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Memories and Motherhood in the Rhythms of Ugandan Computing

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Abstract

Based on ethnographic research in the computing communities of Ugandan universities, we advance a feminist and decolonial critique of the dominant chronopolitics of globalizing technologies. Our analysis starts with participants recounting their childhood memories of growing up in rural poverty under the shadow of rebellion wars. We show how the future promises of computing make sense in reference to this past. The same chronopolitics of pitching the past against the future is used by the global computing and donor development industry, and Uganda's governing regime, which disguises the symbolic and physical violence of the evacuated present. In coping with the precarities of the present, we show how female computing researchers build enduring "near futures" through work that corresponds to the historical and symbolic role of Ugandan women in the domestic realm. And yet the chronopolitics of global computing syncopates with that of "near futures." Women's communal roles are written into computing and computing is made possible and doable in Uganda through the gendered logics of care practised in the present. The paper thus

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contributes to an expanding literature on computing in Africa, by providing a temporal analysis that recognizes women's roles in more substantive ways.

Keywords

computing, feminism, Uganda, chronopolitics, technoliberalism, reproduction, decolonialism, temporality

Introduction

Joy, a computing researcher at Makerere University in Kampala working on preserving the language of Runyikitara, was born in rural Uganda in the early 1970s.[1] Julianne, Zebia, Charity, Joyce, Agnes, and Florence were born at around the same time, maybe a little later.[2] These women are all computing researchers working at different universities in and around Kampala, the capital city of Uganda. They teach and carry out research using computing to address health, societal, and environmental problems. The era of their childhoods is significant because civil war raged in Uganda throughout the 1970s and 1980s, followed within a decade by an HIV/AIDS epidemic that ravaged the country, wiping out a generation. The rural villages in the east, west, and central regions provided safety away from the looted cities and epicenters of disease. At the turn of the millennium, each one of these women arrived in Kampala with good grades, proud mothers looking on, and a good dose of ambition to pursue their undergraduate studies.

"It wasn't easy, but I have always had an ambitious spirit," laughed Zebia when we interviewed her in her office at Uganda Technology and Management University "I think it might be dying down with age, but I've always had [an ambitious spirit], from how I came to get the scholarship, to today, it is intriguing me." We share Zebia's intrigue, not at her own career achievements, but at how she constructs this narrative of progression. From what and towards what has she progressed and how does her story resonate with the dominant narratives of computing in African societies? Our aim is to examine how gender and computing resound with the colonial chronopolitics of contemporary technoliberal discourse. We show how linked ideologies of motherhood and nation-building exert a cruel optimism that is embodied by participants in their continual striving to actualize the benefits of computing in modernizing Uganda (Berlant 2011). At the same time, the expectations around women's roles in the family and community continue to sustain life in the evacuated present that lies in the wake of technoliberalism (Sharpe 2016). We argue that women's communal roles are written into computing and computing is made possible and doable in Uganda through the gendered logics of care practised in the present.

Zebia, alongside other female computing researchers, recounted childhood stories of hardship in contrast to the apparent comfort they experience in continuous employment, a PhD from a European university under their belts, and opportunities to develop their research internationally. Beyond the apparent stability that a PhD and university career provide, the subject matter itself—computing—is encoded with narratives of modernity and nationhood flung far into the future that are held up against Uganda's turbulent past. In his memoir, Venansius Baryamureeba (2015), the former vice-chancellor who oversaw Makerere's success in computing, asserts that he saw the market value and potential future impacts of computing in meeting the goals of the government's national development plans to transition Uganda from a "peasant to a modern and prosperous country within 30 years" (NPA 2020, i). The Uganda 2040 (NPA 2021) report is adorned with images of technoscientific progress—trains, electricity pylons, laboratories—alongside those of national pride to form a mosaic pattern in the shape of the country.[3] These motifs of progress are tied to dreams of nationhood in which narratives of Uganda's past, depicted as conflict and poverty ridden, are juxtaposed with techno-utopian futures.

Thinking through these ties between the temporal and technological, we develop a feminist and decolonial critique of the dominant chronopolitics of globalizing computing. As Octavia Butler (1979) conceived, chronopolitics entails thinking of time as sculptural, and while Kodwo Eshun (2003) argues that a chronopolitics inherited from colonialism splices time in Africa to empty out the present, it is met by another temporality sculpted in what Jane Guyer (2007) calls the "near future." Time moves along two axes that we identify, each resounding off the other to produce a critique of computing in the Ugandan context. By taking a decolonial approach, we break with the temporal and political orders of colonial power that are continuous in the present, and, as Sareeta Amrute and Luis Felipe R. Murillo (2020) argue, stake a claim in alternate ways of thinking and practising computing.

In this paper, we contribute to studies in technology in and from Africa and the Global South that use ethnography to analyze what we refer to as syncopated beats between globalizing processes and local contexts (Irani 2019; Odumusu 2017; Mavhunga 2014). We do not propose that technoliberal discourses float around the world in ready-made forms (Avle et al. 2020; Atanasoski and Vora 2018).[4] Instead, we illustrate how globalizing discourses are made workable in local contexts (Avle 2020; Beltrán; 2020; Ames 2019; Irani 2019; Chan 2013), showing how they are articulated and the ideals they represent put into practice by researchers working in Ugandan universities. In advancing this approach, we closely follow a group of female computing researchers and adopt "feminist theorizations of affect and care to expound the everyday practices that enable surviving and thriving in the face and in the wake of techno-empires" (Jack and Avle 2021, 2).

We begin by introducing the research site and consider our positionality within it before moving onto the empirical sections that focus on two prevalent narratives in the testimonies of the female computing researchers interviewed for our research project. First, we explore how memories of Uganda's past frame the future imaginaries of computing. As a narrative device, Uganda's past is not only used by research participants, donors, and technology companies to promote the developmental promise of computing; the past also serves as a resource for the current authoritarian regime of the National Resistance Movement that has been in power since 1986. Yoweri Museveni, Uganda's long-term president, trades on the same memories of war and rural poverty to promote his deliverance of future prosperity, all the while utilizing technological infrastructure for political subjugation. A chronopolitics emerges through this framing of turbulent pasts against prosperous futures in which Ugandan citizens are situated in a past that they continually yearn to move beyond.

Our second narrative concerns the "near future" in which the symbolic role of women and their reproductive capacity is performed in the maintenance of family and community (Guyer 2007). All the female participants had started families early in their careers, and, in addition to fulfilling an academic position, they have a central role in nurturing family, community, and the ancestral village through activities that range from communal child rearing to farming. We emphasize the different temporal orders in which a more enduring near future is culturally reproduced to guarantee bodily integrity and evade poverty in later life, what Grace Kyomuhendo and Marjorie McIntosh refer to as "domestic virtue" (2006, 2). This temporality deals with the inevitable precarities produced through techno-utopianism and authoritarianism by practising a gendered logic of care in the present.

We then illustrate how the temporalities of globalized computing and motherhood form syncopated rhythms that amplify and agitate each other. Women's reproductive labor is continually enlisted in making computer science possible in Uganda, even when gender is neutralized in the discourses of technoliberalism.[5] Participants relegate communal care to "life in parenthesis" away from the beating heart of computer science labs (Robbins 2004 quoted in Guyer 2007).[6] Yet ideologies of motherhood are reproduced in scaling and commodifying computer science research in Uganda to be of planetary relevance as well as tutoring future generations to opportunistically exploit its political economies. While computing appears dressed in neutrality, we show that it embodies feminist strategies for survival in the near future that make bearable, indeed liveable, the necropolitics of technoliberalism (Mbembe 2019).

Methods

This research is part of a larger project funded by the US National Science Foundation, comparing computing research in Kenya and Uganda from 2012 to 2016. The project documented the growth of nascent computer science communities in academic institutions (Harsh et al. 2018, 2019). In this paper we focus on women in computing in Uganda because of their strong presence in academic departments and the shared similarities in participants' ages, backgrounds, and working lives. These women were part of the first generation of PhD computer scientists in Uganda.

Makerere University has succeeded in meeting one of the early goals of feminist technology studies by opening up access to computer science to men and women equally (Wajcman 2007). Women make up about 50 percent of the PhD graduates in computer science and related fields. The first cohort awarded studentships to undertake doctoral training as part of a program offered by Makerere and a European partner university began in the mid-2000s. Out of around thirty students, we learned that all except one had returned to work in the expanding computer science and information technology departments at Makerere (Harsh et al. 2018). For the female PhD graduates, the path of return was predestined because they had family commitments; one participant mentioned taking her youngest child with her and almost commuting between Uganda and Europe to fulfil both the PhD and her kinship role.

Computing in Uganda is distinguished from other parts of East Africa by its academic focus and outputs. Research participants had ties to the local private sector, especially with local telecom providers and nongovernmental agencies such as the UN Global Pulse Lab. However, the entrepreneurial tech scene in Kampala is less vibrant than other African capitals, such as Nairobi, which is teeming with hubs, incubators, and accelerators (Harsh et al. 2018, 2019; Ndemo and Weiss 2017). This is not to say that respondents were not entrepreneurial, as we explore below, but they do not build capital through social networking sites and online presences. Rather, they build capital through grants, inventions, publications, citations, teaching, and mentoring.

Our research involved successive year-on-year ethnography, collating a rich stock of qualitative interview and observational data, and building relationships with respondents through multiple interviews and interactions. All participants were computing researchers working at universities. Our methodology was approved by ethical review boards at two affiliated universities (one in the United States and one in Canada). At the beginning of the project, and throughout the research process, we discussed with participants how we could structure the project to create benefits for them. As a result of these conversations, we sponsored and co-designed a workshop at Makerere University where participants showcased their work to local media, private sector, and donors. As another way to bring attention

to their work, the consent process asked participants whether or not they wanted to be anonymized in publications. Participants were then given the opportunities to reflect on transcripts and field notes as we progressed with the research. When the draft of this paper was prepared, it was sent to participants for comments and as an opportunity to reconfirm whether they wanted their names used. Participants who were not willing to be named were given pseudonyms to protect their anonymity as much as possible, and these cases are noted when the participants first appear in the text. Overall, our ethnographic approach has created possibilities for future collaborations and funding. Indeed, our current grants continue to support research participants we met over a decade ago.

As researchers based at North American and European universities, we were positioned as being in the same profession as participants. Our social science approach resonated with participants, who published in journals and attended conferences of an interdisciplinary nature. Also, most participants were globally mobile, having been trained in Europe, North America, or Asia, and still attended meetings and conferences in different countries. We built lasting relationships from this sense of commonality that we are all academics dealing with overly hectic teaching and research responsibilities, constantly navigating external funding applications and institutional politics.

While we shared anecdotes about working in higher education, there were distinct differences in our experiences. One difference concerned the visible lack of investment in infrastructure and resources at Makerere, which helped to position participants as recipients in the donor-philanthropic complex of global technologies and locked them into the temporal orders of development through the conditions of research funding. The impacts and outcomes of this research project, for example, are not explicitly tied to the development trajectories of our respective countries, but rather implicitly tied to its development assistance policy through National Science Foundation funding.

The lack of institutional investment led to participants experiencing a heightened sense of precarity when relating that they could not rely on stable internet, journal access, or software provision; at times, absorbing research costs themselves. In contrast, our home institutes had engaged in real estate development and infrastructural strengthening in establishing their research prowess internationally. Working in this context, the authors experienced different degrees of precarity that stemmed from the disciplinary effects of audit cultures and the calculative futures around research outputs and reputational management. Another difference was in the management of work-life balance. Our authorship team includes a mother and a father, but unlike participants, all the authors had moved away from the communities we were raised in, one of us coming to North America from India. Thus, we were not in close proximity and as responsive to kinship networks in the same way as participants. Reflecting on

these differences, and how they emerged in the data, led us to the analysis of the politics of time, to which we now turn.

African Pasts and Technoliberal Futures

> Since Africa is the future and it will be the future, this rhetoric claims implicitly, that Africa presently doesn't exist—that Africa's co-presence with the current times rings hollow.
> —Felwine Sarr, *Afrotopia*

Memories of Uganda's past, framed by narratives of rebellion wars, rural poverty, and infectious disease, appear in the testimonies of the women we spoke to. The interviews often started with introductions and some background information. It was a typically balmy afternoon in Kampala when we arranged to meet Joy. We sat on white plastic chairs at the edges of the Makerere University Guest House garden overlooking a part of the city called Wandegeya. With the distant hum of afternoon traffic in the background, Joy remembered how the impact of Uganda's rebellion wars suspended her education:

> I started school in 1977…but there was a war and what have you so we could not continue in the school where I was. We had to change to another school which was relatively a bit stable…We actually couldn't do the exams because of the war. The rebel group of the current sitting president. That was the war in '85, so we could not sit the exams till '87…it was not quite a good experience because actually that war did so much harm on us. We had it rough. It was terrible.

Joy was raised in the west of Uganda, where the National Resistance Movement originates. The rebellion conflicts of the 1970s and 1980s delayed her education by several years, leaving it stuck in the moment of near completion. This effect of stalling was also felt among her parents, who owned a smallholding that they farmed to survive and raise whatever funds they could from selling surplus produce to send their children to school. She explained, "They were typical peasant farmers. They were farming at a small-scale level. You just grow to eat, and you sell very little produce. Basically, that's where they would get money to pay for our school fees—from farming, basically."

Tales of basic subsistence, rural poverty, and illiteracy formed part of everyday life under conflict. Zebia, also from the western region, recounts a similar background of rural poverty. Her parents had limited access to education and learnt literacy skills through the local church: "They did not have formal education to tell you the truth. They just had informal, church-based education. Yes, just teaching them how to read and write, teaching them basic literacy and numeracy. Yes, but they never had formal education."

Research participants remember their lives as children and teenagers as slower and characterized by a rural upbringing and limited access to education. While conditions of poverty continue to impact life for many Ugandans, they were narrated by research participants as part of their background story, defining their own sense of self-development in parallel with the story of Uganda's transition to peacetime. The story of these women, who as girls struggled to advance their education, is narrated as a remarkable story of ambition and social mobility against considerable odds. Joy referred to her mother's limited understanding of what she does (as a computer scientist) as a sign of her own social mobility: "My mother, what she knows is that it is a degree, but she does not know how heavy or how light it is to have a PhD. She knows that now so far, I have two degrees, I mean three. She knows I have three degrees, but she doesn't really know what they mean."

Joy refers to heaviness and lightness as states of being that represent educational achievements. While Joy's mother does not appear to understand her daughter's accomplishments, she speaks the local languages that Joy is trying to preserve using computing. Runyakitara is the dominant language of the western region, and it represents its political history, which is the same history through which Joy narrates her own story. It emerged as a "new" language in the 1980s, merging the dialects of four ethnic groups (Bernsten 1998). The origins of Runyakitara are in the Bunyoro-Kitara Kingdom that declined during colonialism because of the tribe's resistance to British rule. The Baganda were seen as more receptive to the British colonial administration, and tribal emissaries were given key posts across the territory, bringing with them educational and health programs all spoken in the Baganda language of Luganda. The revival of the western Bunyoro languages represents a postcolonial response to the dominance of the Baganda, but the four dialects merged primarily because during the wars, radio was the main medium of communication across the region. Today, efforts to establish Runyakitara as a secondary language spoken as much as Luganda are seen as the project of "Makerere elites," of which Joy probably qualifies. While the preservation of regional dialects is considered vital to the continuation of cultures, linguistic history is revealing of political tensions and social upheaval (Fleisch and Stephens 2016). Language preservation is a research strength at Makerere, with several participants active in ongoing projects to build natural language processing (NLP) tools, machine learning methodologies that translate between languages. The computational processes of NLP effectively flatten languages, lightening the weight of history to focus on learning and acquisition, etymology, and linguistic comparison across texts; the intricate political histories through which languages change are lost in the standardizing practises of NLP (see, for example, Aludhilu and Bidwell 2018).

Dr. Julianne Sansa-Otim, a successful researcher who leads the Weather Information Management in East Africa (WIMEA-ICT) project,[7] intimates a different relationship to her mother, crediting her as the "real strength under my wings." As she explains, her mother endowed in her children the confidence to pursue their ambitions: "I think the real strength or the real wind under my wings in my education was my mother. She just exhibited this confidence in all her children and just letting you know that you can do anything." Elevation, or taking flight, infers a similar feeling of lightness to that of Joy's journey. The metaphor of flight implies transcendence instead of incremental progression. Julianne's flight took off at a young age when she was encouraged to pursue her interest in mathematics:

> I was one of the few girls who really enjoyed doing mathematics…I am so proud of my high school—first, it was an all-girls only school, okay that is good and bad, depending on how you look at it, but this school was so empowering. I know so many people who went to mixed schools and they always had the impression [that maths] is for boys, not for girls, but in this high school you could do anything, really. So this just encouraged me to continue believing in myself and in my dreams.

Julianne locates her sense of empowerment and "belief in myself" in her mother's encouragement and the opportunities to study maths while at an all-girls school. The combination of mainly female encouragement is remembered as fueling her ascent.

These memories of growing up in rural Uganda and with conflict rumbling in the background are conceived in plotlines of sedentariness succeeded by mobility, inertia by transcendence, feeling stuck by breaking free. These are celebratory stories of transformation that are also performative of wider narratives of global computing. A version of this story will be narrated to funding bodies, perhaps with the details of childhood memory omitted, but the aspirational rhetoric of development enhanced. Stories of succeeding in the face of adversary make research participants the ideal recipients of computer science philanthropy and donor funding.

While participants narrated personal successes in stories of social mobility and educational attainment, these narratives were paralleled by stories of computing in Uganda as deterministic. Like Joy, Dr. Florence Tushabe works on Uganda's languages (Tushabe et al. 2010). She has translated the Mozilla Firefox interface into three different languages to extend accessibility. Florence states, "if you aren't an English speaker, you will not be able to use your smartphone and you find that the majority of Ugandans do not know English or are comfortable in English reading and writing." Florence translates applications and web services from English into the dominant language of each region of Uganda. By extending

access via mobile phone to services such as healthcare (through mobile medicine and diagnostics) to economic transactions (through mobile money operators), Florence determines that the technology will make Ugandans healthier and wealthier (Rwashana et al. 2010).

Julianne's project corresponds with Florence's by making data accessibility an economic stimulus. Julianne leads a team of eight researchers in developing the technology to capture, analyze, and disseminate weather reports with the long-term goal of supporting agribusiness, tourism, and leisure industries that rely on readings (Nsabagwa et al. 2019). Julianne explains,

> One of the reasons the [Meteorological authority] took long to actually get authority status was they were being asked, what's the value, the monetary value of what they do. It is easy to see why the Revenue Authorities are an authority because they collect taxes…It is not easy to see this, at least in our part of the world, it is not very obvious to the decision makers the value of this weather climate information…Hopefully as our relationship develops [with the Meteorological authority]…we will be able to…show the economic value…and then feed…into the national agenda through policy.

In Julianne's and Florence's research, a deterministic concept of technology is configured as the driver of socioeconomic change.

From these plateaus of technoliberalism emerges the perspectival view (Yusoff, forthcoming) of future sociotechnical imaginaries stretching out the economic benefits while simultaneously blurring the slow violence of digital technology in surveilling and subjectivating African citizens in the present.[8] Uganda's long-term president, Yoweri Museveni, increasingly views social media as a destabilizing political force and a threat to his hold on power, exemplified by the repeated shutdowns around elections and the abrupt introduction of new taxes on apps.[9] The 2021 general election represented the first time since his inauguration that Museveni ran against a new oppositional candidate. Instead of facing his old bush comrade Kizza Besigye, Museveni faced competition from musician Bobi Wine, a favored candidate in the cities and popular on social media across the world. The threat of Wine's youthful energy and social media reach prompted Museveni to shutdown social media platforms (Burke and Okiror 2021). This is not the first time that he has done this. A shutdown around the 2016 general election stoked controversy internationally as a breach of human rights by inhibiting freedom of speech during an election (Obla 2021). However, the impact of the shutdown was much more insidious because it blocked mobile money transactions essential to rural campaigning.

In his speeches and dress code, Museveni regularly evokes the rebellion spirit that originally brought him to power and has long since justified his increasingly

exclusionary grip. At times, and almost in the mode of technologically assisted bush tactics, he has used social media as a surveillance tool to identify and suppress dissenting voices.[9] He embodies what Mats Utas (2012) characterizes as the African Big Man in his recapitulation of the original zeal of liberation politics that brought him to power in 1986 when the participants were young girls. In the subsequent decades, he has been constrained by global capitalism and the conditional development aid in sustaining Uganda's fragile economy (Tripp 2010). While Museveni looks back, invoking the past as a political resource, the technoscience-donor development complex (featuring constellations of philanthropy, bi- and multilateral aid, and global technology industries) uses the same past as a resource to embrace technoliberal futures.

The chronopolitics wielded by Museveni and global computing industry meets Sarr's observation that "one shouldn't underestimate the enormous amount of symbolic violence inscribed and represented within the collective African imaginary in the form of some sort of failure, of some kind of handicap, or even as a kind of human deficiency and congenital deformity" (2019, 1). Instead of delivering democracy, the inheritance of liberatory struggles has morphed into authoritarianism, which, in turn, has seeded distrust in the competencies of present-day bureaucracies to function well. Global computing targets the resultant problems of dysfunctional governance that are perceived to perpetually derail a continent. The African Big Man rhetoric and the discourses of global computing vindicate each other, leaving Uganda and its citizens in continual states of lag and becoming. While Museveni flexes his political muscle through informal networks, computing promises to correct corruption by instituting mechanisms for transparency and accountability through innovations in e-governance; while Museveni promotes reciprocal forms of political value entrenched in rural cultures and traditions, computing promises democracy based on the rationalization of knowledge and its function in instituting representative politics and evidence-informed decision-making. The chronopolitics that is constructed and exercised by global technology stakeholders and Museveni's governing regime continually cancel out the present. The exertion of power in the management of time disempowers African citizens by relegating them to a past that restricts them from realizing their political subjectivity in the present (Mbembe 2001; Eshun 2003).

Childhood memories become a chronopolitical tool in ordering the past in relation to the future that eclipses the violence wrought in the present; of, for example, Ugandans being subsumed in the larger biopolitical research projects of the North through global health (which serves as Florence's only source of funding) and through which the value of life is rendered calculable (Murphy 2017); of the commodification of metrics and their predictive futures (Julianne's research operates within the calculations of future food provision) that not only standardize and survey society and space but rely on global production chains and

material infrastructures erected from racialized extractive and polluting industries (Liboiron 2021). While Julianne, Zebia, Joy, Agnes, and Florence strive to foster life through their computer science projects in weather readings, health diagnostics, and language preservation, the probabilities of the future are always being calculated to exceed the deficits that haunt the present. These women are embroiled in the fantasies of computer science, and they navigate the affective desires, precarity, and forms of abandonment that play out in their everyday lives. Their pasts are a proxy for African pasts that technology promises to move them beyond. The background rattle of war, disease, poverty, and illiteracy that rings in the ears of female computer scientists counterbalances the apparition of depoliticized computer science and the distant futures that unfold from it (Nyabola 2018; Poggialli 2017). As we explore below, research participants' encounters with the chronopolitics of technoliberalism and authoritarianism are through the everyday routines of computing in higher education and their own symbolic status as women in Uganda in which their reproductive labor is tied to the future of the nation.

"Living in Parenthesis"

> Who will bury you when you die? You really work hard for your body not to be ashamed when, you know, you die.
> —Joy

Back at the Makerere University Guest House garden, Joy laughed as she spoke, recognizing that she was asking an important question that broaches the symbolic status of women in Uganda, where the capacity to bear children and take care of family and community are considered primary roles. Motherhood is historically symbolic as a guarantee of future survival, as Joy articulates, and it is often evoked as foundational to nation-building. Kyomuhendo and McIntosh (2006) use the term "domestic virtue" to conceptualize this consistent style of thought that lends rectitude to motherhood and communal caring. Reproductive labor has also been important in the aims of Ugandan women's development movements to realize women's political subjectivity by turning domestic virtue into an active form of citizenship. While participants reflect on motherhood and communal caring as parenthetical to the goals of computing in securing Uganda's socioeconomic development, in this section, we illustrate how mothering embodies strategies for coping with the precariousness of living in the wake of technoliberal and authoritarian chronopolitics. "Life in parenthesis" (Robbins 2004) reveals the different temporalities participants experience through motherhood, and how participants nurture an enduring "near future" that attends to and puts meaning back into the present (Guyer 2007).

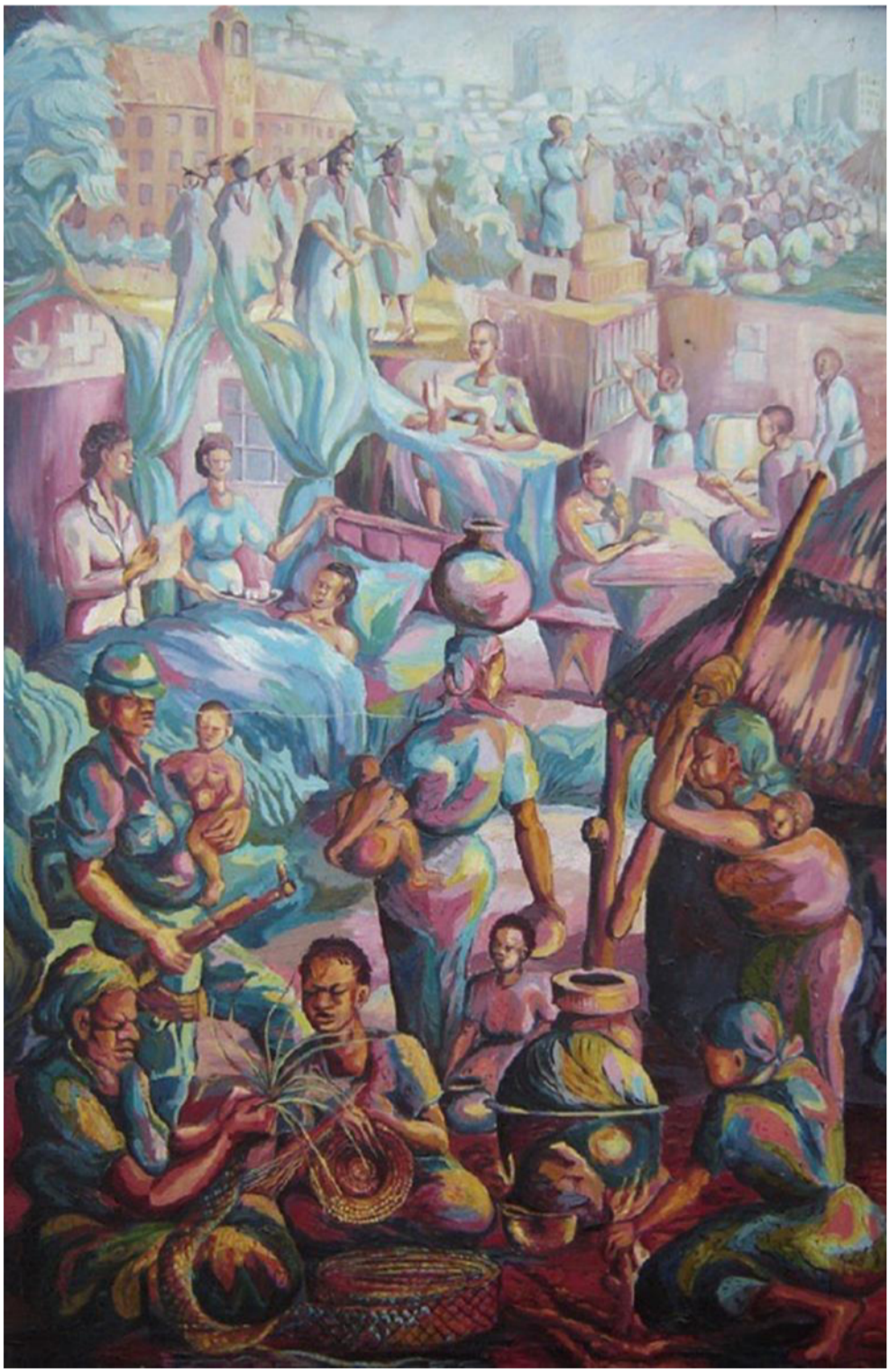

Figure 1: Alex Baine, *Women's Emancipation in Uganda*, 1989. Oil on canvas, 164 cm × 102 cm Institute of Heritage Conservation and Restoration (IHCR) collection, Kampala. Reproduced with permission from Dr Amanda Tumusiime, Dean of the Margaret Trowel School of Industrial and Fine Art (MTSIFA) at Makerere University

Sitting in the offices and in the manicured gardens of campuses, our conversations began with academic achievements; however, participants were keen to remind us, often with humor, that as Ugandan women they all had significant family commitments to attend to. Female participants regularly left work earlier to collect children, prepare food, and attend to their home. They referred to working on the farm at weekends and attending church on Sundays where they would engage in communal affairs. They spoke as though they were tapping us on the shoulder and reminding us not to forget this role. Their eagerness to voice that in addition to computers, labs, students, and books there are also children, husbands, family, land, villages, church, communities, and an ongoing procession of weddings and funerals all arranged through multiplying WhatsApp groups, was also an acknowledgment that these parts of their lives were often written out of computer science grant applications and publications. Joy reminds us about the expectations of her role in reproductive and communal labor: "Even when you are in your books, your mind should not forget about the family matters…remember I am a woman, I have to have a family."

The computer scientists we spoke to all had numerous children that they had given birth to and raised during their PhD studies and into their early careers. As Rhiannon Stephens (2012) charts in her linguistic history of poverty in East Africa, women avoided hardship and guaranteed their position in the community by giving birth.[10] Joy echoes this history of gendered survival strategies in the epigraph. When she asks who will bury her when she dies, she intimates that having children and taking care of the community guarantees her future personhood. While Joy anticipates that motherhood guarantees that her body will not be forsaken, women's development movements have long sought to challenge this symbolic yet passive role of women by recognizing and advocating the active presence of women's reproductive labor in nation-building. Like many other parts of Africa, Uganda has maintained independent women's movements that have championed women's economic and political participation (Tripp 2000). In post-conflict Uganda of the late 1980s and 1990s, these women's movements focused on expanding the representation of women in the public sphere and increasing their legal, economic, and political representation. In the context of the broader international donor priorities, the need to court aid and respond to the aims of the Ugandan women's movements, Museveni's government supported the demand for greater representation and put into place affirmative action policies in education and politics (Tripp et al. 2008; Tamale 2000). Participants have benefited from these campaigns and policies in receiving additional credit and gaining entry through equal opportunities schemes, as Dr. Agnes Semwanga Rwashana, a health informatics specialist at Makerere states: "I think that right from entry to university…there is always a point 1.5 extra point given to female students. So that encouraged women to join the university to begin with and to carry on, and what we have seen with projects that we have had so far from

Norway and Netherlands, they always insist that there has got to be a strong gender component on all the scholarships."

Agnes was the first graduate in the PhD program at Makerere and as such, she is the beneficiary of the generations of women in the 1980s and 1990s who were university-educated, urban, and employed as teachers, managers, doctors, and scientists (Tumusiime 2012, 2017). In her current role as the Gender Focal Person in the WIMEA-ICT project, Agnes nurtures the careers of younger female researchers. Thus, she extends the ethos of promoting women's work to computing. The painting by Alex Baine (Figure 1) visualizes the momentum gathered over generations of women's work: the darker bottom parts of the painting represent women's domestic labor giving birth, providing food, shelter, and clothing as part of the building blocks of Ugandan modernization. At the top of the painting, basking in the light, are groups of women donning the cap and gown of graduation ceremonies as representative of this cumulative and oft forgotten labor.

The female computer scientists are indebted to women, intellectuals, and artists, who in the 1980s translated the power of their "domestic virtue" into active nation-building. Participants echoed the discourse of empowered womanhood forging the nation in remembering the influence their mothers, teachers, and female kin had in supporting their education and careers. Julianne's mother, for example, embodies female empowerment by being "the wind beneath her wings," giving flight to her children's futures. And yet, participants were reluctant to apply the same temporal trajectory to their own labor in nation-building outside of the computer science laboratories. While their mothers' strength lifted them up, instilling in them the ambition to follow the upward trajectory depicted in the painting (Figure 1), participants did not place the same value on their own domestic and kinship roles, and relegated this sphere to life in parenthesis. As Zebia states,

> Still in African setting a woman still has to put in more. As a woman you have to end up putting in more because…according to our culture, a woman is the one responsible for the, what can I call it, the well-being of the family, in terms of household chores, making sure the kids are well looked after, all those kinds of small, small things at home. So as a woman you end up having to put in much more amount of time as compared to a man.

Zebia's reaching for a label to describe reproductive labor signifies that there is no ready definition to hand. Yet, by reminding us of their communal role, participants alerted us to its lack of visibility in their professional roles (illuminated at the top of the painting). Their accounts amplify the gendered dimensions of the chronopolitical discourse we described earlier. Women's work in sustaining the

nation is recalled as part of past struggles that their mothers helped them to transcend, but that participants do not lend the same significance in terms of contemporary nation-building. Zebia's scaling of her domestic life to the "small, small things" reflects the routine erasure of the political purchase of this communal caring that seems to run parallel to their professional role. To some degree, by tapping us on the shoulder and reminding us of their communal role, participants were also vindicating their careers as computer scientists as the potential gateway to a more contoured political subjectivity. Their careers and the institution they work for, alongside any research they engage in, formally lends them visibility in public life and in nation-building strategies that they otherwise might not enjoy as women in Ugandan society. The national development plans are after all replete with images of technoscience, whereas images of mothers and babies, farms and villages feature on development reports signifying past problems and not future promises. The diversification of women's roles to professional spheres is both an achievement of women's development movements, establishing greater representation of women in public life, and it is chronopolitical in organizing time around the formal and waged employment of computing in aspiring towards technoliberal futures. On the surface, motherhood does not appear to be important to doing computer science, which happens in offices with artifacts, dematerialized data, and students away from life in parenthesis.

The problem with this logic is that the historical condition of colonialism has meant that formal institutions and waged employment have remained aspirational, unable to support this route to more active political subjectivity for women and men (Fanon [1952] 2008). Reproductive labor provides security and integrity for women and men in the face of vast precarities arising from the continual evacuation of the present, and its destabilizing effects on institutions and patterns of work. Sitting in a hotel lobby in downtown Kampala, while attending a conference,[11] Florence made this precarity explicit: "For me, my dream, and I am not going to mince my words here, is to make a decent living with my skills."

Florence's dream of a decent living is not easy to come by. Funding to do research is mostly dependent on external donors and their agendas, and provided only on contractual basis, thus making it conditional and ephemeral. The funding for Julianne's project finished in 2018 and weather reading is not yet a functional arm of the Ugandan government. For all the enthusiasm for computing, Julianne lamented the infrastructural and government obstacles to realizing the vision at the heart of her research grant. In addition to the provisional nature of funding, there are times when Makerere University cannot pay its employees. In 2016 Museveni closed Makerere in response to staff striking over unpaid compensation and students striking over not receiving financial aid from the Ministry of Education (Nakkazi 2016). Similarly, during the COVID-19 pandemic, the

university was shut down, and its staff received reduced pay. This precarity is represented by the bare walls of participants' offices, which contained minimal decor and scant personal objects, almost in recognition that the space they occupy professionally might not last. Basking in the light at the top of the painting is a major motivation for all research participants, but the promise of stable institutional and waged work remained uncertain.

Syncopated Rhythms

The "small, small things" that Zebia does to care for her family and community, in fact, sustain the very large dreams of doing computing. She presented a version of computing that performs to the degendered dreams of global technology industries and philanthropic donors and excludes reference to motherhood. And yet, by analyzing how participants talk about tutelage and data, we reveal how the ideology of "domestic virtue" actually sustains computer science. In this way, we show how computing resounds in the rhythms of everyday life where time is experienced by participants in a syncopated way, at times amplifying the larger chronopolitical discourses and at other times diminishing them.

Engineers and technicians are promoted as essential to Uganda's future economic prosperity. Making the social world, and in Julianne's case the natural world, legible requires a labor force capable of constructing technological infrastructures, writing code and algorithms, analyzing data, and so on. Florence, for example, directed the conversation towards her students, and, like many participants, she talked passionately about extending her caring role in tutoring a generation of coders equipped with the skills to join a growth economy. She describes her motivation for teaching and the joy she finds in the process, expressly comparing it to parenthood:

> I love it. I love dealing with students. I love seeing students come in when they don't know anything and they leave when, you know, they have a skill, and they can be self-employed. I love it when I see my students sustaining themselves and flying and reaching their full potential. Yes, I think as a parent I see that as my children, I think all of us are where we are because someone held our hand and helped us to be where we are. Maybe someone gave us some advice; maybe someone gave us some material support. So you support people and you don't know what can come out of them.

Florence speaks to Baine's painting and to the testimony of participants in recognizing that their success was achieved through the strength of others. And like other participants, Florence uses the metaphor of learning to fly. However, she also expresses uncertainty in not knowing "what can come out of them." We interpret this as both about not knowing how much students can achieve in learning computing skills, but also uncertainty about whether and how these

students will find economic and social security. The United Nations (2015) estimates that Africa's youth population will more than double from current levels by 2055. Florence reflects on computing as a response to both the opportunities and challenges presented by sharp population growth in Uganda's cities. She aims to train generations of coders who can ignite the economy, but she is also recognizing the vast insecurities around future work, particularly waged work.

The university is graduating ever-increasing numbers of computing students for a data-enabled future that is speculative. Back in the early 2000s, Baryamureeba led a transformation at Makerere University that instituted a neoliberal model of higher education dependent on enlarged cohorts of fee-paying students. Computer science has indeed benefited from this political economy as technical skills are in high demand and equate to a market value in Uganda's transition to a "modern society" (NPA 2020). Yet the next generation of female computer scientists face the same precarity as their mentors: few academic jobs, and even less employment stability. Florence wishes to provide a means for her students to have stability, and thus she prepares them for a more enduring near future through self-employment and entrepreneurship that has traditionally defined the informal, non-waged economies of African societies. Tutelage extends further than training in computer skills. It entails imparting gestures and attitudes towards a future that could arrive, or it could not, in which case tutelage includes teaching strategies for coping with uncertainty.

Julianne embarked on a similar strategy of "future proofing" in a public engagement event held at Makerere. She demonstrated the significance of Uganda's meteorological readings in connecting to global chains of supply and demand for data. In this way, Julianne envisioned a future political economy for her students to participate in. The public engagement event was oriented towards future jobs by scaling up Julianne's project to planetary dimensions, summoning a sociotechnical imaginary of anticipated supply and demand for weather data and the labour force to support it.

The idea for Julianne's project started with her observing seasonal changes affecting a small farm she manages with her mother. To cope with the fluctuating rhythms of professional work, Julianne and her mother had established a smallholding. This was not unusual as most participants had made similar investments in farming and fulfilled multiple jobs (Harsh et al. 2019). Julianne explained,

> My mother thought…maybe we should begin doing some farming on this land and…I put my support into the project. I was following up on how things were and…I found out so many stumbling blocks…One of which was the fact that traditionally in Uganda, March is the rainy season and August, so March, April, May is rains and then August,

> September is also the shorter rains. We were farming in the March season. What happens is that traditionally in February everybody goes to plough, to prepare the ground for the planting and then in March everybody plants. That's what it has been for, I mean, from when I was born. But something happened. I don't know when it started happening…I'm not a meteorologist. So in this particular year we followed the traditional thinking…and then after we planted, it did not rain for several weeks.

Her experience of farming led Julianne to "thinking weather" (Sansa-Otim et al. 2022). She noticed changes in the annual harvest that neither she nor the Uganda meteorological authorities could explain: "I began to understand that we actually have national authorities in our countries that are mandated to do this [provide weather readings] and then I reached out to them to understand okay, why aren't you doing this?…If you really want this [weather] information to be accessed by anybody who wants, what it would take?"

Julianne's experience of farming bears similarity to Florence's experiences with childhood illnesses when she says, "you need a lot of samples of the sickle cell blood cell. You need that data." Through tutelage and scaling up their projects, Julianne, Florence, and other research participants structure much of their everyday lives around the production of big data. Yet to solve what participants recognize as data deficits requires the growth of vast sectors of the Ugandan economy. Open-access data available in the volumes required by research participants needs collection and storage facilities, communication networks, analytics, labor, hardware, and cloud computing. The materiality required to support the industrial trajectories of computing entails self-devouring growth. As Julie Livingstone (2019) notes, the theory of the limits to growth is not new but still relevant in understanding the effluence and extensions of modernization. The raw materials needed to build technoscientific infrastructures – the metals and minerals mined from African earth, the fossil fuels burnt in the production processes and along the global production chains—all upend the problem-solving promises of data science (Bridge 2015).

It is from observations in the discrete geographical sites of the farm and village health center that the problems Julianne and Florence pursue were born, but to do the computer science research, both epistemologically and financially, requires the kind of scaling that promises national growth by attending to "global problems" (framed by the Sustainable Development Goals, for example). The dominant cartography of computing slides along the nested scales of nation, region, and globe that harmonizes data across a flat, even planetary surface. Participants imagine that they cannot do computing at the scale of the farm or the village health center; these cartographies literally do not compute, they are too small, bumpy, and dislocated.

Through their investments in research projects, female computer scientists actively reproduce data in the service of national futures, which ideologically calls upon their symbolic status as women and induces ethical posturing towards nurturing the nation. This posture seems imperative, but it might not necessarily lead to solving the problems they observe, but deepening environmental degradation, health problems, and economic inequality. Research participants are immersed in these paradoxes of syncopating temporalities; their histories, both personal and societal, have been conditioned by the necropolitics of modernity, of which the spread of global computing in Ugandan higher education and research is an extension. Participants invoke the discourses of motherhood in Uganda to orchestrate the near future into a survivable state of being that can cope with the wavering precarity of computing.

Conclusion

> It is not a vacant, uniform, or universal feature that sets in motion liberty but rather the future as it is seen, felt, and heard from the enfleshed parenthetical present of the oppressed, since this group's NOW is always already bracketed (held captive and set aside indefinitely) in, if not antithetical to, the world of Man.
> —Alexander Weheliye, Habeas Viscus: Racializing Assemblages, Biopolitics, and Black Feminist Theories of the Human

Understanding computing in Uganda means paying attention to what makes it possible. The technoliberal discourses, emerging from Silicon Valley, operate across a seemingly smooth planetary surface encoding an ungendered and deracialized form of technology. Yet, in this paper, we have argued that gender is central to the configuration of computing in Uganda. The appearance of neutrality is a "god trick" performed in a dominant techno-philanthropic complex, the lack of acknowledgment that all knowledge is situated is where racial, ethnic, and gendered violence erupts (Haraway 1991). More significantly in this paper, we have focused on how female computer scientists cope with the uncertainty produced through chronopolitics by instantiating gender in ways that are specific to Ugandan culture and history.

The epistemic demands of computer science for more data, extended and comparative metric systems promise to network countries such as Uganda into global digital infrastructures that promise socioeconomic growth in the form of jobs, innovation, and entrepreneurship. The present condition in Uganda, and across the African continent, is represented as impoverished time that can only be improved upon—through technology, in this instance. To add definition to the techno-utopias of the future, memories of African pasts are framed by problems of disease, poverty, conflict, and illiteracy.

Museveni, Uganda's president, utilizes the same chronopolitics to consolidate his power base. He regularly invokes the same liberatory rhetoric and style that first brought him to power through the military coup by promising future prosperity against the backdrop of civil war. By ordering time in similar ways to technoliberalism, Museveni also relegates the present time to the "waiting room of history" (Chakrabarty [2000] 2008, 7). The products of global computing—namely, social media—are framed as either for or against Museveni. Shutdowns, surveillance, and taxes are just some of the more visible forms of subjugation and suppression that Museveni uses regularly used to govern social media in his favor.

The chronopolitical discourses of authoritarianism and technoliberalism shape time in Uganda by pitching the past against the future and, in the process, evacuating the present. Everyday life is narrated in parenthesis, outside of the chronopolitical discourse but essential to the near futures in which life ticks by; work gets done, families are raised, and wider communal networks are cared for. The near future provides a way to cope with the precarity of chronopolitics and the uncertainties that are produced in chasing down futures that remain speculative socio-technical imaginaries.

We show how the near future is a gendered space orchestrated by women that reverberates with the intricate histories of motherhood and social reproduction in Uganda. Conceptually, motherhood is linked to survival strategies. To bear children was to guarantee future survival and evade poverty. Research participants connect to this cultural history, investing in family and community to ensure future personhood. Motherhood is also symbolically important in Uganda as the nourishing force of the modern nation-state by bearing future generations. While women's movements have persuasively argued to shift the symbolic status of women to a political subjectivity that recognizes their power to produce good citizens, mothering was described to us as parenthetical to the profession of computing, necessary but perhaps not politically salient. Their professional role as computer scientists with research and teaching responsibilities gave them access to more public and representational roles.

And yet closer interpretation of their testimonies shows how these winding histories of motherhood and social reproduction are written into computing through tutelage and data production. Equipping students with coding skills includes preparing them for uncertainty. Opportunism and hustling are taught in navigating a speculative future where industriousness might be needed to make a living. Similarly, echoing the rhetoric of technoliberalism by relaying the future promise of, for example, data about weather readings and child health are important in connecting to those global flows of capital and knowledge emanating from the universities and tech centers of the North. In building the near futures, female computer scientists are nurturing resilient environments able to cope with the evacuated present. These practices of care include recognition of

the paradoxes of computing that on the one hand promise prosperity—so learning to speak the policy language and produce masses of data is useful—and on the other hand, confront the ecologically and economically destructive force of expanding extractive industries already eating into African lands in order to build the material infrastructures of computing. This paradox rings with the histories of colonialism and racial capitalism that have also shaped Uganda. What could be perceived as incongruities and irregularities in the realities of African women's lives is what we call a syncopated rhythm that is repetitive, amplifying, and dissipating the chronopolitics, but also irregularly producing random patterns. This is not a dialogic story for or against global computing by attempting to provincialize African science. The story moves away from the postcolonial critique of local resistance to a feminist critique that questions how computer science is made in Uganda through the syncopation between the globalizing processes and extended infrastructures of computing and the gendered strategies for coping with its inevitable precarities.

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Notes

[1] Joy is a pseudonym used to protect anonymity as much as possible. See the Methods section.

[2] Zebia and Charity are pseudonyms used to protect anonymity as much as possible. See the Methods section.

[3] Stephen Kiprotich is pictured crossing the finish line to claim the Olympic gold medal in long-distance running in 2012.

[4] We use Atanasoski and Vora's (2018) critique of technoliberalism as an ideology of Silicon Valley, representative of global computing industries, and multilateral stakeholders such as the World Bank, in which social difference, injustice, inequality are pitched as problems that digital technologies, done right, can seamlessly overcome. Technoliberalism bears the hallmarks of the "culture of no culture" (Traweek 1998, 162) in recapitulating a neutral and depoliticized form of computer science.

[5] Colonialist power regimes have historically established territorial control by medically intervening in women's reproductive capacities, and thus succeeded in abstracting birth as a source of data and tool of surveillance (Hunt 1999).

[6] We borrow the term "life in parenthesis" from Robbins (2004; quoted in Guyer 2007) for a view of time where the present and the future are disconnected.

[7] WIMEA-ICT is a lab where low-cost automatic weather stations research, forecast modeling, and software development for weather services are conducted.

[8] Stella Nyanzi, a vocal feminist, human and LBTQI rights campaigner and academic, is regularly arrested, harassed, and smeared for writing about Museveni on her social media. A famous Facebook post featured a poem to Museveni's mother's vagina. Nyanzi campaigned in the 2021 general election for a parliamentary seat representing a district in Kampala. She experienced harassment, claiming that her partner was abducted and tortured as a result of her political campaign, and it was last reported that she had fled to Kenya to seek safety.

[9] In July 2018, Museveni introduced additional taxes on the use of social media, which prompted many critics, writing mainly on their Facebook walls, to ask how authorities know about individual usage. The levies have led to a decrease in social media and mobile money usage amongst Uganda's youth (Aceng 2019; Boxell and Steinert-Threlkeld 2019).

[10] Stephens (2012) shows how historically male children were highly valued and were more likely to accommodate female relatives, especially their mothers, in later life. Female children would be married into another family.

[11] Participants regularly attended conferences where per diems and honorariums provide an extra income stream.

References

Aceng, Sandra. 2019. "Taxing Dissent: Uganda's Social Media Dilemma." *Global Voices Advox*, December 12, 2019. https://advox.globalvoices.org/2019/12/12/taxing-dissent-ugandas-social-media-dilemma/.

Aludhilu, Hilma N., and Nicola J. Bidwell. 2018. "Home Is Not Egumbo: Language, Identity and Web Design." *Proceedings of the 2nd African Conference for Human Computer Interaction: Thriving Communities*, art. no. 2, 1–11. https://doi.org/10.1145/3283458.3283460.

Ames, Morgan G. 2019. *The Charisma Machine: The Life, Death, and Legacy of One Laptop per Child*. Cambridge, MA: MIT Press.

Amrute, Sareeta, and Luis Felipe R. Murillo. 2020. "Introduction: Computing in/from the South." *Catalyst: Feminism, Theory, Technoscience* 6 (1): 1–23. https://doi.org/10.28968/cftt.v6i2.34594.

Atanasoski, Neda, and Kalindi Vora. 2018. "The Surrogate Effect: Technoliberalism and Whiteness in a 'Post' Labor Era." *Catalyst: Feminism, Theory, Technoscience* 4 (1): 1–13. https://doi.org/10.28968/cftt.v4i1.29637.

Avle, Seyram. 2020. "Making as Imaginative Crossroads: Ghanaian Makers and the Geopolitics of Technological Progress." *Proceedings of the Association for Information Science and Technology* 57 (1). https://doi.org/10.1002/pra2.298.

Avle, Seyram, Cindy Lin, Jean Hardy, and Silvia Lindtner. 2020. "Scaling Techno-Optimistic Visions." *Engaging Science, Technology, and Society*, no. 6, 237–41. https://doi.org/10.17351/ests2020.283.

Baryamureeba, Venansius. 2015. *They Will See Him: Memoir of a Remarkable Life.* Self-published.

Beltrán, Héctor. 2020. "The First Latina Hackathon." *Catalyst: Feminism, Theory, Technoscience* 6 (2): 1–29. https://doi.org/10.28968/cftt.v1i001.32904

Berlant, Lauren. 2011. *Cruel Optimism*. Durham, NC: Duke University Press.

Bernsten, Jan. 1998. "Runyakitara: Uganda's 'New' Language." *Journal of Multilingual and Multicultural Development* 19 (2): 93–107. https://doi.org/10.1080/01434639808666345

Boxell, Levi I., and Zachary Steinert-Threlkeld. 2019. "Taxing Dissent: The Impact of a Social Media Tax in Uganda." https://arxiv.org/pdf/1909.04107.pdf.

Bridge, Gavin. 2015. "The Hole World: Scales and Spaces of Extraction." *Scenario Journal* 5 (Fall). https://scenariojournal.com/article/the-hole-world/.

Burke, Jason, and Samuel Okiror. 2021. "'This Is Africa's Generational Cause,' Says Uganda's Election Challenger." *The Guardian*, January 9, 2021.

https://www.theguardian.com/world/2021/jan/09/this-is-africas-generational-cause-bobi-wine-uganda-election-challenger.

Butler, Octavia. 1978. *Kindred*. Boston, MA: Beacon Press.

Chakrabarty, Dipesh. (2000) 2008. *Provincializing Europe: Postcolonial Thought and Historical Difference*. Princeton, NJ: Princeton University Press.

Chan, Anita. 2013. *Networking Peripheries: Technological Futures and the Myth of Digital Universalism*. Cambridge, MA: MIT Press.

Eshun, Kodwo. 2003. "Further Considerations on Afrofuturism." *CR: The New Centennial Review* 3 (2): 287–302. doi:10.1353/ncr.2003.0021.

Fanon, Frantz. (1952) 2008. *Black Skin, White Masks*. New York: Grove Press.

Fleisch, Axel, and Rhiannon Stephens, eds. 2016. *Doing Conceptual History in Africa*. New York: Berghahn.

Guyer, Jane I. 2007. "Prophecy and the Near Future: Thoughts on Macroeconomic, Evangelical, and Punctuated Time." *American Ethnologist* 34 (3): 409–21. https://doi.org/10.1525/ae.2007.34.3.409.

Haraway, Donna. 1991. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." In *Simians, Cyborgs, and Women: The Reinvention of Nature*, 183–201. London: Routledge.

Harsh, Matthew, Kerry Holden, Jameson Wetmore, G. Pascal Zachary, and Ravtosh Bal. 2019. "Situating Science in Africa: The Dynamics of Computing Research in Nairobi and Kampala." *Social Studies of Science* 49 (1): 52–76.

Harsh, Matthew, Ravtosh Bal, Jameson Wetmore, G. Pascal Zachary, and Kerry Holden. 2018. "The Rise of Computing Research in East Africa: The Relationship between Funding, Capacity and Research Community in a Nascent Field". *Minerva* 56 (1): 35–58.

Hunt, Nancy Rose. 1999. *A Colonial Lexicon: Of Birth Ritual, Medicalization, and Mobility in the Congo*. Durham, NC: Duke University Press.

Irani, Lilly. 2019. *Chasing Innovation: Making Entrepreneurial Citizens in Modern India*. Princeton, NJ: Princeton University Press.

Jack, Margaret, and Seyram Avle. 2021. "A Feminist Geopolitics of Technology." *Global Perspectives* 2 (1): 1-18. https://doi.org/10.1525/gp.2021.24398.

Kyomuhendo, Grace Bantebya, and Marjorie K. McIntosh. 2006. *Women, Work and Domestic Virtue in Uganda, 1900–2003*. Oxford: Oxford University Press.

Liboiron, Max. 2021. *Pollution Is Colonialism*. Durham, NC: Duke University Press.

Livingstone, Julie. 2019. *Self-Devouring Growth: A Planetary Tale as Told from Southern Africa*. Durham, NC: Duke University Press.

Mavhunga, Clapperton Chakanetsa. 2014. *Transient Workspaces: Technologies of Everyday Innovation in Zimbabwe*. Cambridge, MA: MIT Press.

Mbembe, Achille. 2001. *On the Postcolony*. Berkeley: University of California Press.

Mbembe, Achille. 2019. *Necropolitics*. Durham, NC: Duke University Press.

Murphy, Michelle. 2017. *The Economization of Life*. Durham, NC: Duke University Press.

Nakkazi, Esther. 2016. "President Orders Indefinite Shutdown of Top University." *University World News*, November 4, 2016. https://www.universityworldnews.com/post.php?story=20161104143813146.

NPA. 2020. *Third National Development Plan* 2020/21-2024/25. Kampala: National Planning Authority, Government of Uganda.

NPA. 2012. Uganda Vision 2040. Kampala: National Planning Authority, Government of Uganda. http://www.npa.go.ug/wp-content/uploads/2021/02/VISION-2040.pdf

Ndemo, Bitange, and Tim Weiss, eds. 2017. *Digital Kenya: An Entrepreneurial Revolution in the Making*. London: Palgrave Macmillan.

Nsabagwa, Mary, Maximus Byamukama, Emmanuel Kondela, and Julianne Sansa-Otim. 2019. "Towards a Robust and Affordable Automatic Weather Station." *Elsevier Journal of Development Engineering*, no. 4, art. no. 100040. https://doi.org/10.1016/j.deveng.2018.100040.

Nyabola, Nanjala. 2018. *Digital Democracy, Analogue Politics: How the Internet Era is Transforming Politics in Kenya*. New York: Zed Books.

Obla, Vincent. 2021. "Uganda Election: Museveni Social Media Ban Caps Violent Campaign." *The Conversation*, January 15, 2021. https://theconversation.com/uganda-election-museveni-social-media-ban-caps-violent-campaign-153338.

Odumosu, Toluwalogo. 2017. "Making Mobiles African." In *What Do Science, Technology, and Innovation Mean from Africa?*, edited by Clapperton Chakanetsa Mavhunga, 137–50. Cambridge, MA: MIT Press.

Poggiali, Lisa. 2017. "Digital Futures and Analogue Pasts? Citizenship and Ethnicity in Techno-utopian Kenya." *Africa* 87 (2): 253–77. https://doi.org/10.1017/S0001972016000942.

Robbins, Joel. 2004. *Becoming Sinners: Christianity and Moral Torment in a Papua New Guinea Society*. Berkeley: University of California Press.

Sansa-Otim, Julianne, Mary Nsabagwa, Andrew Mwesigwa, Becky Faith, Mojisola Owoseni, Olayinka Osuolale, Daudi Mboma, et al. 2022. "An Assessment of the Effectiveness of Weather Information Dissemination among Farmers and Policy Makers." *Sustainability* 14 (7): 3870. https://doi.org/10.3390/su14073870.

Sarr, Felwine. 2019. *Afrotopia*. Translated by Drew S. Burk and Sarah Jones-Boardman. Minneapolis: University of Minnesota Press.

Sharpe, Christina. 2016. *In the Wake: On Blackness and Being*. Durham, NC: Duke University Press.

Stephens, Rhiannon. 2012. "Birthing Wealth? Motherhood and Poverty in East-Central Uganda, c. 700–1900." *Past and Present* 215 (1): 235–68. https://doi.org/10.1093/pastj/gts002.

Tamale, Sylvia. 2000. *When Hens Begin to Crow: Gender and Parliamentary Politics in Uganda*. Milton Park, UK: Routledge.

Traweek, Sharon. 1988. *Beamtimes and Lifetimes: The World of High Energy Physics*. Cambridge, MA: Harvard University Press.

Tripp, Aili Mari. 2000. *Women and Politics in Uganda*. Madison: University of Wisconsin Press; and Oxford: Fountain Publishers.

Tripp, Aili Mari. 2010. *Museveni's Uganda: Paradoxes of Power in a Hybrid Regime.* Boulder, CO: Lynne Rienner Publishers.

Tripp, Aili Mari, Isabel Casimiro, Joy Kwesiga, and Alice Mungwa. 2008. *African Women's Movements: Transforming Political Landscapes*. Cambridge: Cambridge University Press.

Tushabe, Florence, Venansius Baryamureeba, and Fridah Katushemererwe. 2010. "The Translation of the Google Interface into Runyakitara." Presented at the *International Conference for Computing and ICT Research*, August 1–4 2010, Kampala, Uganda.

Tumusiime, Amanda. 2012. "Art and Gender: Imag[in]ing the *New Woman* in Contemporary Ugandan Art." PhD diss., Makerere University.

Tumusiime, Amanda. 2017. "Alex Baine's *Women's Emancipation in Uganda*: A Visual Archive of the History of a New Generation of Women in Uganda." *African Arts* 50 (2): 58–67. https://doi.org/10.1162/AFAR_a_00344.

United Nations, Department of Economic and Social Affairs. 2015. "Youth Population Trends and Sustainable Development." *Population Facts*, no. 1 (May 2015). https://www.un.org/esa/socdev/documents/youth/fact-sheets/YouthPOP.pdf.

Utas, Mats, ed. 2012. *African Conflicts and Informal Power: Big Men and Networks*. New York: Zed Books.

Wajcman, Judy. 2007. "From Women and Technology to Gendered Technoscience." *Information, Community and Society* 10 (3): 287-98. https://doi.org/10.1080/13691180701409770

Weheliye, Alexander G. 2014. *Habeas Viscus: Racializing Assemblages, Biopolitics, and Black Feminist Theories of the Human*. Durham, NC: Duke University Press.

Yusoff, Kathryn. Forthcoming. *Geologic Life: Inhuman Intimacy and the Geophysics of Race*. Durham, NC: Duke University Press.

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