AIDS and of HIV denialism are inextricable from South Africa's violent legacies of apartheid (Fassin, 2007) and then structural adjustment (Cooper, 2008). This is part of why knowledge production in South Africa is high stakes: the place of IP has always been assumed to be the Global North, and if that collocation can be unraveled, it shifts the place of science in postcolonial orders.

Consideration of this case illuminates the limitations of global health discourse that posits the Global North as the unique site of knowledge-making. There are many efforts globally to create new places of pharmaceutical knowledge-making – the biotechnology industry in Cuba provides a particularly relevant model of a socially aware effort to change this mapping (Reid-Henry, 2010) – and this South African effort is a distinctive complement. With the business models of Big Pharma in transformation (Pollock, 2011), there may be many new opportunities amid the flux.

This case also provides a concrete opportunity for the consideration of postcolonial science. Scholars in postcolonial anthropology have been increasingly interested in

subverting traditional epistemological hierarchies that see the Global South as the source of raw materials and local knowledge, whereas the Global North is the source of transcendent knowledge – Jean Comaroff and John Comaroff (2011) ask whether, in many aspects of capital and state forms, it might be that 'at the present moment, it is the Global South that affords privileged insight into the workings of the world at large' (p. 1). The nature of the organization of scientific research is changing, and forms developed in the Global South are relevant on their own terms and because they may suggest future forms of the organization of global science. This South African drug discovery effort provides an opportunity to explore emerging models of knowledge production and new global flows of research and development capital.

Post-apartheid South Africa is a particularly rich site for the analysis of the allure and the difficulty of the creation of *science* (universally applicable knowledge) that is *democratic* (accountable to particular publics). Whereas in the early 20th century, there were aspirations that science could unite white South Africans across ethnic divides as they contributed to the 'commonwealth of science' (Dubow, 2000), in the early 21st century, South African science is at once more marginal globally and more inclusive nationally and regionally.

To the extent that iThemba is successful in making compelling claims on both South African publics and those of global science, the African scientists become, like the African American geneticists described by Alondra Nelson (2009), 'bio-culture brokers': they deploy 'authentic expertise … available to them as minorities and community-minded professionals' (pp. 742–743). They position themselves as native speakers of two discourses, global science and African democracy, uniquely situated to make the former accountable to the latter.

The scientists at iThemba are good examples of what Warwick Anderson calls 'conjugated subjects'. The scientists at iThemba are not a good fit for a postcolonial project in Sandra Harding's terms, which would seek the hopeful recovery of 'Third World' standpoints (Harding, 2011). The project has little potential to inspire any 'romantic vision of ethnoscience' (Anderson, 2009: 389). The knowledge is being made in a postcolonial context, but it is discovery not recovery, and not subjugated knowledge. Anderson compellingly argues that STS scholars should pay more attention to postcolonial hybridity (Anderson, 2009: 389); what Homi Bhabha (1994) might flag as their mimicry of colonial forms is patently hybrid.

Analysis of iThemba complements postcolonial analyses of projects by and for scientists from the Global North that are problematically situated in particular places in the Global South (Redfield, 2000), often making claims from inextricably colonial perspectives (Reardon, 2004), and foregrounds ways in which postcolonial perspectives and scientific perspectives are not necessarily opposed to one another.

As noted at the beginning, so far, iThemba has not actually produced any drugs. The English meaning of iThemba, 'hope', is of a piece with R&D generally – an Accounting professor at my university in the United States likes to say that 'R&D means hope'. iThemba's project is aspirational more than actual, yet this article has shown that the aspirations themselves are worthy of consideration. We can acknowledge that the terrain of IP-making is deeply stratified without accepting Africa's exclusion from it as a permanent state of affairs. To understand center/periphery relationships in global research

collaboration today, dichotomous understandings continuous with colonialist discourse are necessary but not sufficient (Hwang, 2008). At iThemba, the global legitimizes the local and vice versa, such that the global and local grow at the same time. The twin obligations to the global and the local are in productive tension.

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Notes

1. At the time of writing, iThemba Pharmaceuticals has just one rival in South Africa, a company called H3-D, which is based at the University of Cape Town campus. That company also relies on international partnerships on a somewhat different public–private model (Nordling, 2013).
2. 'Emory Law's Conference celebrating the 60th Anniversary of the Universal Declaration of Human Rights: Advancing the Consensus', 18 October 2008. Panelists: Dr Dennis C. Liotta, Professor of Organic Chemistry, Emory University; Todd Sherer, Director, Office of Technology Transfer, Emory University; Sherry M. Knowles GlaxoSmithKline.
3. This argument operates on the widely held view that high drug prices in the Global North are due to the high cost of research and development rather than to what the market will bear, an idea that I explore elsewhere (Pollock, 2011).
4. See http://essentialmedicine.org.
5. In a report dated December 2012, the Grant Map on the Gates Foundation web site listed the countries receiving grants as follows: North America 662; Europe 149; Asia 75; Oceania 48; Africa 36; South America 16. http://www.grandchallenges.org/Pages/GrantsMap.aspx (accessed January 30, 2013).
6. The history of the local and global pharmaceutical industries in South Africa under sanctions is a complicated one (Akermann and Kermani, 2006; Sethi and Williams, 2000).
7. Relatedly, there was also a government lab doing drug discovery research there, CSIR Biosciences, with which iThemba pooled resources early on. CSIR Biosciences has since ceased drug discovery work and moved to Pretoria.

8. For discussion of these two strains of pharmaceuticalization literature, see Bell and Figert (2012).
9. This is analogous to the African American clinician/researchers who I have written about previously (Pollock, 2012).

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