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KEYWORD

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Abstract

Vernacular discourse about science reveals theorizations of it as a power-laden, morally charged experimentation with the world guided by (often implicit) ethical orientations. Applying these vernacular theorizations to interpret professional class science on the continent, the author argues that this science has been shaped most profoundly by the politics of independence. While indigenous projects, European imperialism, and neoliberalism shape scientific institutions, African independence continues to inform the moral and political ends toward which science is thought to work. Understanding the alignment of professional class science with nation-building can help guide the recalibration of science toward the goal of substantive independence.

Résumé

Le discours vernaculaire sur la science révèle des théorisations de la science comme une expérimentation du monde chargée de pouvoir et de morale, guidée par des orientations éthiques (souvent implicites). En appliquant ces théories vernaculaires pour interpréter la science des classes professionnelles sur le continent, l'auteur affirme que cette science a été profondément façonnée par la politique de l'indépendance. Alors que les projets indigènes, l'impérialisme européen et le néolibéralisme façonnent les institutions scientifiques, l'indépendance africaine continue d'influencer les objectifs moraux et politiques vers lesquels la science est censée travailler. Comprendre l'alignement de la science de la classe professionnelle sur la construction de la nation peut aider à guider le recalibrage de la science vers l'objectif d'une indépendance réelle.

Resumo

O discurso vernacular acerca da ciência revela teorizações segundo as quais este conceito corresponde a uma experimentação com o mundo plena de energia e de carga moral, orientada por considerações éticas (muitas vezes implícitas). Através da aplicação destas

teorizações vernaculares para interpretar a ciência profissional no continente, o autor defende que esta ciência foi profundamente formatada pelas políticas da independência. Ao mesmo tempo que os projetos indígenas, o imperialismo europeu e o neoliberalismo condicionam as instituições científicas, a independência africana continua a informar os fins morais e políticos para os quais se acredita que a ciência deve trabalhar. A compreensão do alinhamento entre a ciência profissional e a construção das nações pode ajudar a orientar a recalibração da ciência rumo ao objetivo da independência substantiva.

Keywords: science; nation; knowledge; expertise; vernacular; independence

Mots-clés: science; nation; savoir; expertise; vernaculaire; indépendance

To approach science as a keyword for African studies implies an evaluation of the practices through which knowledge in (and about) African societies is produced, interpreted, and responded to, as well as the political and moral implications of that knowledge production. Furthermore, it requires a unified analytical approach to studying both the kinds of science that takes place in formal scientific institutions and those forms of expertise not sanctioned by the state and its allies.[1] Science has already been the subject of keyword analyses. Raymond Williams ([1976] 2014) traced how the term—which once implied theoretical knowledge of a subject—came, by the nineteenth century, to refer almost exclusively to the use of experimental methods to produce knowledge about nature. Subsequent keyword analyses have responded to the imperative articulated by historians to ground peripatetic science in its regional and institutional contexts (see Anderson 2002; Livingstone 2003; Chambers and Gillespie 2000).[2] Yet, even as these same normative understandings of science circulate in African contexts, past analyses of science as a keyword are insufficient for working out the implications of the term for African studies. Science as a keyword carries a distinctive set of stakes for African studies scholarship. Indeed, the very categories of "science" and "Africa" have been shown to be deeply entangled: the continent has served as a generative site for the production of knowledge and even the reinvention of the sciences at the same time that discourse about science has explicitly involved claims about Africa.[3] For this reason, the core definitional problems of the social study of science are heightened when studying science on the continent. What counts as science, what constitutes its major features, and what kinds of consequences are tied to its practice are up for grabs for both scholars and the public.

My research on scientific herbal medicine in Ghana has in some ways been organized around the investigation of a keyword in Raymond Williams' ([1976] 2014) sense. It's been an inquiry into a word that is infused with a particular, though complex, set of values and affects. And the association of these values and affects with this word has an apparent social history. In particular, I've been concerned with understanding the meanings associated with the category of science in the classrooms and laboratories that form the ostensible centers for the creation of scientific herbal medicine in Ghana, as well as meanings that circulate outside of the conventional academic institutions that lay claim to the term. Investigating science in sites dedicated to herbal medicine therefore opens up the term to broader swaths of social interaction, meanings, and relations,

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underscoring the importance of recognizing knowledge-production outside of conventional academic institutions. Understanding the keyword science for African studies requires grappling with the meanings associated with science both in and out of state-allied institutions as well as its political and ethical significance on the continent.

In this article, I offer a methodological approach for analyzing science as a keyword, as well as an argument about the ethical underpinnings of scientific practice. The first half of the article offers a methodological approach meant to reorient understandings of science by centering vernacular theorizations of science located in everyday life. Using African vernacular practice and discourse as "modes of theory" (Mavhunga 2017b, x) to interpret science offers an alternative to locating definitions of science in either state-affiliated institutions or particular ethno-linguistic traditions that may also be involved in governing its meaning.[4] Instead, this approach emphasizes how modes of knowledge production and authority are flexibly reinterpreted in the experiences of a broad collective of people and draws on these experiences to theorize the category of science.[5] I begin by considering vernacular discourse about science in relation to African religious and healing traditions. Guided by recent literature on the topic (Neely and Meek 2024; Crosson 2020; Falen 2018), I show that attending to popular theorizations of science outside of the formal institutions validated by the state leads to an understanding of science as a power-laden, morally charged experimentation with the world. This approach to understanding science requires developing a sensitivity to the often-tacit ethical underpinnings that guide science.

The second half of the essay applies this vernacular theorization to interpret the professional class practice of science as it obtains within universities and research institutions. Doing so reveals a formation of science shaped most profoundly by the politics of independence. Guided by recent books concerning the construction of scientific institutions in postcolonial Africa (Osseo-Asare 2019; Mika 2022), I argue that state-affiliated scientific institutions are part of a project for shaping the postcolonial world, albeit one that may be captured by a number of interests that work against collective emancipation. Remaining sensitive to the political salience of professional class science, as well as the values that inspire its practice, offers opportunities for evaluating how well scientific institutions have lived up to the expectations of independence, as science, and scientific independence, remains relevant to African populations (see Ake [1979] 2003; Hountondji 1990; Ela 2006). Following vernacular theorizations of science (that is, inquiring into the moral and political foundations of science as an active process of intervention), allows for a reckoning between scientific institutions and their own values.

Vernacular theorizations of science

In this section, I examine vernacular discourse about science in order to better appreciate popular theorizations of knowledge production that are too often ignored. By vernacular discourse, I refer to everyday talk and action that reflects on the boundaries and defining characteristics of science. Some of the theorizations of science under consideration here may overlap with systems of expertise governed by institutions (whether these be institutions recognized by the state

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or those glossed as "traditional"), but the focus here is on understanding how relevant understandings of expert knowledge have been taken up in quotidian experience. I am guided in this inquiry by three recent publications that analyze the category of science as it is involved in practices of healing and harming outside the spaces of biomedicine. A remarkable recent article by Neely and Meek (2024) interrogates the consequences of rethinking science from the kind of everyday experiments carried out in the home and homestead. Having encountered assertions that their interlocutors' experiences with witchcraft were happening within, and not outside of, "the world of science and technology," Neely and Meek (2024, 2) therefore propose to theorize science from everyday domestic experimentation. Likewise, Crosson (2020) describes how practitioners of what gets called obeah in Trinidad understand their spiritual work as experiments with power accurately described by the term science. Falen's (2018) book, *African Science*, is a study of the Fon-language categories of *àzê* and *bô* in Benin. These are typically translated into English as "witchcraft" and "sorcery" (a distinction not present in French), but are also sometimes understood as "religion," "magic," "technology," "occult," and so on. While àzê and bô are therefore described using a number of words, they are most frequently invoked as constituting a distinctively African science. Taken together, these works describe vernacular theorizations of science that emerge from collective lived experience. While these theorizations of science are not identical, this collective lived experience leads to understanding of science as a form of engaged experimentation with significant, situationally dependent moral stakes.

Importantly, this work is doing something different from staking a position in the twentieth-century rationality debate, in which "African traditional thought" was interrogated for its relationship to "Western science" (Evans-Pritchard 1976; Horton 1993; Appiah 1992; Gyekye 1995; Wiredu 1996; Hountondji 1983; see also Malinowski 2022 [1948]; Good 1994). Parts of this wide-ranging scholarship doubtlessly offered complex considerations of expert knowledge that is typically excluded from the category of science. However, much of this work lacked what Latour (1987) called symmetry, by prioritizing comparative questions about the particularity of traditional thought over sustained reassessments of hegemonic understandings of science or biomedicine (but see Good 1994). If the logic was that of (asymmetrical) comparison, the object was epistemology; scholars sought out differences and similarities between epistemological systems and offered hypotheses about their potential relationship (hierarchical or otherwise). Rather than compare African traditional thought with science, recent work in African studies seeks to theorize science by centering expertise gained outside of the context of formal scientific institutions.

Working with the vernacular theorization of science described by these authors means taking those extra-institutional practices often labeled as science to be science, and examining what this means for science practiced in other locales as well. However, if none of these authors are concerned with distinguishing "science" from its others, neither is the point to offer a liberal process of inclusion that would merely expand the category of science to incorporate a broader set of practices (Crosson 2020, 6). Rather, they each rethink science as

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cultural practice from new places and practices that challenge hegemonic depictions. For example, Crosson argues that the racialized exclusion of African spiritual practices from both "religion" and "science," as suggested by anthropologists like Malinowski or Horton, is part of making these categories into universals apparently detachable from specific socio-historical circumstances (Crosson 2020, 9; see also Asad 2003). In contrast, taking spiritual work understood as obeah seriously as a practice of science leads one to insist on the embeddedness of all scientific practice in particular worlds. Understood in this way, science is "a situated practice of partially articulating divergent epistemic communities, paradigms, and forms of existence to address specific problems" (Crosson 2020, 19). Incorporating more methods and engaging more entities than are often recognized, science does not imply a particular epistemological stance that morally elevates it above other manners of interrogating the world. Similarly, Falen is less interested in working out differences between categories of magic, science, and religion than he is in understanding how Beninese interlocutors understand, deploy, or challenge those categories. Out of this consideration emerges a consideration of àzê as the universal category within which phenomena labeled as science, technology, religion, or moral philosophy might be located (2018, 3). Put differently, when Trinidadian or Beninese lay experts describe obeah or àzê as science, they are equally making claims about the nature of the kind of science that occurs in universities and laboratories.

Following this vernacular theorization of science also means avoiding an overly narrow focus on epistemology. It's not all about belief. Neely and Meek (2024), for example, build on the work of Helen Verran, Stacey Langwick, Laura Foster, and others who center ontological and moral questions regarding entities and their relations rather than only questions of epistemology. The forms of healing that are the subject of vernacular theorizations are more than windows into ways of knowing. They are also worldmaking practices that experimentally intervene in and co-construct the world. Taking healing practices as a guide, science appears to be more diverse than it was understood to be by many of those engaged in the rationality debate. Rather than a totalizing, universal form of knowledge production, it is a partial, situated practice of helping to render the entities on which it acts (Neely and Meek 2024, 16). What emerges from such an investigation is less a picture of African epistemological orientations than a recognition of differently arranged set of beings involved in the practice of science.

The most critical point that I draw from vernacular theorizations of science is that thinking science from such practices leads to an understanding of it as a morally and politically charged form of intervention. It is, as the spiritual workers who spoke with Crosson and Falen explain, often an esoteric practice that can be used to beneficial or harmful effect (like say a knife or a bomb could be [Falen 2018, 64]). While àzê is most typically described as an evil force, deeper discussions on the topic suggest a certain moral ambivalence regarding the deployment of its destructive power. Some Beninese suggest that àzê may be oriented toward justice (Falen 2018, 51–61). A key example comes from Trinidad in the midst of the 2011 state of emergency called in response to rising murder rates. At the same time that lower-class Black men from southern Trinidad were cast as thugs or

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even demons in the national media discourse, their popular association with obeah operated as both a source of stigma and power that could be used toward finding justice. Observers claimed that it was obeah—the potential harms that could be unleashed by expert experiments with power—that led to the police being held accountable for the murder of three people, an act they might otherwise have committed with impunity (Crosson 2020, 1–2). Obeah and àzê in these accounts represent science as a set of instruments for achieving justice beyond the framework of political liberalism that so often envelops the science of laboratories.

Another example of how popular scientific practices can, in contrast to the science occurring in formal scientific institutions, operate as forces for achieving justice beyond the framework of liberalism comes from James Smith's (2022) study of artisanal mining in the eastern Congo. Smith (2022, 96–102) describes how local armed groups known as Mai Mai are understood as drawing on and generating scientific knowledge to be used in their defense. Comparable with but ontologically alternative to the technoscience arrayed against them, the science of Mai Mai is rooted in the life of the forest such that it manifests as a holistic war of the forest—including the plants and animals that live in it—against invading forces. This forest knowledge is transmitted to Mai Mai fighters by ancestors, but it also exceeds what is normally understood as "traditional knowledge" by departing from traditionally governed systems of authority. Instead, Mai Mai understand themselves as ecologists or scientists who experimentally fuse together knowledge traditions from across ethnic groups to create new forms of practice (Smith 2022, 99). Mai Mai science is therefore different from the science weaponized in defense of the liberal world order and the ongoing colonial domination of the Democratic Republic of Congo. In the rhetoric of Mai Mai, it is used in service of a territorially localized rebellion. When carried out by people whose lifeways are the target of governmental power, popular experimental practices may furthermore be examples of what Britt Rusert (2017) has termed fugitive science. In opposition to the science of the state or of transnational assemblages, fugitive science escapes or otherwise counters hegemonic systems of power-knowledge, as when rural Tanzanians cultivate experimental expertise in evaluating and modifying pharmaceutical drugs (Meek 2023, 2024). These popular forms of science are integrated into social relations not governed by liberal political institutions and are therefore oriented to other kinds of justice. This is not to say that science has an inherent moral orientation, such as is suggested when science is construed as a vehicle of progress and enlightenment (or, conversely, when it is associated solely with pernicious dimensions of modernity). While these manifestations of science can be used to empower the weak, even its advocates understand that they can just as easily be misused (Crosson 2020, 20–21).

If vernacular theorizations of science emphasize that it is a moral and political practice with undetermined effects, it also makes the point that both the characterization and practice of science are linked to racial and cultural identity. The discourse of *science* and the category of *Africa* appear complexly intertwined and mutually constitutive. As Crosson carefully delineates, while practices labeled as obeah are often described as African in Trinidad, the Orisha, Caribbean

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Spiritual Baptist, and Trinidadian Kabbalah traditions that inform these practices each invoke a non-identical Africa. Falen, in particular, considers discourse in which expert spiritual practice is understood as "African science" related to but non-identical with what then gets called "Western science." The phrase "African science" is noted in a wide range of contexts. I've encountered this phrase being used among professional scientists in Ghana (Droney 2014), while Adam Ashforth (2005) notes its use in South Africa. The phrase was used to describe mystical techniques deployed during the Liberian War (Ellis 2001) and the use of witchcraft in Ghana (Akrong 2007). Falen's Beninese interlocutors frequently made analogies between "European witchcraft," which included things like cell phones and airplanes, or more pertinently guns and bombs, and "African science," which included spiritual expertise.

Several things could be said about this kind of discourse. Based on my own encounters with it in Ghana, use of the term African science can span a wide range of meanings. In a Ghanaian plant medicine laboratory in which I spent time, the phrase was used to describe localized improvisations made in underfunded laboratories rather than spiritual expertise (Droney 2014). Related phrases such as "African electronics" could be used to dismissively describe spiritual expertise, but were sometimes used as part of earnest interrogations of conceptual categories. Among the professional classes, psychotherapy and atomic physics were more commonly used as analogies to describe spiritual powers (see Tilley 2010; Allman and Parker 2005). This discourse presented African expertise in spiritual power as carrying its own distinctive insights and capacities that were equivalent if not related to practices occurring in formal scientific institutions. This is consistent with published theorizations of African science. Nwankwo Ezeabasili's book *African Science* (1977) and Jonathan Chimakonam's *Introducing African Science* (2012) each argue for the existence of a distinctively African form of science, which, Ezeabasili argues, shares the methodological approaches with Western science but proceeds from different metaphysical starting points. African science, in this usage, demonstrates its explanatory power and efficacy in life experiences rather than the controlled conditions of the laboratory. For these reasons, Ezeabasili argues, African science can sense realities easily overlooked by conventional experimental methods carried out according to Western metaphysical orientations. While these practices of comparison and equivalence can vary, one point that is clear throughout these cases is that the term "African science" can be a fulcrum for the construction of Africa as a category.

This vernacular theorization of science also underscores the way in which science is racialized. Neely and Meek (2024) make explicit the racialized stakes of defining science: treating as universal the definition of science endorsed by scientific and biomedical institutions reproduces hegemonic whiteness.[6] Crosson (2020), too, examines how the constitution of obeah as an Other to both science and religion operates through a racialized logic. Falen shows, furthermore, how the discourse about African science involves implications for the understanding of African and European identities. Falen's interlocutors associate African epistemological standpoints with particularly efficacious knowledge and insights (Falen 2018, 8). At the same time, popular discourse about African science in Benin sometimes draws upon anti-Black tropes, which Falen (2018)

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reads as evaluations of the structural, global systems of inequality in which African epistemological practices are situated. The image of African science that emerges is one in which expert practitioners operate in a racialized global and national context that devalues their knowledges and skills.

This is not to say that the interlocutors who theorize science in the work of Crosson (2020), Falen (2018), and Neely and Meek (2024) draw an equivalence between laboratory science and their own experiments. At times they point out epistemological differences between the science practiced in their homes and the science practiced by university denizens in white coats, particularly when it comes to the latter's emphasis on controlling conditions and generating proof (Crosson 2020, 223; Neely and Meek 2024). Critical literature on science and its relationship to epistemological practices labeled as its others can take a number of different positions on the translatability of the category of science across difference. Clapperton Mavhunga, for example, has emphasized centering indigenous African vocabularies for conceptualizing science and technology. This perspective demonstrates the ways in which recognizable, state-centered science carries cultural features allied to colonial endeavors and is often dependent on indigenous knowledge (Mavhunga 2014; 2018). Beginning with the Shona word *ruzivo* rather than the English word science refuses the Eurocentrism of extant scholarly literatures (Mavhunga 2018, xiii). However, African-centered approaches to the category of science may sometimes insist on translating across traditions of expert knowledge, while other times pointing out their incommensurability. Mavhunga applies concepts normally associated with hegemonic representations of science to describe ruzivo as operating through a process of peer review, while pointing out that it proceeds with communal rather than individualistic modes of evaluating knowledge production (Mavhunga 2017c). Shadreck Chirikure (2017) likewise takes precolonial spaces of knowledge production as "laboratories without buildings" in order to better apprehend indigenous African knowledge systems without the need to subordinate them to normative representations of science. Finally, boundary-work around science and its others need not necessarily center Euro-centric definitions of expert knowledge, but may reflect other means through which elites in a society may define legitimate knowledge (Marcus-Sells 2022, 3).

Rather than an enterprise synonymous with the triumph of modernization or the practice of a circumscribed kind of rationality, science is an experimental practice that does things in powerful, if often esoteric, ways. While not all traditional science and technology studies are well equipped to analyze science in African contexts, we can follow the vernacular theorization of science to lead us toward some parts of the theoretical resources offered by science studies over others (Neely and Meek 2024, 11–16). In this vernacular theorization, science is understood as an array of embedded practices, themselves diverse (Stengers 2010; Cartwright 1999, 2022). Science is a performative practice of experimentation with and in the world (Hacking 1983; Mol 2007). Actively engaged in relations of power, science produces new ethico-political relations (Barad 2007). In this sense, science is morally charged (not a neutral tool), but also morally ambivalent (Haraway 1990). In other words, the practice of science can be understood as an experimental practice characterized by its relationship with

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projects (see Droney 2024); it is a transformative engagement with the world that is defined by its (often implicit) foundational ethico-political orientations. It is materially engaged in bringing about desired yet speculative arrangements. These vernacular theorizations therefore offer a more accurate and productive depiction of science than that suggested by scientistic discourse fetishizing the laboratory (Crosson 2020, 227–33). For these reasons, vernacular theorizations provide a basis for evaluating those forms of science most at home in laboratories, clinics, and universities.

The projects of professional class science

I find it useful to extend these arguments, which have rethought the category of science from sites located outside of its ostensible centers, and use them as a lens to investigate those practices institutionally authorized to carry the label science. Beginning with a model of science developed above (diverse, underdetermined, morally charged practices of experimental intervention), this section turns its focus on science, sometimes referred to as "Western" or "modern" science, that has been constituted as "professional," practiced by those who by definition hold a privileged class position and have been validated by governing institutions. Professional class science is more diverse even than conventional distinctions like "laboratory," "field," "basic," or "applied" typically let on. Still, it is unified by complex institutional assemblages that train, fund, and provide oversight for the professionals who carry it out. These institutional systems of credentialing and validation necessarily involve the creation of expert positions and a consolidation of professional class authority.

Acknowledging that professional science has contributed to the consolidation of power by elites and sometimes furthered political programs at odds with public interest does not, however, give a satisfying explanation of the ethical projects guiding professional scientists. It, in fact, prompts a question: if science is best understood as a project engaged in enacting and producing the world in an ethically charged manner, what kinds of projects motivate the practice of professional science in Africa? What makes professional class science appear as a meaningful endeavor for those who dedicate their careers to it? Certainly, professional class science has been organized around a number of distinct and seemingly contradictory political programs. As Beinart and Dubow (2021) demonstrate in their history of the scientific imagination in South Africa, professionalized science has been joined to the imaginaries of the British empire (see also Breckenridge 2014), Afrikaner nationalism (see also Dubow 1995), and postapartheid democracy (see also Pollock 2019). It is my contention that what gives professional class science its most powerful sense of political mission and therefore shapes the ethos of its practitioners is its association with African independence and the process of nation-building. Moral understandings of the good postcolonial society form an often-implicit set of goals toward which professional class science can be oriented and against which it may be evaluated.

Interpreting professional class science in relation to indigenous African projects, colonialism, and neoliberal reform may help clarify why I argue for the

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centrality of independence and African nationalism for contemporary scientific careers. Few today argue that professional science in Africa continues along the trajectories established in the precolonial period. Is it so unrealistic to claim that African scientists have adapted a globally circulating institutional form to further an indigenous set of projects? Of course, it has long been recognized that precolonial African expertise made significant contributions to the global development of science (see Diop 1974; Poskett 2022; Raju 2009; Harding 1998). With the rise of the Atlantic world system, knowledge generated by Africans became integral to political economic and medical systems across the diaspora, even as the sources of this expertise were repressed (Carney 2001; Schiebinger 2007, 2017; Schiebinger and Swan 2005). Indigenous expertise has likewise impressed itself on any number of colonial and postcolonial institutions. Colonial knowledge regimes very often relied upon and incorporated indigenous expertise (Mavhunga 2014, 2018; Hunt 2006, 2016; Tilley 2011; Jacobs 2016), while many independence-era governments claimed a continuity between precolonial indigenous projects and nascent national institutions (Mavhunga 2017b; Nkrumah 1962). The development of industry has likewise been shaped by indigenous scientific traditions. Much of West Africa's mining economy has been built upon a regional, millennium-old mining tradition (D'Avignon 2022), while metallurgists have continued to innovate metalworking techniques (Osborn 2009, 2016). Nevertheless, scholarship has emphasized the more pressing point that professional class science is often more integrated in elite global networks than it is with the daily life of African people (Ela 2006). So, while the expertise produced by precolonial scientific traditions fed the development of state-allied scientific institutions, projects defined within an indigenous cultural framework are not empowered to guide whose work.

It is much more common for scholars to point out the ways in which professional science served the colonial project and how it continues to be characterized by its coloniality. Indeed, though European systems of scientific governance were built upon African expert knowledge, they weaponized science against the colonized. Scientific research contributed to the European scramble for colonies in Africa, with exploration and proposed scientific stations facilitating governmental power and the acquisition of territory (Tilley 2011, 31–68) even as the official representations of science that emerged belied the actually practiced science of the European scramble (Fabian 2000). With this constitution of Africa as an imperial laboratory, scientific discourse and medical practice became part of a power/knowledge regime that constituted the category of Africa (Mudimbe 1988) and "the African" (Vaughan 1991), rendering African nature and culture as objects of colonial governance. Science played a key role in the racializing assemblage that disciplines Africans and people of African descent into a status of less than fully human (Weheliye 2014; see also Wynter 2003), approaching rural Africans as vermin beings (Mavhunga 2011) or as animals to be owned or domesticated (Mbembe 2001). The sciences were integral to what Mavhunga calls the "deintellectualization" of Africans, taking them as objects of study rather than active participants in the production of knowledge (Mavhunga 2018, 13; see also Mafeje, 1998). Broad-stroke political rhetoric about science often constructs a subservient place for Africa within shifting techno-evolutionary narratives.

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Whether it is the industrial revolution (Adas 1989), the nuclear age (Hecht 2012), or the digital age (Smith 2022), Eurocentric discourse misrecognizes and misconstrues African expertise to present the continent as seemingly out of time with the global North (Fabian 1983). Another body of scholarship has contested the suggestion that science is universally aligned with colonialism. Tilley (2011) argues that scientific practice in colonial Africa necessitated an attention to site-specificity, complexity, and multiple sources of knowledge that worked as a counterpoint within the imperial endeavor, while studies of European scientists in the context of imperialism have likewise contested the idea that scientific careers could be reduced to their coloniality in a simple way (Beinart, Brown, and Gilfoyle 2009; MacLeod 2000; Monnais and Tousignant 2016; Beinart and Dubow 2021). Nevertheless, the major thrust of analysis has been to point out the continued coloniality of science in postcolonial Africa.

Collectively, this work demonstrates the ways in which institutional science operates as transnational ideology reflecting the interests and predilections of the (African and non-African) elites who practice it (Ela 1994, 2006). The "scientific dependence" characterizing postcolonial African scientific institutions is a feature of the broader structure of economic extraversion (Hountondji 1990; see also Rodney 1972) in which the bourgeois liberal epistemologies of the social sciences have particularly served an ideological function (Mafeje 1971, 1976). This has been most clear in the complicity of professional science with neocolonial development programs. Indeed, insofar as it promotes Eurocentric capitalist values and institutions, development-oriented social science has operated as ideology, contributing to the dependency of African societies within Euro-American dominated political economic systems (Ake 2003; Mafeje 1978). The associated development industry relies on technologies of inscription and representation that obfuscate the politics of development to further neoliberal rationalities of governance (Rottenburg 2009; see also Ferguson 1994). Joeva Rock's *We Are Not Starving* (2022) offers a particularly illustrative example of the coloniality of science as it is constructed in relation to agricultural development. Advocates of genetically modified crops present them as urgently needed humanitarian gifts from the Global North poised to relieve a beleaguered continent from supposedly enduring conditions of food scarcity. However, to import genetically modified crops Ghana had to create a regulatory framework that would govern them in accordance with the Cartagena Protocol on Biosafety (Rock 2022, xiv), a bureaucratic transformation resulting from the coordinated influence of philanthropic foundations, transnational corporations, and the governments of Northern nations (Rock 2022, 35–62). Opposition to the neocolonial political economic system within which genetically modified crops are situated is constructed as being "anti-science." Supporting "science" in this scenario means ceding national sovereignty while accepting a subservient position for African producers within the corporate food regime.

In addition to development enterprises, global health likewise demonstrates the continued coloniality of the sciences. Global health forms a distinctive and in some ways novel epistemological assemblage that brings knowledge production into new, neoliberal forms of global governance that stand in tension with the sovereignty of nation-states (Adams 2016). Oni-Orisan's analysis of maternal

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mortality statistics clarifies how Nigerian states are compelled to evaluate their own success through the application of metrics measuring their progress toward achieving the Millenium Development Goals. Local sovereignty is, as she puts it, "tethered to the numbers games that arrive with global health grant-giving organizations" (Oni-Orisan 2016, 85). In addition to the incentives to create misleading data that Oni-Orisan documents, global health data become persuasive when they are scaffolded by previously existing cultural narratives (Biruk 2018), often reifying preexisting understandings of, for example, diseases like malaria as a bounded problem addressable by a technological fix (Tichenor 2017). Even when developed through a democratic, multi-stakeholder process, the "vast programme of metricization" (Rottenburg 2024, 16) represented by the Sustainable Development Goals lays the foundation of an emergent epistemic infrastructure and global public policy paradigm (Tichenor et al. 2022) that manifests new tensions with political models organized around national sovereignty.

It is no refutation of these critiques to argue, as I do, that it is the political aspirations associated with African independence that most shape the imaginaries surrounding the practice of professional science, motivating the people who dedicate their careers to it. Two recent histories of scientific institutions in Africa are particularly instructive: Marissa Mika's *Africanizing Oncology* (2021), a history of the Uganda Cancer Institute (UCI); and Abena Dove Osseo-Asare's *Atomic Junction* (2019), which chronicles the Ghana Atomic Energy Commission. Each book documents institutions founded in the 1960s and traces the practices that kept them going in the decades that followed. Together, these books demonstrate that understanding the history of scientific research requires also understanding the purpose and mission guiding the work required to build, maintain, and repair institutions. Both books describe work across multiple generations of researchers that sometimes transcend national boundaries, all the while maintaining a focus on developing institutional capacity in researchers' home countries. As Osseo-Asare documents, the work of establishing the Ghana Atomic Energy Commission, acquiring a research reactor, and developing concomitant institutions was animated by nothing less than an Afrofuturist vision of postcolonial Ghana and scientific ethos to match. Kwame Nkrumah and the engineer Robert Patrick Baffour laid out a vision of a nuclear Ghana in which gaining access to the means of doing nuclear science was part of broader efforts to achieve national equity and racial equality.

Catalyzed in part by opposition to imperial France's nuclear weapons tests in West Africa, the Nkrumah-era vision for the development of nuclear science in Ghana hinged on the development of a robust scientific workforce. It is this investment in Ghana's human resources, framed as a nationalist and anti-imperialist endeavor, that has allowed for the continuity of the independence-era vision across periods of political and economic instability after the 1966 coup that removed Nkrumah from office and suspended his plans for nuclear development. Even as the state deprioritized the nuclear program, professionals continued their work to realize the "afterlife of Nkrumah's dream" (Osseo-Asare 2019, 73; see also Geissler and Tousignant 2020 on dreams) by studying in the USSR and the US and pursuing careers with institutions like the International Atomic

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Energy Agency (IAEA), national nuclear programs in France and the UK, as well as building collaborations in China. That this work was sustained across five decades is the result of intentional efforts to pass expertise on to new generations, represented most clearly with the founding of the School of Nuclear and Allied Sciences in the early twenty-first century (Osseo-Asare 2019, 74). Even as nuclear science increasingly shifted toward interdependence with the international community, science was practiced with the goal of achieving equity in both domestic and global affairs (Osseo-Asare 2019, 3–4).

Marissa Mika's *Africanizing Oncology: Creativity, Crisis, and Cancer in Uganda* (2021) likewise underscores the ethos defined by the politics of independence that has driven the postcolonial history of the Uganda Cancer Institute. The UCI was founded in 1967 through partnerships with the US National Cancer Institute, Makerere University, and the British Empire Cancer Campaign. More recently, it has continued its work through relationships with the Fred Hutchinson Cancer Research Center, which led to the construction of the UCI-Fred Hutch Cancer Center. Mika's history shows that underneath the latticework of institutions and their memoranda of agreement, the careers of Ugandan oncologists dedicated to better research and improved medical care in their home country have seen the UCI through its more than fifty-year history. The work of Africanizing oncology—making it a part of medical practice in independent Uganda—began during the period of its administration by British and then American expatriates (Mika 2021, 42–60). It was then that practicing oncologists learned to accommodate entire families rather than individualized patients and adapt colonial-era techniques to new goals. Mika shows how creative acts of maintenance and repair kept the UCI going through subsequent years of military dictatorship, civil war, and economic austerity, allowing the UCI to access new resources in recent years.

One aspect of the work that it took to build, maintain, and eventually expand the UCI that I wish to highlight here is the way in which this work constituted a project held dear by the professionals who dedicated their lives and careers to it. Ugandan physicians who remained in Uganda through the 1970s did so as a way "to keep the national interest at heart. They were committed to serving and caring for Uganda: the people, the patients, the landscape, the national project" (Mika 2021, 69). Indeed, as an institution the UCI was distinctively national in scope, even when political events including the Ugandan civil war drove a tendency toward regionalism in the country (Mika 2021, 48). In addition to their loyalty to the mentors who had trained them (Mika 2021, 69), researchers were motivated by a fidelity to the Ugandan public that had funded their education. Also, Uganda was home (Mika 2021, 70). Just as importantly, though, in neither of these cases was science subsumed by nationalist goals. The work remained focused on the production of good science, productive collaboration, and quality medical care, which would themselves serve the nation.

If science is made meaningful because it is part of a morally charged project of experimenting with the world, it is the project of creating the nation that has most given shape to scientific institutions and careers. While some see the embrace of the nation-state by the planners of African independence as ultimately a triumph of European imperialism, this view belies the transformative vision at the heart of the anti-colonial political program (Getachew 2019). These

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projects are without a doubt also racial ones: African scientists have worked to challenge the whiteness of the sciences, applying what Jemima Pierre (2012) identifies as a postcolonial racial project to academic knowledge production. To the extent that nation-building was also about using national sovereignty to contest global white supremacy and create a new, more egalitarian and just class system, then science has been infused with these meanings as well. It is this ethos that continues to animate the professional sciences today; the benefit of science for the development of the nation is often taken as self-evident, and contribution toward this collective aim lends greater significance to individual careers.

It would be misleadingly optimistic to ignore the ways in which the professional class project of nationalist science has been derailed by political economic instability, the decline of the development state, and the related neoliberal gutting of public institutions. However, the relationship between professional science and the project of nation-building is perhaps made especially clear when professionals find themselves facing material shortages or even operating in institutions incapable of supporting their work. In laboratories dedicated to plant medicine research in Ghana, I found that missing or broken elements of laboratory infrastructure provoked exasperated comments and cynical jokes about the state of science in Africa (Droney 2014). It's no wonder why, as inadequate scientific infrastructure can pose a real health hazard to workers (Calkins 2021a), contributing to the conditions of exposure to which they are subject (Tousignant 2018). An expression of dissatisfaction with the very real limitations that these conditions place on their careers, these comments also signaled the significant symbolism invested in African laboratories. Scientific spaces were especially meaningful because of their association with the project of nation-building and the narratives of progress with which the nation has been tied. Indeed, recent scholarship has described how spaces built for the practice of science continue to resonate with the projects that have invested them with meaning even after resources had fled (Geissler et al. 2016; Tousignant 2018; Prince 2020; see also Geissler 2023). Though often profoundly impacted by political economic extraversion, such spaces still allow for the development and pursuit of new dreams (Okeke 2020) and the working out of new scientific possibilities (Calkins 2021b).

My argument is not that the entanglement of institutionalized science with the aspirations of national independence should override a consideration of how science has been shaped by colonialism or neoliberalism. Ghana's postcolonial nuclear science program, for example, has a complex relationship with the coloniality of the sciences. Although Ghanaian planners actively played multiple international partners against one another in their pursuit of a nuclear reactor, the IAEA effectively treated Ghana as a "nuclear protectorate" (Osseo-Asare 2019, 109), the British government may have worked to thwart Ghana's early nuclear ambitions, and the Soviet Union restricted Ghanaians' access to nuclear reactor plans. Importantly, Osseo-Asare also excavates Ghanaian scientists' own imperious relationship with non-elite Ghanaians, documenting how nuclear researchers at the Ghana Atomic Energy Commission used the exceptional and mysterious nature of nuclear science to assert land claims in relation to their neighbors (Osseo-Asare 2019, 139–69). Concerns about how the development of scientific institutions could be linked to harms are even more apparent in the

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history of the Uganda Cancer Institute. The same perseverance that helped the UCI endure could lead to a significantly compromised kind of oncological practice. During Uganda's civil war, chemotherapy treatment was likened to the rocket launchers used in battle (Mika 2021, 102–08), while the inability to replace the Cobalt-60 source of a radiotherapy device first acquired in the 1990s led to potentially damaging improvisational therapeutic uses (Mika 2021, 115–30). However, centering the national project makes sense of these histories in a way that other analytical lenses might not. What has continued to lend scientific practice a particularly meaningful set of goals for its practitioners is its association with African independence and the mission of constructing the nation after colonialism.

Conclusion: Recalibrating the project of science

To grapple with the category of science as a keyword for African studies, this essay has identified vernacular theorizations of science present in everyday social life. This approach leads to an understanding of science as an always situated, always partial, morally laden, performative project materially engaged in experimenting with the world (see Neely and Meek 2024; Crosson 2020). These forms of experimentation generate knowledge at the same time that they materially rearrange the world toward particular political models of justice. Like a knife or a bomb (Falen 2018), science as a practice is morally ambivalent, loaded with potential power that can be directed toward various political ends.

Applying this theoretical model to professional class science, I find it to be defined most powerfully by its entanglement in the politics of independence. Building scientific institutions and careers is seen as good to those who do this work, in part because science is understood to share in the making of self-possessed African nations. In the most affectively engaging understandings, professional science is oriented toward a modernist form of justice defined by an imaginary of a remade postcolonial world. To be sure, the independence-era conceptualizations of science and their role in achieving substantive independence were diverse, containing a spectrum of philosophical orientations. However, they were oriented toward a shared goal of independence. If professional class science has been most engaged by postcolonial nationalism, then science outside of professional scientific institutions is often defined by the ways in which it offers alternatives to this political vision, including its capture by the state, its domination by elites, its neocolonial models of development, and its liberal conception of justice. When extra-institutional uses of science appear particularly illiberal in their applications of expert knowledge, it may be because they are particularly aware of the destructive capacities inherent in esoteric experimentations with reality.

Situating the keyword science in relation to the politics of independence offers a basis for further evaluation and critique. Based on the apparent moral alignment with the politics of independence, one might ask how well the scientific professions live up to independence-era visions of the postcolonial future. To what extent is professional class science aligned with class-based justice, struggles for sovereignty, or opposition to racial capitalism? What would be needed to transform science such that it would be aligned with these goals?

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These are some of the questions that have been taken up by those working on reinventing sciences to respond to the everyday lived experience of African people. This would require changes to the priorities and practices of scientists as well as of the methodologies (Ela 2001) and institutions in which they work. The social sciences would need to be recalibrated toward mass interests with the object of contesting African dependency (Ake 2003), aiming toward understanding totalities rather than isolated fragments of life (Mafeje 1976; see also Nyoka 2020; Mafeje 1992). Of course, challenging Eurocentric ideologies offers diverse opportunities for infusing academic disciplines with the indigenous knowledge systems that they too often ignore, repress, or appropriate (Emeagwali and Dei 2014; Nhemachena, Hlabangane, and Matowanyika 2020; see also Hountondji 1995). In light of the extraversion of much science on the continent (Hountondji 1990), the continued development of national, regional, and Pan-African scientific networks, associations, and journals can be seen as substantive means for achieving scientific independence. The affective purchase of this mission only highlights all the more starkly the ways in which professional science may be captured by interests at odds with the well-being of African societies. When the sciences work for the benefit of elite class and business interests, entrench gendered inequalities, or pursue the goals of Global North-dominated organizations, they fail to live up to some of their most meaningful aspirations.

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Notes

1. See Langwick (2011) for a related analytical approach to healing in and out of the clinic.
2. Briggs argues that by the end of the twentieth century American science was aligned with the structures of global hegemony undergoing reorganization following the end of the Cold War (Briggs 2020, 218).
3. As Helen Tilley puts it, for colonial-era European scientists Africa served as a "living laboratory" (Tilley 2011) that furthered the production of knowledge but also the formation of disciplines and interdisciplinarities. Simultaneously, what counts as science has often been worked out in both academic and popular discourse through reference to things carrying the adjective "African" (traditional thought, religion, medicine, agriculture, and so on [Tilley 2010]).
4. Scholars have understood "vernacular science" as the ways that people reinvent the products and knowledge systems of science through appropriation (Eglash 2004) or investigations made by scientific disciplines into subaltern knowledge (Tilley 2010). Here, I begin with the narrower focus on vernacular discourse about science, which I take as a nonelite practice of boundary work (Gieryn 1983).
5. See Melly (2017, 159–70) for an example of making vernacular concepts travel.
6. Neely and Meek (2024, 12) cite Mavhunga 2017a, 2018, McKittrick 2021, and Shiva 2016 on this point.

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