

# Bioprospecting and Resistance: Transforming Poisoned Arrows into Strophanthin Pills in Colonial Gold Coast, 1885–1922

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**Summary.** The rise of pharmaceutical chemistry in Europe at the end of the nineteenth century dovetailed with the wars of imperial expansion in Africa. The drug strophanthin joined the official roster of the British *Pharmacopoeia* in 1898; meanwhile, British troops were the target of poisoned arrows on the Gold Coast. This article argues for a global history of drug discovery through the case of strophanthin in colonial West Africa. The drug's key ingredient, the seeds of various *Strophanthus* species, also critical to poison arrow manufacture, was at the centre of power struggles between colonial administrators and communities in the Northern Territories of the Gold Coast Colony and Togoland throughout the 1920s. In 1885, Africans had control of their land and unrestricted access to *Strophanthus* and other plants. By 1905, a British military presence had been established and poisoned arrows were outlawed. Simultaneously, breakthroughs in pharmaceutical chemistry increased international demand for *Strophanthus* seeds, prompting an unsuccessful export scheme from the Gold Coast during the First World War. Reading narratives of drug discovery in Europe against colonial politics in West Africa reveals the world history in which pharmaceuticals continue to be embedded.

**Keywords:** bioprospecting; colonialism; drugs; Ghana; Gold Coast; indigenous; intellectual property; pharmacy; strophanthin; traditional medicine

In August of 1899, a warrior of a 'Frafra' community in what became north-eastern Ghana released an arrow dipped in poison. The arrow pierced the shoulder of a Sergeant serving with the British forces, Igala Grunshi.<sup>1</sup> Grunshi's men immediately ripped out the arrow, and conveyed him to the army surgeon. Dissatisfied with the solution of potassium permanganate offered to him, Grunshi begged the surgeon to allow the application of an indigenous antidote. Most likely a Gur-speaker fighting on the colonial side, Grunshi would have been familiar with the effects of arrow poison (capable of killing within the hour), and may have been inoculated against the toxin.<sup>2</sup> The British surgeon,

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<sup>1</sup>Royal Botanical Gardens Archives, Kew (hereafter RBGAK) MR/GCCP 1888–1906 (B–J) Garland, 23 August 1899, 'Medical Report on Sergeant Igala Grunshi's arrow wound at Frafra'.

<sup>2</sup>The surname 'Grunshi' suggested Gurenne or Gurunshi ethnicity, and was used interchangeably with Frafra and Kanjaga to describe military recruits from the region. The term 'Frafra' came to refer to the pastoral communities residing between the Rivers Sissilla and White Volta after the sound of the everyday greeting of thanks to be heard amongst them. Including the Nankani, Namnam and Tallensi, it was a loose designator for a subset of the Gur-speaking people (Gurunshi or Gurenne) based today in north-eastern Ghana and southern Burkina Faso. On soldier recruitment and inoculation, see Cardinall 1920; Killingray 1982. On toxicity of *Strophanthus*, see Beentje 1982, p. 12.

P. J. Garland, reported that 15 minutes after he administered his drugs, further treatment was provided by men who 'made small incisions on [Grunshi's] back and placed the antidote in the incisions'.<sup>3</sup> Within a week, Grunshi was well enough to return to the battlefield. Admitting his ignorance on the matter, Garland dispatched the arrow and antidote to London for identification.

During the 1890s, the British Colonial War Office and Royal Botanical Gardens at Kew witnessed a spike in correspondence surrounding arrow wounds as wars were waged to secure territory in Africa.<sup>4</sup> Earlier emissaries of the empire, including David Livingstone, had collected poisoned arrows for European museums. Army surgeons and military intelligence were now concerned with their actual deployment as weapons. Much has been made of the devastating impact of the repeating rifle in Africa after its introduction to British troops in 1889; as the satirist Hilaire Belloc famously quipped, 'Whatever happens, we have got the Maxim gun, and they have not.'<sup>5</sup> Indeed, Britain's considerable success was followed in the emerging West African colonies in newspaper reports on fatalities and advances. In June 1892, the *Gold Coast Chronicle* published a fight song describing the war in nearby Nigeria (sung to the tune of Bonnie Dundee): 'Away with the Jibus! / Bring out the Rockets / The Maxims, the Gatlings / Give it 'em Hausas, Ibadans & Scouts / Finish 'em, Finish 'em, Finish 'em now!'<sup>6</sup> However, apprehension surrounding poisoned arrows and other African armaments shaped a surprising footnote to the official narratives of colonial conquest.

By the close of the nineteenth century, investigations on African poisoned arrows led to the creation of a new heart medication called strophanthin. European appropriation of poison arrow technology for an export trade in the valuable *Strophanthus* seeds—critical to both the weapon and the drug—represented one of the earliest episodes in transnational drug prospecting in African colonies. African medicinal plants had long found wide markets on the continent and overseas. In West Africa, the proximity of diverse ecological zones fostered longstanding internal trade in sheanut butter, mahogany bark, kola nuts and other healing plants.<sup>7</sup> Atlantic coastal communities cultivated grains of paradise (*Aframomum melegueta*), used as an aphrodisiac and general tonic, for markets as far as Egypt and Morocco.<sup>8</sup> Increased maritime trade along the Atlantic Coast, first with Portuguese ships in the 1440s and subsequently English, Danish, Dutch and French merchants, redirected both enslaved individuals and therapeutic plants away from Saharan routes.<sup>9</sup> With the rise of formal colonialism in West Africa, European administrators hoped to not only export medicinal plants, but also secure control over their means of

<sup>3</sup>RBGAK MR/GCCP 1888–1906 (B–J) Garland, 'Medical Report on Grunshi'.

<sup>4</sup>RBGAK MR/GCCP 1888–1906 (B–J); RBGKA MR/MGCCP 1888–1906 (I–W); National Archives (hereafter NA), FO 881/7110; Public Records and Archives Administration Department, Accra, Ghana (hereafter PRAAD) ADM 56/1/225.

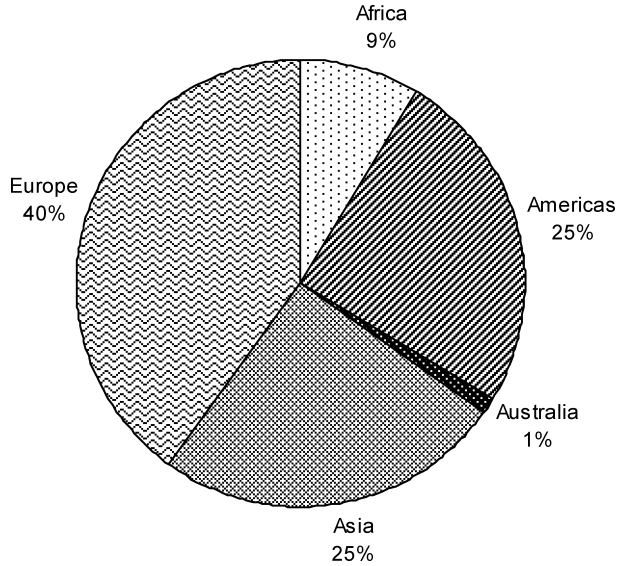
<sup>5</sup>Belloc and Blackwood 1898, pp. 41, 66; Adas 1989; Pacey 1993.

<sup>6</sup>'Judy', 6 June 1892.

<sup>7</sup>Connah 2001; Chalfin 2004; Abaka 2005.

<sup>8</sup>Achaya 1998, p. 43; de Cintra in Kerr (ed.) 1811, p. 270.

<sup>9</sup>Petiver 1697; Rutten 2000; Carney 2001; de Marees 1987.



**Fig 1.** Plants included in 1885 British *Pharmacopoeia* with approximate continent of origin (175 plants in all)  
 Note: I wish to thank Jonathan Cole for his research assistance in the preparation of this data. All values are approximate. Source: GMC 1864, 1874 and 1885.

production. Importantly, the 1884–5 Berlin Conference demanded safe passage for scientific parties exploring plants along the Congo and Niger Rivers.<sup>10</sup>

Increased colonial presence in West Africa by the 1880s coincided with efforts to better manage pharmaceuticals in laboratories. Thus, colonialism was a critical, and sometimes violent, subtext to the ‘discovery’ of alkaloids and glycosides in medicinal plants. In the United Kingdom, official pharmacological knowledge incorporated laboratory examination of plant-based drugs from around the world (Figure 1). From 1858, the British government tasked a new General Medical Council to create a unified British *Pharmacopoeia*. In 1867, the number of plant-derived ingredients included was 166. By the 1885 edition, the number of plants was 175. Throughout this period, approximately 15 of the plant ingredients were imported from Africa, including Acacia gum, Calumba root and Calabar beans. The largest percentage was derived from European folk remedies, approximately 40 per cent, and included elderflower, elm bark and rose hips. And while digitalinum from common foxglove was omitted in 1885, its African substitute, strophanthin, was introduced with the 1898 edition.<sup>11</sup>

Through the simultaneous stories of arrow poisons and strophanthin pills, this article articulates two points. First, the search for new drugs was a component of colonial expansion in Africa during the late nineteenth century, although it has received little historical attention. The historiography of medicine in Africa during the colonial period has

<sup>10</sup>Great Britain *et al.* 1885.

<sup>11</sup>Wellcome 1908, p. 135. Digitalinum was omitted; however, *Digitalis* was maintained in the 1885 edition: General Medical Council (GMC) 1885, pp. xxii, 136.

focused on breakthroughs in epidemiology from research on parasite-borne diseases such as malaria, bubonic plague and sleeping sickness.<sup>12</sup> Where pharmacology has been linked to colonial Africa, it has been in the treatment of diseases like yaws with new synthetic antibiotics and injections by the 1930s. Indeed, it was parasitology researchers such as Alphonse Laveran working in North Africa and Ronald Ross in India who opened the way for colonial expansion and gained international attention in their day (ironically, strophanthin's inventor Thomas Fraser recommended Ross for the 1902 Nobel prize in medicine). National *pharmacopoeias* in Europe and North America were purged of extraneous animal and plant remedies in the wake of synthetic compounds in the early twentieth century. However, recent attention to botanical sources for new drugs has led scholars to revisit earlier variants of plant-based drug discovery, particularly in Europe and the Americas during the eighteenth century.<sup>13</sup> A close reading of pharmacological history suggests that the search for new drugs was also a factor in the scramble for Africa.

In addition, the success of a drug trade in the Gold Coast depended on colonial subjects and regional politics. Initially, chemists relied on African informants to collect samples for laboratory analyses; then, agricultural officers leaned on chiefs to commandeer plants for export. This uncomfortable dependency on Gold Coast populations compromised attempts to transform arrow poisons into innocuous tinctures and pills for sale in Europe and North America. The fear of colonial authorities that plants might fall into the wrong hands jeopardized a full partnership of African communities in plant cultivation and collection. African resistance to the twinned motives of colonial expansion and botanical survey was central to the story of how strophanthin failed to supplant poisoned arrows in the northern reaches of the Gold Coast.

The first section of this article considers the use of poisoned arrows as a technology of warfare and resistance from 1885 to 1922. The second section examines the same period through the story of the conversion of the weapon into a drug, and the third explores the subsequent export scheme in the Gold Coast. Read together, these contemporaneous narratives recover the social and global milieus in which pharmaceuticals continue to be embedded. A note on the term bioprospecting, a contraction of 'biodiversity prospecting', is in order. While it is a relatively new term dating to 1992, I use it retrospectively to describe earlier forms of exploration for new medicines and crops similarly dependent on remote biological resources, scientific research, local knowledge and market-driven outcomes.<sup>14</sup> Today, many people engaged in the search for valuable plants aim to fairly trade 'bio-property' between interested researchers and those residing in biologically-rich environments. In part, this is because of the legacy of the earlier theft of plants and related knowledge in Africa, Asia and the Americas. However, creating the conditions for fair trade and shared benefits remains elusive. Recent critiques of bioprospecting highlight the continued injustices central to botanical drug discovery, particularly as various stakeholders compete for often overestimated financial benefits.<sup>15</sup>

<sup>12</sup>Lyons 1992; Echenberg 2001; Tilley 2004.

<sup>13</sup>Merson 2000; Schiebinger 2004.

<sup>14</sup>Bloom and Walton 1957; Eisner 1990; Reid *et al.* (eds) 1993; Shiva *et al.* (eds) 1999.

<sup>15</sup>Hayden 2003; Dentlinger 2004; Greene 2004; Stahl 2004; BBC 2005.

Studies of recent bioprospecting are useful as a means of interpreting the politics of plant rights in colonial Ghana. Inconsistent systems to reward botanical exchange have endured throughout bioprospecting's long history. In the absence of assured benefits for their plant expertise, Africans on the colonial frontier resisted both military and scientific intruders, paving the way for the demise of *Strophanthus* exports in the Gold Coast by the close of the First World War. This is not to suggest a story of triumph on the part of African communities. The legacy of colonial occupation and drug discovery was that populations such as the 'Frafra' lost rights to knowledge with cultural and medicinal value. Stripped of local detail in the hands of the scientific class, *Strophanthus* seeds served to alienate indigenous communities of what had always been theirs.

### *Strophanthus* as a Weapon on the Gold Coast

Poisoned arrows were critical weapons in the arsenal of African populations resisting invaders, slave raiders and distrusted voyagers. The party of the Portuguese explorer Nuno Tristao made the earliest European report of poisoned arrows in Western Africa after a failed attempt to land in Gambia in 1447.<sup>16</sup> Poisoned arrows also killed a large number in the party of the British navigator Richard Hakluyt as he approached Cape Verde in 1567.<sup>17</sup> Poisoned arrow technology became synonymous with the mysterious dangers of the African continent. For several centuries, details on their manufacture were unavailable to Europeans at coastal forts. In 1673, the Danish missionary, Wilhelm Müller, wrote of Fetu poisoned arrows purportedly laced with crocodile bile on the Gold Coast, but until the late nineteenth century further information eluded inquisitive Europeans.<sup>18</sup>

Grunshi's experience on the battlefield illustrated this larger phenomenon of European unfamiliarity with indigenous weaponry and therapies by the nineteenth century. Further, from European traders along the coast, northern populations sustained knowledge of poisoned arrow production alongside imported weaponry. In a rare document written in Hausa (using Arabic script), Abu Mallam described the Zabarma conquest in the Sahel in the nineteenth century. Mallam noted use of both guns and arrow poisons in battles for trade and slaves. Zabarma's leader, Babatu, fought against local groups sometimes 'gun against gun, man against man'. Of the Guni, it was noted that 'Their poison was not a thing to play with.'<sup>19</sup> Further examples of hybrid weaponry included Dane guns used by the Dagomba who made their own iron bullets.<sup>20</sup>

Africans capitalised on their superior understanding of local plants to challenge efforts to occupy their territory. Among Gur-speaking communities, secret recipes for 'red-tipped arrows' were disclosed to religious and healing figures such as the land priest or *tiindana* who prepared the poison in secluded parts of the bush ahead of offensives (Figure 2). In

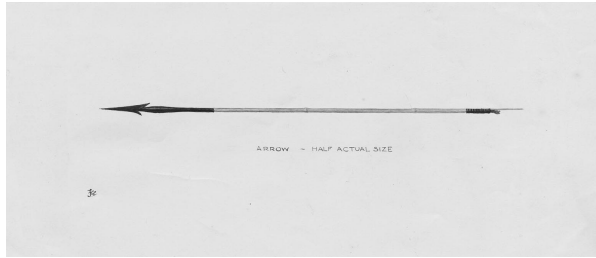
<sup>16</sup>Faria e Sousa 1703. This is referenced in the papers of a colonial medical officer. See Leitch 1938.

<sup>17</sup>Hakluyt 1889. Cited by Leitch 1938; Kutalek and Prinz in Yaniv and Bachrach (eds) 2005, p. 99.

<sup>18</sup>Vogt 1912; Leitch 1938.

<sup>19</sup>Mallam 1992, pp. 80, 87.

<sup>20</sup>Northcott 1899, p. 35.



**Fig 2.** Illustration of Poisoned Arrow from Albert Chalmers' 'A Further Report of Experiments upon the Frafra Arrow Poison', 1899 in Miscellaneous Report 'Gold Coast Cultural Products (1-W), 1888–1906. Image reproduced with the kind permission of the Board and Trustees of the Royal Botanic Gardens, Kew. Source: RBGKA MR/MGCCP 1888–1906 (1–W).

the face of colonial espionage in the 1890s, those privy to poison arrow production supplied incomplete details:

The seeds are reduced to a powder by grinding *and the other parts added*. And to this a small quantity of water is added and stirred. The mixture is then boiled for some time until it becomes of a thick consistency. It is then allowed to cool and the arrows are subsequently smeared with the thick brown coloured resinous looking residue.<sup>21</sup>

Arrow poisons represented a form of African experimentation and innovation. Communities adapted inherited recipes to create secretive, localised formulas.<sup>22</sup> Parts and amounts of plants, time of collection, additional ingredients and heating processes were committed to memory and varied from community to community. These diverse formulas combined available toxins including potent plants, snakes, fermented urine and scorpions to devastating effect. Northcott reported that poisons included 'Ali', a water insect, while preparations from Wa used snake venom mixed with 'Yao' plants, suggesting the Mole word for *S. hispidus*, 'Yoagba'.<sup>23</sup>

While it is not my aim here to reveal secret recipes, further details regarding arrow poison technology in the nineteenth century emerged from accounts written on colonial battlefields. To surgeons like Garland, arrow wounds presented a medical quandary. Garland reported that 'it was impossible to carry out very accurate observations as the column was in motion and men were hit from time to time'.<sup>24</sup> He advised his men and officers 'that in the event of their being hit by arrows they were to immediately have the arrow pulled out without waiting for my arrival on the scene'.<sup>25</sup> Once Garland or one of his dressers caught up with the wounded party, a solution of potassium

<sup>21</sup>Punctuation and emphases are mine. RBGKA MR/MGCCP 1888–1906 (1–W) Garland, 'Report on the Arrow Poison used by the Frafra'.

<sup>22</sup>Northcott 1899, p. 35; Irvine 1930, pp. 397–8; Echenberg 1971.

<sup>23</sup>RBGKA MR/MGCCP 1888–1906 (1–W); Northcott 1899, pp. 35–7; Smith 1967; Mshana *et al.* (eds) 2000, p. 892.

<sup>24</sup>RBGKA MR/MGCCP 1888–1906 (1–W); Garland, 'Report on the Arrow Poison used by the Frafra'.

<sup>25</sup>*Ibid.*

permanganate was syringed into the wound. Brandy was also on offer and in extreme cases, a weak solution of cocaine. Like Grunshi, not all soldiers were confident in Garland's procedure to neutralise the poison. Limited evidence suggests that while French and German military convoys were more likely to use indigenous antidotes, British-led troops were encouraged to avoid using them.<sup>26</sup> In an atmosphere marked by war and conflict, misinformation ran rampant. A surgeon working with Garland noted, 'it is highly improbable that natives against whom we were fighting would give any information with regards to such a secret and virulent poison'.<sup>27</sup> Reports on poisoned arrows were marked 'confidential' and 'These papers are not intended for publication'.<sup>28</sup> Considering soldiers in West African regiments were from neighbouring communities, it is certain that like Grunshi they offered their own opinions and experiences, much of which unfortunately remains outside historical records.

From the battlefield, military officials carried available poison and plant samples. The parcel Garland sent to the Army Medical Department in London 1899 could not be fully identified at Royal Botanic Gardens, Kew. Thus it was stated that:

- (a) 'poison plant' is a species of *Strophanthus*. I cannot make it exactly; but it must be very near to *S. hispidus*. There are no twigs with the pods as stated in the letter.
- (b) The 'antidote' is a mixture of 4 or 5 diff. Plants or plant fragments, namely 2 very diff. kinds of Branches. They are like the second set of leaves [indeterminable] without a close anatomical examination.<sup>29</sup>

While the antidote remained a mystery, efforts were made to compare research on the species and related poisons in other parts of Africa, including observations made in Uganda the previous year.<sup>30</sup> Partial identification of key ingredients in the arrow toxins submitted by Garland allowed the Army Medical Department greater control over the 'nuisance' of African resistance. Importantly, it served as a first step to reconfigure arrow poisons into strophanthin in the emerging colony. However, an export trade in *Strophanthus* from the Gold Coast was not realised for a further two decades.

By 1902, British-led troops secured control over the Asante kingdom and declared a protectorate over the Northern Territories. Arrow poisons continued to be of concern in the colony as administrators replaced soldiers and military physicians. Limiting access to weaponry was a central government policy. Efforts in October 1905 to secure Navarro (now Navrongo)—the last municipality before the Ghanaian border with Burkina Faso at Paga—were indicative.<sup>31</sup> Colonial authorities hoped to monitor French encroachment from the Western Sudan, establish a trading post, and levy taxes on

<sup>26</sup>Leitch 1938.

<sup>27</sup>RBGKA MR/MGCCP 1888–1906 (I–W) Albert Chalmers, 1 September 1899, 'A Further Report of Experiments upon the Frafra arrow poison'.

<sup>28</sup>RBGKA MR/MGCCP 1888–1906 (I–W) Secretary Chamberlain to Director of the Royal Gardens, Kew, 26 February 1900.

<sup>29</sup>RBGKA MR/MGCCP 1888–1906 (I–W) Botanical report on Gold Coast arrow poison, 13 June 1899.

<sup>30</sup>NA, FO 881/7110.

<sup>31</sup>Killingray and Matthews 1979.

the lucrative trade in gold run by African merchants between Asante and Salaga.<sup>32</sup> But, as Paul Feyerabend was to write in the 1970s, attempts to subjugate a population by another might lead to unintended consequences: 'A powerful tribe invading a country may impose its laws and change the indigenous traditions by force only to be changed itself by the remnants of the subdued culture.'<sup>33</sup> In this case, colonial authorities in the Northern Territories developed a fascination with the banned poisoned arrows and their ingredients.

Lieutenant P. J. Partridge was sent with 150 men to establish the post. He was informed that:

the reasons for this move are [first] the enormous populated region that exists in this part which up to date, has only been brought into touch with our administration by somewhat hurried raids. [And second] tribes in these parts settle all disputes by immediate recourse to poisoned bows and arrows and only within the last few weeks one village has fought among themselves over a trivial dispute resulting in the loss of several lives.<sup>34</sup>

After a meeting with town leaders, Partridge reported the suggested 'prohibitions met with great applause and clapping of hands... I conclude they have as great an objection to the poisoned arrow as we have.'<sup>35</sup> To confirm his mandate, Partridge displayed a large Maxim gun with 2,000 rounds of ammunition in the centre of Navarro. He executed two criminals in neighbouring towns, and donated a 'silk dress to the chief of Navarro' in return for his supply of 'free labour'.<sup>36</sup> Within two days, Navarro's citizens mobilised the collection of 500 loads of grass and 200 loads of sticks to start building a jail, government store, courthouse and military barrack. According to Partridge, the Navarro leader understood that the European presence 'would make him into a big Chief and he and his people were prepared to do everything they could to help'.<sup>37</sup>

Paternalistic policies directed Partridge to seize arrow poisons and inflict offenders with heavy fines, including the collection of herds of sheep and cattle. Outlawing poisoned arrows and possession of poison extended the Gold Coast laws of 1892 to the Northern Territories. Section 46 of Criminal Code 12 made not only murder, but evidence of intention to murder a punishable offence with up to ten years imprisonment:

Every person who prepares or supplies, or has in his possession, custody, or control ... any instruments, materials, or means ... by which life is likely to be endangered ... shall be liable to punishment in like manner as if he had attempted to commit that crime.<sup>38</sup>

<sup>32</sup>PRAAD ADM 56/1/38 Chief Commissioner, Northern Territories to Lieut. P. J. Partridge, 16 October 1905.

<sup>33</sup>Feyerabend 1988, p. 232.

<sup>34</sup>PRAAD ADM 56/1/38 Chief Commissioner, Northern Territories, Gambaga to Lieut. P. J. Partridge, 16 October 1905.

<sup>35</sup>PRAAD ADM 56/1/38.

<sup>36</sup>PRAAD ADM 56/1/38 Memo from Chief Commissioner Northern Territories, 10 July 1906.

<sup>37</sup>PRAAD ADM 56/1/38.

<sup>38</sup>PRAAD ADM 4/1/16; PRAAD ADM 56/1/38.

Household and military weapons including bows and arrows were outlawed within colonial jurisdiction: 'The information should be widely circulated that the carrying of poisoned arrows and the possession of the poison in their compounds will be considered an offence.'<sup>39</sup> These new policies would have criminalised a wide spectrum of individuals—including hunters, war medicine specialists, rebels and warring chiefs.

As colonial occupation solidified, banning arrows served the interests of both chiefs and colonial officers hoping to minimise resistance. 'Frafra' was the name assigned to one of the five kingdoms of the North East province (now Upper East Region in Ghana) that the colonial administration christened in 1911.<sup>40</sup> To maintain control in this and other kingdoms, British authorities continued to give gifts to 'friendly chiefs' and regularly propped up preferred leaders.<sup>41</sup> After the death of several chiefs in Zouaragu in 1918, regional commissioners confided on a list of possible replacements.<sup>42</sup> Given the close alliance of political authorities, those who chose to resist the colonial apparatus aimed their arrows indiscriminately at both European and African officials. In November 1917, Akanye, a man residing in Bolgatanga, threatened to shoot arrows at both his king and the colonial police sent by the District Commissioner to arrest him. After several months in hiding, Akanye reappeared the following April, prompting a standoff between village royals, mounted police officers and the new acting District Commissioner, A. W. Cardinall. Akanye stationed himself on the roof of his thatched house, armed with his bow and arrows. After one arrow grazed Cardinall, and a second pierced the shin of Cardinall's interpreter, the Commissioner opted to fire a gun towards the house, prompting a flurry of activity and confusion which ended with a fatal bullet wound to Akanye.<sup>43</sup> An official statement was sent from the capital to 'please inform Cardinall that Governor considers he acted with courage in a critical situation and that the shooting of Akanye was justified'.<sup>44</sup>

In 1920, Cardinall capitalised on his experiences in the publication, *The Natives of the Northern Territories of the Gold Coast, Their Customs, Religion and Folklore*. The Akanye affair or similar incident formed an ethnographic morsel for the colonial official to digest at his leisure:

Once my interpreter was hit by a poisoned arrow. The local *liri-tina* [herbalist] would not come. He was too afraid of a general fight, since the war-cry had been raised. He supplied the antidote, however, *but I could not learn of what it was composed*. The procedure was as follows. The wound was in the left leg just below the knee-cap, *the poison strophanthus*. The arrow had pierced in about three-quarters of an inch and took me several seconds to extract. The man was made to sit down. His neck was cut in three places, but not so as to draw blood, and the skin between

<sup>39</sup>PRAAD ADM 56/1/38.

<sup>40</sup>Brukum 2001.

<sup>41</sup>PRAAD ADM 56/1/38.

<sup>42</sup>PRAAD ADM 56/1/236 Provincial Commissioner, North-Eastern Province to Chief Commissioner, Tamale, 21 December 1918.

<sup>43</sup>PRAAD ADM 56/1/236 Armitage to Acting Provincial Commissioner, Gambaga, 10 June 1918.

<sup>44</sup>PRAAD ADM 56/1/236 Acting Col Secretary to Armitage, 4 July 1918, A. W. Cardinall to C.N.E.P., Gambaga, 7 May 1918, Bila Moshi, Witness Statement, May 1918.

the fingers was treated likewise. The wound was then beaten with the flat of a knife, and after a little blood had flowed the medicine—a black sort of paste—was applied and a draught of some concoction given. . . . The man lived.<sup>45</sup>

In contrast to earlier encounters with poisoned arrows like that of Grunshi in 1899, Cardinall's experience occurred at a moment of increased colonial authority. Cardinall escaped brushes with 'primitive' warfare unharmed, and was celebrated for his courage under fire. Whether he could be certain the poison was from *Strophanthus* plants when he had no clear indication of the composition of the antidote was unclear. But by then *Strophanthus* was almost expected in a colonial tale. Even Arthur Conan Doyle's *Lost World* described a mythical land where South American *Strophanthus* arrows were aimed at dinosaurs: 'But where the conical explosive bullets of the twentieth century were of no avail, the poisoned arrows of the natives, dipped in the juice of strophanthus and steeped afterwards in decayed carrion, could succeed.'<sup>46</sup>

In the Northern Territories of the Gold Coast arrows were officially outlawed, though they continued to be used to resist both European administrators and African leaders until at least 1918. Yet even as poisoned arrows were met with prompt gunfire, colonial administrators continued to make toxic armaments the object of scientific inquiry. The following section shows simultaneous efforts to remake arrow poisons into the drug strophanthin. Thus, to export *Strophanthus* seeds meant gaining full access to a plant whose alternative uses in weaponry were forbidden.

### *Strophanthus* as a Drug in Europe and North America

Before *S. hispidus* was identified as a possible ingredient in 'Frafra' arrow poison, the colonial administration in the British Gold Coast was keen to find signs of the plant on the Gold Coast. In the wake of the landmark 1884–5 conference of Berlin that firmly secured European interests in the interior of Africa, the Gold Coast Governor appointed a group of interested men to a Commission for the Promotion of Agriculture on the Gold Coast Colony.<sup>47</sup> Significantly—though mention was made of regional crops including rice, corn, yams, kola and the newly introduced cocoa—*Strophanthus* was the only item listed under the subheading 'Drugs' in the Commission's initial forty-page memorandum:

Drugs A large number of plants are used medicinally by the natives, but too little is know of this department to allow of particularization. No doubt examination of the flora by botanists will lead to the discovery of many plants as valuable as the *Strophanthus*, to which attention has been lately directed.<sup>48</sup>

*Strophanthus* species were found throughout Africa and Asia, including parts of China and the Philippines, with no overlap between species in Africa and those indigenous to

<sup>45</sup>Cardinall 1920.

<sup>46</sup>Doyle 1912, p. 88.

<sup>47</sup>RBGAK MR/GCCP 1888–1906 (B–J) Percival Hughes, Acting Colonial Secretary, Government Gazette, Accra, 30 September 1887, reprinted in Report on Economic Agriculture on the Gold Coast, p. 46.

<sup>48</sup>RBGAK MR/GCCP 1888–1906 (B–J) 1889 Report on Economic Agriculture on the Gold Coast, p. 28.

Asia.<sup>49</sup> A climbing vine with dramatic spotted flowers, *Strophanthus* plants could be found growing south of the Sahel and throughout eastern and southern Africa in the underbrush of woody grassland and amongst treetop vines in more forested areas. Linguistic evidence suggested that a range of West African communities had terms for the genus.<sup>50</sup> Some populations protected it within communal gardens, perhaps implying popular knowledge of its uses among those not inducted into military, hunting or medico-religious sects.<sup>51</sup>

African healers had long recognised the medicinal value of the genus, incorporating different species into treatments for muscular aches, open sores, constipation, food poisoning, venereal ailments and heart failure.<sup>52</sup> In the Gold Coast, preparations of the plant variously called *Omaatwa*, *Yoagbe* and *Ajokuma* relied on alcoholic decoctions made by steeping roots in a fermented, alcoholic beverage; a therapeutic method common to the region. The resulting bitter-tasting solution would be taken in small sips over a period of days or weeks.<sup>53</sup> Local healing specialists throughout West Africa seemed to have closely monitored its use: 'The stems are mashed and boiled and the liquid drunk, the dose being carefully regulated by the native doctor, any error easily producing poisoning.'<sup>54</sup> Reticence regarding recipes continued to mark the Ghanaian healer profession by the early twenty-first century.<sup>55</sup>

The enthusiasm for *Strophanthus* represented in the 1889 report of the Commission for the Promotion of Agriculture on the Gold Coast Colony stemmed from the rising popularity in Britain of a novel treatment for circulation promoted by the Scottish physician, Thomas Fraser. His studies on a series of poisoned arrows led to the isolation of purified strophanthin in the late 1880s, creating a demand for *S. hispidus* seeds from Africa.<sup>56</sup> Fraser, having conducted research on South American arrow poisons, researched *Strophanthus* after corresponding with explorer David Livingstone and his companion, the physician John Kirk. Kirk kept his collection of poisoned arrows in the same bag as his toothbrush. Noting a throbbing sensation on his gums one morning, he thought the arrow tips might contain a potent stimulant.<sup>57</sup> Livingstone secured

<sup>49</sup>Beentje 1982.

<sup>50</sup>Examples of terminology for species of *Strophanthus* in Ghanaian languages include: *Ajokuma* (Nzema); *Kwaman*, *kwani* (Hausa); *Omaatwa*, *Omletwa* (Ga-Dangme); *Yoagbe* (Mole); *Ahoti*, *Matwa*, *Amatsiga* (Ewe); *Amamfoha*, *Omaatwa* (Twi); *Oman*, *Edupanyin* (Fante). See Mshana *et al.* (eds) 2000, pp. 83, 69, 637. Centre for Scientific and Industrial Research 1992, pp. 132–4.

<sup>51</sup>PRAAD ADM 56/1/225 Acting Chief Commissioner, Northern Territories to Tudhope, 10 February 1917; Fairchild 1928; Mshana *et al.* (eds) 2000.

<sup>52</sup>Reported use in heart failure may be an indigenous therapy or a reference to clinical derivatives such as strophanthin.

<sup>53</sup>Mshana *et al.* (eds) 2000.

<sup>54</sup>Leitch 1938.

<sup>55</sup>It is not the intention to publish extensive 'ethnopharmacological' data here, nor were healers interviewed in my larger study requested to provide plant information. But see Osseo-Asare 2005.

<sup>56</sup>PRAAD ADM 56/1/225 Imperial Institute of the United Kingdom, The Colonies and India, 'Report on Strophanthus Seed from the Gold Coast, 6 June 1917.'

<sup>57</sup>Fraser 1890–1, p. 977. On the Zambezi expedition, see Dritsas 2006.

information on the source of the poison from arrows collected in Kombé during an expedition along the Zambezi river.<sup>58</sup>

To make the drug, Fraser first ground and dried samples of seed obtained from his colleagues, which he surmised to be of *S. hispidus*. It was not until the early twentieth century that Fraser's experiments were corrected to reveal that the plant in question was actually *S. kombé*.<sup>59</sup> In response, the British *Pharmacopoeia* approved only strophanthin made from the *S. kombé*; a specification that affected the export schemes described below.<sup>60</sup> Fraser mixed combinations of powdered seed with alcohol or water until he was able to create a concentrated form of seeds which, under the lens of his microscope, revealed suspended crystals.<sup>61</sup> These crystals, described as 'intensely bitter', were mixed with water and tannin to produce 'the active principle'. Then, the tannin was converted to tannate through the introduction of lead oxide. Carbonic acid was passed through the remaining solution for several days, which, once dried, could precipitate strophanthin through the introduction of ether.<sup>62</sup> The rewards of this long process were 'beautiful stellar groups of colourless and transparent crystals'.<sup>63</sup>

Strophanthin's effect on the heart and blood circulation was similar to that of digitalin derived from common foxglove.<sup>64</sup> Fraser heralded strophanthin as more potent, with the added effect of increasing the action of the heart without raising blood pressure or causing indigestion. By late 1905, clinical trials of intravenous use of strophanthin for individuals suffering from weak hearts began in Germany under the direction of Albert Fraenkel in Strasburg.<sup>65</sup> During the next decade, German researchers perfected the use of strophanthin to combat poor circulation and came to dominate the trade in *Strophanthus* through their African colonies. Strophanthin was incorporated into official *pharmacopoeias* in the United States, Britain, France and Germany.<sup>66</sup> Using both British and American standards, Burroughs Wellcome and Company prepared the 'tabloid' brand Strophanthus Tincture from 0.01 grams of seed for each 0.1 gram dose.<sup>67</sup> The drug was prescribed to adults with heart murmurs; it was also masked in sweet syrup and given to children three times a day to alleviate a plethora of ailments including 'nervous asthma', typhoid and pneumonia. For the American market, E. R. Squibb and Sons combined digitalis with strophanthin in a popular chocolate covered tablet sold at 16 cents per hundred. The recommended dosage for palpitation, smoker's heart and as a cardiac tonic was 1 tablet every three or four hours.<sup>68</sup>

<sup>58</sup>Fraser 1890–1.

<sup>59</sup>Anon. 1887.

<sup>60</sup>Fraser 1890–1, p. 976.

<sup>61</sup>Fraser improved on *inée*, developed by French researchers Polailon and Carville in 1872. Fraser 1890–1.

<sup>62</sup>*Ibid.*

<sup>63</sup>*Ibid.*

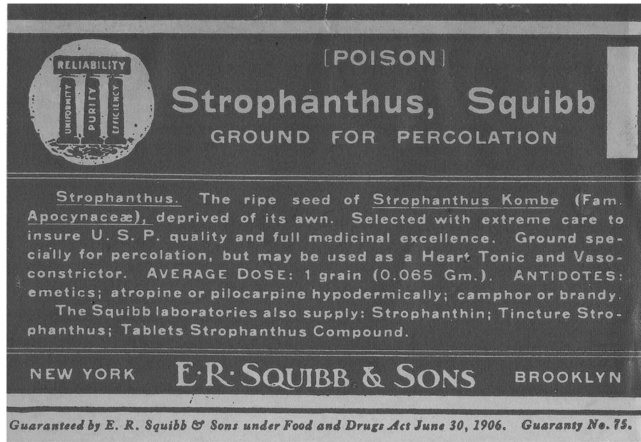
<sup>64</sup>On the 'discovery' of digitalis from folk medicine in England, see Koppanyi 1935.

<sup>65</sup>Fraenkel and Schwartz 1907.

<sup>66</sup>See Pharmaceutical Society of Great Britain 1907. See also Desfontaines 1802; Planchon 1896; Stillé 1896; Wood *et al.* 1899; *Deutsches Arzneibuch* 1910; Dalziel 1937; Irvine 1961.

<sup>67</sup>Wellcome 1908, p. 165.

<sup>68</sup>Squibb 1910, pp. 245, 340–2, 389–90.



**Fig 3.** Digital scan of label for Squibb Strophanthin c. 1916 and photograph of a bottle of Squibb Strophanthin tincture filled in 1932. Images reproduced with permission from the Archives of Bristol-Meyers Squibb.

Questions on the safety and purity of strophanthin plagued its initial acceptance. Physicians reported inconsistent results with strophanthin pills, preferring digitalis, or pills made with a mixture of both.<sup>69</sup> Fraenkel's studies on *injecting* strophanthin, though he recorded no fatalities, were not widely accepted outside Germany.<sup>70</sup> In retrospect, what might have been behind the unreliable results reported with strophanthin? The white crystals of the extract suggested a pure, standard commodity. However, accurate differentiation of various species of *Strophanthus* with their distinctive chemistry was

<sup>69</sup>Squibb 1910.

<sup>70</sup>During the Second World War, Fraenkel was asked to step down in a climate of anti-semitism, McKenzie in Diz *et al.* (eds) 2002, p. 98.

difficult to conduct with dried seeds devoid of any other plant parts.<sup>71</sup> An early test used sulphuric acid to turn substances containing strophanthin green. However, even 'pure' tinctures turned red or reddish-green, leaving chemists to 'conclude that [they] ... were prepared from a non-official seed'.<sup>72</sup> The chemist alone with the delocalised seeds could not be confident that his drugs were pure (Figure 3).

### Exporting *Strophanthus* from West Africa, 1914–22

Efforts to export *Strophanthus* from the Gold Coast during the First World War indicated a need for botanical expertise at the ground level. However, the very people who might have built on existing knowledge to accurately identify *Strophanthus* were banned from using it. For instance, Akan experts in the Gold Coast had their own schema for distinguishing categories in the genus—*S. hispidus* was categorised as 'male', based on its amount of sap in contrast to 'female' *S. Preussii*.<sup>73</sup> In late 1914, the British in the Gold Coast took advantage of instability during the First World War to invade neighbouring German Togoland, entering an experimental *Strophanthus* garden in the northern town of Yendi. The motley harvest of 'small dark brown seeds with yellowish hairy patches' triggered a short-lived export scheme.<sup>74</sup>

Initially, the Gold Coast administrators had high expectations. In April 1915, a high-ranking colonial official in the Northern Territories shipped off his cache of plundered seed to England for analysis. The Imperial Institute in London determined that they 'differed widely, both in appearance and in their chemical reactions when tested', from the species approved for medical use, *S. kombé*.<sup>75</sup> Secondary identification at the Royal Botanic Gardens, Kew, posited that the seeds were of the species *S. hispidus*, the same type connected with 'Frafra' arrow poisons in 1899. However, since current unrest in Nyasaland had interrupted the normal supply of *S. kombé*, importers in London would temporarily entertain purchase of West African *S. hispidus* seeds at a price of 1 shilling 3 pence per pound.<sup>76</sup>

In the Gold Coast, the government agricultural scientists experimented with *S. hispidus* cultivation. The agricultural department, like all branches of the colonial administration, was weighted to the southern, coastal areas and lacked experience with northern plants. At this time, the Director of Agriculture, W. S. D. Tudhope, was based at the government gardens at Aburi where he focused on cocoa cultivation. Tudhope sent detailed explanations of how to prune the unfamiliar plants, adding that it would be best if he or his curator were to come in person: 'It is difficult to advise on such a matter by letter.'<sup>77</sup> In 1917, the harvest of *S. hispidus* seed did not seem promising. The abandoned German shrubs at Yendi would only provide 'one or two hundred weights' and

<sup>71</sup>Beentje 1982.

<sup>72</sup>Moor and Priest 1901, pp. 33–4.

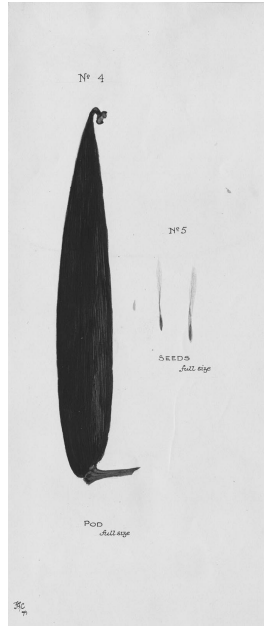
<sup>73</sup>Irvine 1930, p. xviii.

<sup>74</sup>PRAAD ADM 56/1/225 The Imperial Institute, 'Report on Strophanthus Seed from Togoland,' 10 February 1916.

<sup>75</sup>*Ibid.*

<sup>76</sup>*Ibid.*

<sup>77</sup>PRAAD ADM 56/1/225 Saunders, Curator at Agricultural Department, Aburi to the Chief Commissioner, Northern Territories, 1 November 1917.



**Fig 4.** Illustration of *Strophanthus* Pod and Seeds from Albert Chalmers' 'A Further Report of Experiments upon the Frafra Arrow Poison', 1899 in Miscellaneous Report 'Gold Coast Cultural Products (1-W)', 1888–1906. Image reproduced with the kind permission of the Board and Trustees of the Royal Botanic Gardens, Kew. Source: RBGKA MR/MGCCP 1888–1906 (I–W).

Tudhope was forced to admit to the Governor that 'it is quite evident we are not yet in a position to enter into the commercial aspect of the subject'.<sup>78</sup>

The initial enthusiasm for the export scheme soon proved unsustainable. Those appointed to manage the new acquisitions in Togoland were left to tasks such as the winnowing of poisonous seeds under difficult circumstances (Figure 4). The agricultural inspectors at Aburi were not sympathetic to their struggles. Defending himself in March 1918, the District Commissioner in Yendi explained to his supervisor in Tamale: '[I]n my opinion [Tudhope's] criticism was uncalled for':

With inadequate means at my disposal for beating out this seed, and then having to allow it to dry for days in the sun, that a small percentage of dust etc should be mixed with it is unavoidable. Added to which a too close contact in winnowing is dangerous to both the eyesight and lungs as this poison is an extreme irritant. In my attempts to do so both my helpers and myself were caused the acutest discomfort.<sup>79</sup>

<sup>78</sup>PRAAD ADM 56/1/225 Tudhope, Agricultural Department, Aburi to the Colonial Secretary, Accra, 30 October 1917.

<sup>79</sup>PRAAD ADM 56/1/225 District Commissioner, Yendi to Chief Commissioner, Tamale, 30 March 1918.

Given the difficulties of *Strophanthus* processing, colonial authorities turned to Africans for assistance. Tudhope presented a proposal to the Governor's office in 1917 'to encourage the Natives of the Northern Territories to collect the seed and bring it into the Agricultural Station, and to pay them say 3d [pence] per lb; and this may have the effect of stimulating production'. In 1918, at least one community took him up on this proposal; the Chief of Lorha sent a delegation bearing seeds to the District Commissioner in Wa.<sup>80</sup> Further samples do not seem to have been gleaned from local residents.

The threat of poisoned arrows loomed large in discussions surrounding the *Strophanthus* export scheme. While collection of the seed by Africans from wild sources was permissible, experiments in cultivation were left to Europeans. *S. hipsidus* was a favoured ingredient in arrow poisons made in the north-eastern and north-western province and to a lesser extent in the southern. The Chief Commissioner of the Northern Territories explained to Tudhope:

There is no objection whatever to the cultivation of *Strophanthus* at Botanical or District Stations, but I do not advise that the natives should be encouraged to cultivate it; at any rate for the present.

If we find that *Strophanthus* seed is worth the cultivation of the plant on a large scale, and that it would prove to be a profitable local industry, it will be time enough to encourage the Chiefs of the Province to establish plantations of *Strophanthus*.<sup>81</sup>

Efforts to grow *Strophanthus* had limited success. In 1917, the Chief Commissioner of the Northern Territories reported that 'the area planted with *Strophanthus* at the Tamale Agricultural Plantation is not yielding good results and few of the plants have reached a height of more than 6 inches'.<sup>82</sup> Despite the difficulties of cultivation, an object that to this day has not been fully realised, the Agricultural Department persisted. Indeed, in the imagination of lobbyists in Britain at the time: 'The forests of Africa ... teem with useful drugs, prominent among which may be cited the kola nut and the *Strophanthus* seeds.'<sup>83</sup> Tudhope explained to the Governor in 1919 the need 'to lend every assistance in the distribution of seeds' to the experimental plots in Tamale, Wa and Gambaga.<sup>84</sup>

By 1922, the export scheme of *Strophanthus* all but ceased in the Gold Coast and surviving plants in the agricultural gardens were dug up and burned. The failure of the export scheme was pinned on the 'dangerous properties' of the plants and the untrustworthiness of people in 'poison arrow districts'. At Navarro, the Commissioner of the Northern Province received a letter from the regional office advising him to destroy all seedlings in early 1922:

I note that you may have a crop of *Strophanthus* this year. In spite of the wishes of the Agricultural Department, I am not prepared to allow this crop to mature in a

<sup>80</sup>PRAAD ADM 56/1/225 Provincial Commissioner Northwestern Province, Wa, to Chief Commissioner, Northern Territory, Tamale, 6 May 1918.

<sup>81</sup>PRAAD ADM 56/1/225 Chief Commissioner, Northern Territories to the Curator, Botanical Gardens, Tamale, 26 April 1918.

<sup>82</sup>*Ibid.*

<sup>83</sup>Johnston 1918, p.184.

<sup>84</sup>PRAAD ADM 56/1/225 W. D. S. Tudhope, Director to Colonial Secretary, Accra, 10 January 1919.

poison arrow district, unless you can guarantee that none of it will be stolen. Our first duty is to wean the natives from the use of this poison, and I think that it is a poor way to do it by actually growing it in our own experimental gardens right amongst them. There are other places where it can be experimentally grown without risk.<sup>85</sup>

This sentiment was echoed by other commissioners throughout the Northern Territories: 'I beg to inform you that the D. C., Wa considers that it is quite impossible to guarantee that none of the crop will be stolen, and he has therefore had all the plants dug up and burnt.'<sup>86</sup> By the beginning of July 1922, all commissioners were instructed to destroy remaining plants.

The difficulties represented in the Gold Coast export scheme suggest, in part, the circumstances behind impure, unreliable strophanthin stocks worldwide.<sup>87</sup> Commercially, *Strophanthus* buyers preferred pods or previously removed and cleaned seeds, which were ironically more difficult to identify by species and place of origin. German scientific opinion favoured the readily defined, hairy seeds of *S. hispidus*, while 'the British Pharmacopoeia, the French Codex and the Swiss Pharmacopoeia', only recognised *S. kombé* seeds for legal production of strophanthin.<sup>88</sup> Intricate strategies were devised by the 1930s to differentiate between seeds originating in Mozambique versus Sierra Leone, Upper Niger versus the Zambesi delta, yet contamination was common and results unpredictable.<sup>89</sup> While the African plant experts like the *tiindana* may have had greater fluency with plant identification, British agricultural officers, citing concern over 'misuse' of the plants for poisoning arrows, did not formalise any basis for meaningful collaboration and their investigations floundered. This was in contrast to the successful cocoa trade led by African farmers in the colony during the same period.<sup>90</sup>

Threat of potential abuse was sufficient grounds to abandon the initiative, despite an obvious lack of experience propagating and harvesting the plant on the part of colonial administrators.<sup>91</sup> As one commissioner rationalised, '*Strophanthus* is not hardly used (*sic*) as a drug in Europe', and scarcely warranted all of the trouble required to cultivate it in the face of African demand. Insufficient coordination with German scientists was also at play. Further, evidence of poisoned arrow battles such as that between Akanyeleye and Cardinal in 1917 suggested the instability of colonial authority as administrators and indirect rulers feared for their own safety.<sup>92</sup> Ancient writers foretold a time when weaponry might be put aside and transformed, 'They will beat their swords into plowshares and their spears into pruning hooks. Nation will not take up sword against nation, nor will they train for war anymore.'<sup>93</sup> But, in the end, 'swords' were not remade into 'plowshares', and poisoned arrows were not fully transformed to strophantin pills in the Gold Coast.

<sup>85</sup>PRAAD ADM 56/1/225 Chief Commissioner, Northern Territories, Tamale to the Commissioner of the Northern Province, Navarro, 2 May 1922.

<sup>86</sup>PRAAD ADM 56/1/225.

<sup>87</sup>PRAAD ADM 56/1/225 Imperial Institute, 1917.

<sup>88</sup>Planchon 1896; Perrédès 1900; Jacobs 1923; Beentje 1982; McKenzie in Diz *et al.* (eds) 2002.

<sup>89</sup>Perrédès 1900.

<sup>90</sup>Tudhope 1909; Green and Hymer 1966; Southall 1978.

<sup>91</sup>*S. sarmentosus* was used for cortisone in the 1950s, Cantor 1993; McKenzie in Diz *et al.* (eds) 2002.

<sup>92</sup>Dalziel 1937, p. 379.

<sup>93</sup>*The Holy Bible: The New International Version* (HarperTorch, 1993), Isaiah 2:4, p. 610.

## Conclusion

This essay has explored the intersection of poisoned arrows, strophanthin medication and *Strophanthus* export in colonial Gold Coast to interrogate the history of drug discovery in an increasingly interconnected world by the late nineteenth century. Colonialism (like the folk knowledge of European female healers) was central to the elucidation of alkaloids and glycosides, the backbone of modern pharmacology.<sup>94</sup> Literary critics remind us that the colours and textures of Asia and Africa formed an important subtext to European novels of the nineteenth century. The cholera epidemics of China, romanticised ayahs of childhood, a lover gone abroad, circulate in the subconscious of European characters of the imperial age and deserve closer scrutiny.<sup>95</sup> In the case of *Strophanthus*, a careful reading of laboratory reports constructed in Edinburgh suggested the residue of empire. Returning 'colourless, opaque, and brittle' strophanthin crystals to an African setting provided the contours of the larger global economy in which 'science' operated.

Second, the politics of who had rights to use and assign value to plants shaped strophanthin's trajectory in colonial West Africa. Prior to colonial occupation, people residing in the Sahel were free to incorporate local plants into weaponry and healing practices. Through the process of renaming a medicinal plant and reducing it to a standardised extract, European chemists and botanists transferred authority to science and the colonial state. Yet the state was sometimes fragile, and its authority contested on all sides. In the Northern Territories of the Gold Coast, demand for arrow poison plants intersected with colonial aspirations for an export trade. Power, literacy and scientific authority separated the long-standing adaptations of arrow poisons among healers and hunters in African communities from the laboratory and herbarium investigations of European scientists. In the context of anxiety surrounding poisoned arrows, colonial authorities did not treat African plant experts as equals in the Northern Territories of the Gold Coast, undermining possible progress in the trade. This contrasted with both the lucrative cocoa industry, where Gold Coast plantations were developed and sustained through African leadership, and wild rubber collection schemes in the Northern Territories.<sup>96</sup> The *Strophanthus* transformation in colonial Ghana proves insightful as 'local politics' continue to be a perceived drawback to using botanical sources in drug production today.<sup>97</sup>

Third, the uneven process of transforming an orally-transmitted indigenous technology, such as arrow poison production, into the words and numbers of (European) science was part of an irrevocable shift in access to plant knowledge in Africa. Despite the shortcomings of the *Strophanthus* export initiative, the process of co-opting local knowledge systems through colonial violence was a precursor of what Arun Agrawal described by the 1990s as the troubling preservation of medical insights 'ex situ' through 'isolation, documentation, and storage of indigenous knowledge in international, regional and national archives; and . . . dissemination [of it] to other contexts and spaces—a strategy [associated with the rise of] western science'.<sup>98</sup> Re-reading

<sup>94</sup>Koppanyi 1935.

<sup>95</sup>Said 1994; Ashcroft et al. 1995.

<sup>96</sup>Dumett 1971; Arhin 1972; Chalfin 2004; Abaka 2005.

<sup>97</sup>Hayden 2003.

<sup>98</sup>Agrawal 1995.

pharmacological discoveries alongside colonial archives reveals the interplay between medical lineages, and ultimately the multiple benefactors of our intellectual inheritance. Considering nine per cent of plants included in the 1885 British *Pharmacopoeia* were from Africa, what might the pharmacological industry owe descendants of those who suggested new therapies?

Finally, to justify this process of intellectual ‘appropriation’, the colonial state commanded the language of poison and toxicity to demarcate access to promising plants. The potential of *Strophanthus* to cause harm and death in the ‘wrong’ hands was the focus of government policies in the Gold Coast. From the outlawing of poisoned arrows, to the destruction of test gardens, a climate of fear and anxiety bred paternalistic laws. This preoccupation with poison was not necessarily the approach taken by healers; some recognised the medicinal potential of the plant. By the 1930s, though healers were better able to position themselves within the colonial state, government policies continued to emphasise the dangers of plant-based therapies in African hands.<sup>99</sup> European botanists and chemists used the spectre of poisoning to justify colonial investigations, furthering the dissemination of regional plant knowledge beyond the Gold Coast.

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<sup>99</sup>PRAAD ADM 29/6/5; Aaba 1934.

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