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The Memory of Mission: Statues of Belgian Missionaries in their Native Places and Work Areas*

by

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Keywords. — Missionaries; Colonial History; Memory; Public Space; Decolonization.

Summary. — Missionaries take a prominent place in the Flemish public space. Even in the 21st century, new monuments are being erected. Despite the process of mental decolonization and protest movements such as 'Black Lives Matter', they are subject to little criticism today. Missionaries have become secularized: values such as courage, self-sacrifice and solidarity are now emphasized rather than their religious activities. Moreover, they act as heroes who give Flemish rural areas a place in the globalized world. It is striking that missionaries are also remembered with great admiration in their former mission areas, which has led to numerous statues as well. At the same time, they do not completely escape criticism. All in all, this shows that the memory of missionaries is very diverse and that one cannot create an unequivocal image about missionary work.

Trefwoorden. — Missionarissen; Koloniale geschiedenis; Herinnering; Openbare ruimte; Dekolonisering.

Samenvatting. — *De herinnering aan de missies: standbeelden van Belgische missionarissen in hun geboorte- en werkplaatsen*. — Missionarissen nemen in de Vlaamse publieke ruimte een grote plaats in. Tot in de 21ste eeuw worden er nieuwe monumenten opgericht. Ondanks het proces van mentale dekolonisering en protestacties als *Black Lives Matter* krijgen die vandaag amper kritiek. Missionarissen zijn geseculariseerd: eerder dan hun religieuze activiteiten worden nu waarden benadrukt als moed, zelfopoffering en solidariteit. Bovendien fungeren zij als helden die Vlaamse rurale gebieden een plaats geven in de geglobaliseerde wereld. Opvallend is dat missionarissen ook in hun voormalige missiegebieden met veel bewondering herinnerd worden, ook in de publieke ruimte. Tegelijk is er soms kritiek te horen. Alles bij elkaar toont dit dat de herinnering aan missionarissen heel divers is, en dat men geen eenduidig beeld kan geven over hun werk.

Mots-clés. — Missionnaires; Histoire coloniale; Mémoire; Espace public; Décolonisation.

Résumé. — *La mémoire des missions: statues de missionnaires belges dans leurs lieux d'origine et de travail*. — Les missionnaires occupent une place prépondérante dans l'espace public flamand. Même au XXIe siècle, de nouveaux monuments sont érigés. Malgré le processus de décolonisation mentale et les actions de protestation telles que *Black Lives Matter*, ils ne sont guère critiqués aujourd'hui. Les missionnaires se sont sécularisés: des valeurs telles que le courage, le don de soi et la solidarité sont désormais mises en avant plutôt que leurs activités religieuses. De plus, ils agissent comme des héros qui donnent aux zones rurales flamandes une place dans le monde globalisé. Il est frappant de constater que les missionnaires sont aussi célébrés avec une grande admiration dans leurs anciennes zones de mission, ce qui a également conduit à l'érection de nombreuses statues. Dans le même temps, des critiques se font parfois entendre. En définitive, cela montre que la mémoire des missionnaires est très diverse et qu'on ne peut se faire une image univoque de leur travail.

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In June 2020, worldwide protest broke out in support of the 'Black Lives Matter' movement. It was triggered off by the murder of George Floyd at the hands of U.S. police and initially addressed racism in Western societies, but in many places also targeted monuments for historical figures involved in colonization. The movement likewise affected Belgium, where local authorities for the first time removed a number of statues and busts of Leopold II, inter alia in Mons, Ekeren (Antwerp), Leuven, and Ghent (Goddeeris, 2020).

It was not the first time that the Belgian king had inspired public outcry. In the early twentieth century, fierce international criticism led to the take-over of his private property, the Independent State of the Congo (Congo Free State), by the Belgian state and its subsequent transformation into the Belgian Congo. One hundred years later, Adam Hochschild's bestseller *King Leopold's ghost: A story of greed, terror and heroism in colonial Africa* (Houghton Mifflin, 1998) and Peter Bate's BBC documentary "Congo: White king, red rubber, black death" revived public attention. As a result, monuments to Leopold II and his so-called Congo pioneers have since 2004 regularly been vandalized with red paint or graffiti. Apart from the city of Ostend, which did not restore a hand that had been sawed off from one of the statues of black people at the feet of Leopold's equestrian monument, authorities always fixed the damage. The only response they sometimes gave prior to 2020 was the contextualization of a monument with an information plaque (Goddeeris, 2021, pp. 156-157).

Remarkably, monuments to missionaries active in Congo have not been contested. Over the past twenty years only one has been subject to public debate: the statue in Wilrijk, Antwerp, of Constant De Deken – a missionary who in 1881 left for China, in 1889-1891 participated as a translator in an expedition through Tibet, in 1892 moved to Congo and died there four years later. The statue represents the clergyman towering high above a half-naked African. From 2013 onwards, campaigners criticized the monument as racist and offensive because De Deken's knee seemed to rest on the black worshipper. Two years later, the local council put an interpretive panel near the statue. Yet, artists and activists have continued addressing the monument, which was also covered with red paint during the 'Black Lives Matter' protest of June 2020. Interestingly, some protesters now not only stumbled over its iconography, but also denounced that "missionaries such as Father De Deken were not innocent souls who wanted to do charity. They were an essential link in the plundering of natural resources on the African continent" (*Gazet van Antwerpen*, 18 June 2020).

However, De Deken seems to be the exception that proves the rule that missionaries are still widely admired. This is remarkable, since it goes against currents of secularization and decolonization. This paper will check and explain this. It will analyse the memory of missionaries by painting a more comprehensive picture of their presence in the public space, rather than focusing on the contested monuments. It will work with the case of monuments for Belgian missionaries and examine their number, the places where they were erected, the time periods when this happened, and the people and motives behind the creation of these monuments. It will do so for both Belgium and the former mission areas, and in this way reflect on the different memories of missionaries, both in Belgium and beyond. All in all, it seeks to give the floor to several voices, from different places and eras in order to provide a more comprehensive

idea of how missionaries are remembered. The analysis of Belgium is based on a complete list of missionaries' statues, the one of other countries on selected cases.

The paper relies on extensive source research of local archives (*e.g.* of municipality council meetings, inter alia in Wilrijk), media (that often quoted involved people and in this way also reveal why monuments were erected), internet data, and field work (the monuments themselves). This research has resulted in a Dutch-language monograph (Goddeeris, 2021; detailed references can be found there), of which this paper presents some major conclusions. However, the article also includes updated information, for instance on the most recent overview by Matthew G. Stanard of references to the colonial past in the Belgian public space.

An Abundance of Monuments

The sheer number of colonial statues in Belgium results from a deliberate propaganda campaign in the interwar period and the 1950s that sought to rehabilitate Leopold II and to find support for the colonial project. The American historian Matthew G. Stanard has studied this extensively in two monographs, the first on Belgian colonial propaganda (2011) and the second on the country's memory of its colonial past (2019). This latest book highlights monuments and street names and has a link to an online spreadsheet of all markers [https://lup.be/pages/digital-appendix-the-leopard-the-lion-and-the-cock]. In his most recent update of this overview, from July 2022, Stanard has counted 559 markers that celebrate colonizers and/or the colony in general. He could confirm that 372 of them are still standing (and also listed 53 references to missionaries he found in my monograph but could not confirm; I include these in my counting).

Table 1 contains the details. All in all, at least 108 monuments (including statues, busts, memorials and engravings on existing monuments), 84 plaques, 225 street names and 8 other markers (a building, a paving stone and tombs — Stanard indeed also counted funerary monuments) in Belgium — refer to Congo (and Ruanda-Urundi). Of these, 233 are located in Flanders (the northern and Dutch-speaking part of Belgium), 116 in Wallonia (the southern and largely French-speaking part) and 76 in Brussels (the bilingual capital in the centre). This difference between Flanders and the other regions in Belgium is entirely accounted for by references to missionaries ("miss."): Flanders has 109 of these, whereas Wallonia only 7 and Brussels just 3. The gap is much smaller when it comes to markers to secular colonials ("sec.") in the Belgian public space: 124 in Flanders, 109 in Wallonia and 73 in Brussels.

Table 1

Overview of confirmed references to the Central-African colonial past in the Belgian public space (based on Stanard, July 2022)

	Flanders		**Wallonia**		**Brussels**		**TOTAL**
	sec.	**miss.**	**sec.**	**miss.**	**sec.**	**miss.**	
Monument	40	25	23	2	18	0	**108**
Plaque	9	30	35	2	8	0	**84**
Street name	73	52	49	3	45	3	**225**
Other	2	2	2	0	2	0	**8**
SUBTOTAL	**124**	**109**	**109**	**7**	**73**	**3**	
TOTAL	**233**		**116**		**76**		

This difference is confirmed regarding references to missionaries who worked in regions other than Congo, such as China, India, the United States, and Latin America. Whereas I retrieved only single examples of these in French-speaking Belgium (*e.g.* rue Père Damien in both Braine-le-Comte and Mouscron, rue Hennepin in Ath, and the Observatoire astronomique Antoine Thomas SJ in Namur), I found 157 markers for 102 missionaries beyond Congo in the Flemish public space. This number is amplified by the huge attention to Father Damien. Damien, who sailed to Hawaii in 1863, settled in the leprosy colony of Molokai in 1873, caught the disease himself, died in 1889 and was canonized in 2009, has at least 54 monuments and streets in Flanders. But even if we exclude him, there are almost twice as many commemorative markers for missionaries (in Congo and beyond: 109 + 157 - 54 = 212) than for secular colonials (124).

The vast amount of commemorative markers for missionaries in Flanders is explained by the fact that most Belgian missionaries came from that region. In 1948, for instance, Wallonia provided just 16.4 % of the missionaries in Belgian Congo (Vellut, 1980, p. 263). The two regions indeed differ: whereas Wallonia industrialized earlier and had a more socialist and less religious past, Flanders had a more rural and Catholic character until post-industrial transformations from the 1960s onwards. Also from an international perspective, Flanders stands out. Its number of missionary vocations was extremely high: in 1940, Flemings accounted for less than 1 % of global Catholics, but provided almost 10 % of the Catholic missionaries (Vanysacker, 1996, pp. 322-323). The huge presence of missionaries in the public space also seems unmatched in other countries.

Chronology and Geography of Belgian Missionary Statues

The oldest missionary memorial in the public space is the statue of Pieter Jan De Smet in his hometown Dendermonde. De Smet was a Jesuit who was active among Native Americans in the northwest of the United States between 1821 and 1873. The monument was inaugurated in 1878, barely five years after his death. In the following decades, other municipalities followed suit and erected monuments to native missionaries. Leuven installed a Father Damien's statue in 1894, five years after his death (he was born in the nearby village of Tremelo, but entered his congregation in Leuven). Wilrijk did so in 1904 for Constant De Deken; Pittem in 1913 for Ferdinand Verbiest, the famous Jesuit astronomer at the court of the Kangxi Emperor; and Moorslede in 1929 for Constant Lievens, another Jesuit father who had been active in British India in the late 19th century.

These five missionaries eventually grew up to become 'national heroes'. They have street names all over Belgium, including in places with which they have no direct link. Father Damien received a statue in his birth village of Tremelo in 1963, on the occasion of the centenary of his departure to Hawaii, and in several other cities and municipalities around the turn of the century in the context of his beatification in 1995 and canonization in 2009. This recognition also stretched further than the public space. Verbiest, De Smet and Father Damien are included in *The Country's Glory*, an iconic series of five hundred and fifty coloured drawings (chromos) on Belgium's past made between 1949 and 1961. In the early 1960s, three of these five missionaries were the subject of biographical comics by the famous author Jef Nys.

After the inauguration of Lievens' monument in 1929, new statues were erected for other missionaries. In 1938, the city of Mechelen created a monument for the brothers Theotimus and Fredericus Verhaeghen, two Franciscans who were killed in China in 1904. In the early 1950s, four statues were put up for missionaries who had recently died. Father Victor Roelens (Ardooie) was the first, long-serving vicar apostolic in Upper Congo from 1895 to 1941. Father Jozef Raskin (Aarschot), missionary to China between 1920 and 1934, was executed by the Nazis for his participation in the resistance. Petrus Vertenten (Hamme) had served in Dutch New Guinea from 1910 to 1925 and in Belgian Congo from 1927 to 1939. The four brothers Adons (Hasselt) had all been missionaries in China.

More monuments appeared in the 1960s and 1970s, especially commemorating 'martyrs' who died in the violence after Congolese independence (Goddeeris, 2022). The most iconic is the Kongolo Memorial in Gentinnes, a village in Walloon Brabant. The monument was conceived immediately after the murder of twenty Spiritan fathers in 1962 and was inaugurated together with a large memorial chapel in 1967. The honour wall contains two hundred and sixteen bronze names, including those of eighty-one Belgian and seventy-five foreign Catholic religious and thirty Protestants killed in Congo between 1960 and 1965. Similarly, the Crosiers in 1970 built a monument to their twenty-three murdered confreres in Runkst, near Hasselt. In addition, at least thirteen municipalities did the same for their native sons killed in Congo: Nossegem, Borchtlombeek, Opitter, Vielsalm, Eversel, Pittem, Ooigem, Ardooie, Koersel, Lindelhoeven, Overpelt, Neerpelt and Paal.

Gradually, statues for other missionaries appeared again. In 1976, Ghent placed a copy of a statue to Pedro de Gante that had been given to Mexico a couple of years earlier. In 1981, the 'Eskimo Father' Franz Van de Velde himself attended the inauguration of a memorial stone in his honour placed in his native village of Landskouter. Amaat Vyncke, a Flemish nationalist activist who joined the White Fathers in Congo in 1881 and died there in 1888, was given a bust in 1988 in his former parish Dudzele. A year later, the roundabout at Father Damien's birthplace was decorated with a work of art.

Around the turn of the millennium, the number of newly-built monuments continued to increase. At least five were installed in the 1990s, seven in the first decade of the twenty-first century, and another five between 2011 and 2020. Most of the honoured missionaries had died not long before. Two had worked in East Asia: Jozef Boutsen (1903-1970; monument erected in Dilsen, 1995) in China and Clement Lemmens (1923-1974; Heppen, 2004) in Indonesia. Three others had earned their praise in Congo: Edgar Cuypers (1919-2008; Nieuwerkerken, 2012), Gustave Bouve (1902-1989; Lo-Reninge, 2005) and Urbain Morlion (1894-1985, Lo-Reninge, 2005). Martyrs also continued to receive memorial stones: Désiré Pellens (1920-1962; Neerpelt, 2002) had been murdered in Congo; Serge Berten (1952-1982; Menen, 2012) and Alfons Stessel (1929-1994; 1999?) in Guatemala.

In addition, statues were erected for missionaries who had died much earlier. Adriaan Willems alias Joris van Geel (1617-1652; Oevel, 1992) wrote the first dictionary of a Bantu language. Jan Mallet (1870-1900; Hechtel, 2000) was murdered during the Boxer Uprising. Paul Goethals (1832-1901; Kortrijk, 1996) was the first archbishop of Calcutta. Marie-Louise De Meester (1857-1928; Roeselare, 1999) had founded the congregation of the Missionary Sisters of De Jacht in 1910. And the Jesuit Jozef Van Wing (1884-1970; Herk-de-Stad, 2005) can be regarded as one of the most important missionary-ethnologists of the Belgian Congo.

Finally, new monuments were erected soon after the canonization of two missionaries. Sister Amandina (1872-1900), who had been beheaded by Boxers and canonized along with one hundred and nineteen other China martyrs exactly a century later, was venerated in her native village Schakkebroek (Herk-de-Stad). The same happened with Father Damien, beatified in 1995 and canonized in 2009. However, his veneration stretched much further than his native village. Inter alia Wilrijk, Aarschot, Lochristi, Koekelberg and Oostmalle erected statues in the public space, and many more parishes did so in churches.

Contemporary Admiration of Missionaries

In sum, there are at least fifty-nine different monuments to missionaries in Flanders, twenty-five of which are for Congo missionaries. It is especially striking that new monuments continue to appear in the public space: at least seventeen monuments were erected in the past thirty years. Moreover, there is a revived attention for missionaries who had earlier been honoured with a monument. Whereas the 350th birthday of Ferdinand Verbiest in 1973 went virtually unnoticed, the 360th birthday was celebrated with a live-screened jubilee mass and four exhibitions, and his 300th death anniversary in 1988 with the publication of his writings, a new exhibition, a mass spectacle and the restoration and reinstatement of his statue. The centenaries of the deaths of Father Damien (1989), Constant Lievens (1993) and Constant De Deken (1996) were also lavishly commemorated. On top of that, new museums were added, such as the Verbiest Experience Center in Pittem (2010), a new "contemporary and interactive experience center" in Tremelo (2017), and a permanent exhibition about Constant Lievens in the church of Moorslede (2018). Other museums also paid attention to missionaries. The *Huis van Alijn* in Ghent presented an exhibition about Franz Van de Velde in 2006, and Pieter Jan De Smet was the subject of two temporary exhibitions in Dendermonde and Ghent in 2016.

This continued attention is in sharp contrast to the previously-mentioned actions against the statue of De Deken and shows that such protest is the exception confirming the rule that missionaries are generally approached in a positive way. Of course, they are also criticized, inter alia for cases of sexual abuse and for the involvement in snatching mixed-race children from their parental environment during the period of decolonization (for which the Belgian episcopacy has already apologized). But all in all, a benign appreciation predominates. This is remarkable since it contrasts with the many more critical voices in the past. In the first half of the twentieth century the Belgian parliament held fierce debates about missionaries in the colony, and the return of Father Damien's mortal remains to Belgium in 1936 led to negative opinions in anticlerical circles. In recent decades, however, such criticism has subsided. At the end of the twentieth century, Jules Marchal (under the pseudonym of A. M. Delathuy) published three volumes about abuses in the early missions in Congo, but this did not stir people's minds. The scandals surrounding the Jesuits' chapel farms have been forgotten. Only the truncated hands — in which missionaries were not directly involved — remain etched in Belgian collective memory (Stanard, 2019, p. 229).

This almost unanimous respect is paradoxical for two reasons. First, it is at odds with the growing critical approach to the colonial past. Missionaries are hardly mentioned in this ongoing process. The iconoclasm against colonial monuments and street names almost exclusively focuses on Leopold II and his allies. Nadia Nsayi's recent book on decolonization devotes only one and a half page to the church (Nsayi, 2020, pp. 185-187). The extensive report by the

experts of the federal Congo Commission that was released in October 2021 barely mentions the role of missionaries. In some circles, missionaries are even used today to condone colonialism. A Flemish nationalist ideologue found the tumult of 'Black Lives Matter' in the summer of 2020 one-sided: "The heroism and self-sacrifice of Flemish nuns who set up orphanages for leper children deep in the forests of Congo at the risk of their own lives, that was also Belgian colonization. It bothers me immensely that the debate is not conducted in a more objective and, above all, holistic manner." (*Knack*, 17 June 2020).

The great admiration for missionaries is also paradoxical because Belgium was secularized over the past half century. Due to all kinds of developments since the 1960s — including growing prosperity, emancipation of women, new youth culture, increasing individualism, and even a modest modernization of Catholicism — the church has lost its authoritative position within society. However, this is not only a paradox, but also an explanation for the contemporary positive discourse. On the one hand, secularization has dampened the polarization between Catholics and non-Catholics and, accordingly, muted the anticlerical criticism of the past. On the other hand, missionaries are also secularized. This is clear, for example, from the way in which non-Catholics speak of Damien today. In the context of the election of 'The Greatest Belgian' — which Damien won in Flanders; in French-speaking Belgium he ended up with an equally impressive third place — the leading Brussels socialist politician Laurette Onkelinx spoke about his love, courage, efficiency and self-denial (*Het Nieuwsblad*, 27 December 2004). The mayor of Leuven Mohamed Ridouani — a socialist of Moroccan origin — praised Father Damien in 2019 because he "has done a lot of good and [is] a symbol of connectedness, solidarity and commitment" (*Het Nieuwsblad*, 14 October 2019). Ridouani's predecessor Louis Tobback — who is notoriously latitudinarian — called Damien "the example of the ultimate just man" (*De Standaard*, 4 June 2005).

Religious aspects have thus been erased from the collective memory of missionaries, who have become exemplary figures denying themselves a comfortable life in order to help others. Belgian society sees them as development workers instead of proselytizers, and emphasizes the schools and hospitals they built rather than the churches.

The Church has long ceased to be the primary initiator of new monuments, but here and there it is still involved. For instance, Omer Tanghe, the head of the diocesan mission centre *Kontinenten* in the province of West Flanders, still in the 1990s wrote many books about missionaries and initiated the erection of new statues. Cities and municipalities, however, played a much greater role than church institutions and often partly financed the creation of new statues. They did not always have a religious agenda, and the councils of Tremelo (1963), Oosterzele (1981), Dudzele (1988) and Lochristi (2014) had coalitions without Christian Democrats.

The initiative to pay tribute to a missionary often came from family members of the honoured missionary or other citizens from his birthplace. Relatives were, for instance, involved in the erection of the statue for De Meester in Roeselare, the bust for Van Wing in Herk-de-Stad and the monument for Cuypers in Nieuwerkerken. Even more important were local history clubs. It is not surprising that amateur historians show a great fascination for missionaries: they are a concrete study object, with a clear link to local history and at the same time have an international dimension that broadens their relevance. Moreover, missionaries lend themselves perfectly to local historical research since the different phases and relocations in their lives can

easily be reconstructed through institutional sources. Missionaries' many adventurous stories and exotic testimonies can be quoted verbatim from letters and other ego-documents. Local circles disseminated their knowledge about missionaries not only through publications, but were often the driving force behind new markers in public space.

Most of these relatives, friends and amateur historians fit a common profile. They were locally ingrained, had reached a certain age and shared a traditional view of society. Their initiatives to erect statues for missionaries were not coordinated, unlike the campaign for colonial monuments and commemorative plaques in the interwar period and the 1950s, but came about spontaneously. Yet, they are so numerous and the circumstances in which they came about show so many similarities that one can speak of a social phenomenon. Missionaries help older people cope with the rapid changes in society. Their commemorations are forms of 'glocalization': an interweaving of 'global' and 'local' that has been used since the 1990s for the adaptation of globalization to one's own society and culture.

This local character is also mirrored in the fact that many of the more recent monuments were erected in rural areas, often even in the peripheral parts of Belgium. It seems that those villages have few other heroes to place in the limelight and that they even may have inspired each other (and triggered a domino effect across neighbouring places). At the same time, this local character also accounts for the fact that the markers remain under the radar. Fewer people visit those rural places and the local population is still much more white than in urban or semi-urban areas, where people with a migrant past ignited protests against colonial monuments. The new centres of praise of missionaries are far less affected by secularization, multiculturalism and decolonization.

Statues of Belgian Missionaries in Other Countries

Belgian missionaries do not only have monuments in Belgium. We actually find them all over the world. In India, the founding father of the Belgian Jesuit mission, Henri Depelchin, received a statue in Kurseong near Darjeeling, where the Society from 1889 to 1971 had a theological college to train priests. Paul Goethals, the first archbishop of Calcutta, was honoured with a memorial stone in the city's cathedral and also gave his name to the library of St. Xavier's College. There are many memorials to Constant Lievens in Chota Nagpur, especially in Barway, the area west of Gumla where he was active. We find statues on public squares (Birri and Bendora) as well as on school campuses (Manjatoli, Mahuadar, Lohardaga and Soso).

In addition, a striking number of monuments have been erected for the youngest (and last) generation of Flemish Jesuits in India. Hindi expert Kamiel Bulcke is the most celebrated missionary in Ranchi (the centre of the mission and the capital of the Indian state of Jharkhand), both with monuments on Jesuit territory and with a street name, and is also gaining recognition elsewhere in the country, such as in Wardha, Maharashtra. Michael Van den Bogaert is cherished with at least five markers on the campus of the Xavier Institute of Development Action and Studies (XIDAS) in Jabalpur, the institution he founded himself. Pieter-Paul Van Nuffel has a statue at St. Ignatius' High School in Gumla, where the seat of his NGO Animation Rural Outreach Service (AROUSE) was located. Vic Van Bortel was given a mural near his grave in the 'boys town' of Kishor Nagar that he founded near Ranchi in 1969. Joseph Moens has been immortalized in the name of the sports complex of St. Mary's High School in Samtoli.

All in all, there are more monuments to missionaries in India than to their colleagues in Congo. However, Belgian missionaries are also commemorated in the public space of the former colony. Whereas the statues of Leopold II, Albert I and Stanley in Kinshasa have long been removed, the one of Emile Van Hencxthoven, the first head of the Jesuit mission, is still standing in Kisantu, a hundred kilometres to the south. Raphaël de la Kethulle de Ryhove, who was the driving force behind the development of schools, youth movements and sport clubs in Leopoldville in the interwar period, is remembered in the Congolese capital with a statue, a bust and the *Stade Tata Raphaël* (Coppieters, 1967, p. 360). Two missionaries who developed academic institutions recently received busts in Kinshasa: the Walloon Luc Gillon — the first rector of the University of Lovanium — in 2018 on the campus of the *Université de Kinshasa* and the Fleming Alfred Vanneste — the first dean of the theological faculty — a year later at the new campus of the *Université catholique du Congo*. There are also memorials in places where missionaries were murdered in the early 1960s. And here and there we find street names that refer to missionary work, such as the *avenue Mgr Jean Félix de Hemptinne* in Lubumbashi and the *avenue de la Mission* in Kinshasa.

There is also a monument for Theofiel Verbist in the Congolese capital, namely within the walls of *Notre-Dame de Fatima*, the seat of the Provincialate of the Congregation of the Immaculate Heart of Mary, the congregation Verbist founded in the early 1860s. These Scheut missionaries — as they are commonly known — likewise left traces in China, their original destination, although the communist regime has erased a lot. In Laohugou, the place where Verbist died, one can find a memorial in the church, a statue outside in the church grounds, a small museum in the former Scheut residence and a well-maintained cemetery. Ershisiqingdi, where the Nijmegen bishop Ferdinand Hamer was murdered during the Boxer Rebellion, has a museum with a portrait gallery, memorabilia and relics. In addition, there is Scheut heritage, such as monasteries and graveyards, in Xiwanzi (the former Scheut headquarters) and Hohhot (the capital of Inner Mongolia). A penitential chapel that the (imperial) Chinese government erected in memory of Désiré Abbeloos in Sanhecun was recently demolished.

In central China memorials were built for Belgian Franciscans. A photo album from 1908 shows “la maison St. Joseph à Kin tcheou fou [Jingzhou] établie par ordre de l’empereur Juan Siu [Guangxu] en mémoire du massacre de Mgr. Theotime Verhaegen et des PP Frederic [Verhaeghen] et Florent [Robberecht] à Cha tse ti [Shazidi] le 19 juillet 1904” (KADOC Album, KFH2006). The three were also given a chapel and a triumphal arch in Yichang. For Marcel Sterkendries, who during the 1911 revolution kept the peace in Jingzhou, a statue was erected in 1912 “by thirty thousand Chinese, whom he had saved and who melted their idols to pay him their tribute” (*Het Nieuws van den Dag*, 13 December 1912).

It is not clear whether those tributes still exist. Yet, memorials for the Jesuit Ferdinand Verbiest are still present in Beijing. His grave has been preserved and ‘his’ observatory is now a museum. Founded in the thirteenth century, it expanded in the fifteenth century and was modernized by Verbiest who ran it from 1670. It contains, among other things, the Verbiest globe, of which the Chinese government donated a reproduction to KU Leuven in 1989, three hundred years after Verbiest’s death.

In North America, the memory goes even further. Several place names refer to Belgian missionaries. The Vandersteene Lake in Alberta, Canada, is named after Roger Vandersteene. The town of Nerinx in Kentucky owes its name to Karel Nerinckx, who is also buried there and

has a statue. Churchville, Pennsylvania, was renamed Bally in 1883, after the Jesuit Augustin Bally who had died there the year before. The most present missionary, however, is Pieter Jan De Smet, who is immortalized in the name of a lake in Wyoming and of three towns in South Dakota, Montana and Idaho. De Smet is also remembered in many other ways, including a memorial column, a statue and bust, an entrance hall, a stained glass window, a mosaic, a tapestry and exhibitions. In addition, Louis Hennepin is worth mentioning. This Franciscan, born in Ath, accompanied the French explorer René-Robert Cavelier de La Salle in 1675-1680 on his exploration of the Great Lakes and the Mississippi. He lives on in toponyms in Illinois, Oklahoma, and Minnesota, has a statue and a major avenue in Minneapolis, and is honoured with streets in at least four other cities (Buffalo, New York; Ottawa, Ontario (Canada); Chicago, Illinois; and Winthrop, Minnesota).

Father Damien is also commemorated in the United States. His original grave still exists in Hawaii, he was also given a memorial column on Molokai in 1894, and there are now statues at churches in Honaunau and Kalawao and at the Hawaii State Capitol in Honolulu (a copy of which is in the Capitol building in Washington DC, see below). On Waikiki Beach one finds a Damien Museum and a Damien and Marianne of Moloka‘i Education Center. Last but not least, Damien’s death anniversary is recognized in Hawaii as a public holiday, Father Damien Day.

Latin America has its share as well. In Mexico, ‘Fray’ Pedro de Gante is widely known. He is honoured with statues in Mexico City and nearby Texcoco, streets in at least three cities and educational institutions in at least six other cities, including the *Universidad Pedro de Gante* in Monterrey. Ecuador has a similar case with Joos de Rijcke. In the capital Quito alone, one can find a statue on *Plaza de San Francisco*, a commemorative plaque in the nearby Franciscan friary, and a street, school, college, and *escuela fiscal mixta* named after him. There are also references elsewhere in the country, such as the *Parque Fray Jodoco Ricke* in the southern city of Cuenca.

In other Latin American countries, the memory of Belgian missionaries is more local. In Guatemala there are commemorative plaques on the places where Serge Berten was kidnapped and Walter Voordeckers was murdered. In Brazil, ‘Padre Julio Maria de Lombaerde’ continues to live on in various cities where he was active: in Macapá via a cultural centre and in Manhumirim via a *memorial histórico*. The latter grew into a kind of pilgrimage, where ‘PJM’ is worshiped with holy statues.

Interestingly, missionaries who are almost forgotten in Belgium — and do not have any presence in the Belgian public space — are being kept alive in their new places of residence. This certainly applies to Walloons. The Jesuit Gustavo Le Paige, from Tilleur, Liège, is known as the father of Chilean archaeology and has a statue at the museum he founded in San Pedro de Atacama. The Scheut Father Jules Sepulchre, from Herstal, Liège, has a monument in Bontoc, the capital of Mountain Province, Philippines.

Foreign Initiators and Motives

This kaleidoscope of memorials may suggest that missionaries around the world are receiving recognition and praise. However, we should avoid jumping to this conclusion. The references were created at very different times and in very different circumstances. The toponyms

in the United States date from the nineteenth century and are examples of the colonial method of appropriating a place. Statues for Van den Bogaert in Jabalpur, Bulcke in Ranchi and de la Kethule de Ryhove in Kinshasa actually function as funerary monuments. The markers abroad can therefore not be lumped in easily with those in Belgium.

The vast majority of the monuments are located on the grounds of monasteries, schools and other buildings of the congregations to which the honoured missionaries belonged. They should be seen as tributes by Christian communities to their spiritual fathers. Such admiration also manifests itself in other ways. For example, both Brazilian and Congolese church leaders have recently started the beatification process of Jules De Lombaerde and the martyrs of Kongolo. And in 2020, the body of the Belgian missionary bishop Joseph Hagendorens, who had died in Belgium in 1976, was reburied in the cathedral of Tshumbe at the request of his Congolese successor.

Some monuments were erected at the initiative of spiritual superiors. Belgian Jesuits already in the 1940s had made Bendora a place of pilgrimage because Constant Lievens had built a chapel there. On the occasion of the centenary of his arrival in Chota Nagpur in 1885, their Indian successors placed a statue. Other monuments were erected at the request of believers. When I asked in Barway who was behind all those statues for Lievens, the Jesuit Peter Jones told me that his confrère Christopher Dung Dung had made several specimens. He added that "the Provincial tries to stop him, since he's supposed to look after his parish. But parishes want such a statue, since it's prestigious" (interview at Mahuadar, 18 January 2019).

In the West, such tributes can easily be interpreted as the result of the conversion zeal of missionaries and thus as the effect of colonial indoctrination. However, such a critical response implies paternalism and a sense of superiority. It suggests that the secularized West is further ahead than the religious South. It assumes that all missionary work took place in the same way, and neglects that local groups played an active role as intermediaries in the spread and adaptation of Christianity. And it ignores that in many contemporary non-European societies the Church is the institution with the greatest confidence and moral authority.

In addition, secular governments — of independent countries, not colonies — also honour Belgian missionaries. The statue for Joos de Rijcke in Quito was built in 1932 at the request of the city council. Arnold Boghaert, the bishop of Roseau, Dominica, was given a state funeral in 1993. Some missionaries were honoured even while alive. Father Damien became Commander of the Royal Order of Kalakaua in 1882. Kamiel Bulcke was awarded the Padma Bhushan, one of India's highest civilian honours, in 1974. Jozef Bessemans received a memorial plaque and the honorary citizenship of Alto Garças in 1992. And Etienne Alliet was appointed Special Resident of El Salvador in 2008 by parliamentary decree.

These same five missionaries — de Rijcke, Boghaert, Bulcke, Bessemans and Alliet — are also honoured in the Belgian public space. Many others who are not, however, are recognized in their new homelands. Willem Grootaers was elevated by the Japanese emperor to Commander in the Order of the Sacred Treasure. Jan Couvreur received the Fr. Neri Saturn Award for Environmental Heroism. José Comblin was given an honorary doctorate from the *Universidade Federal da Paraíba* in Brazil. And Gerda Van Dooren was honoured with the Gaanman Gazon Matodja Award, a prize that is based on an institution of (Surinamese) Maroons in the Netherlands.

All these examples show that not only local churches, but also governments and non-religious communities have a positive attitude towards individual Belgian missionaries. On the other hand, some of the markers abroad came into being due to Belgian initiatives. The statue of Pedro de Gante in Mexico City is a gift from the province of East Flanders. Two Belgian friends made a work of art in honour of Hubert Gillard for the technical school in Cali, Colombia which Gillard had built himself. The statue to Pierre Paul Van Nuffel in Gumla, India, was financed by three family members. This, of course, casts a very different light on the 'foreign' admiration of missionaries.

Foreign Criticism of Belgian Missionaries' Statues

Some of these statues have received criticism for the past few years. In May 2015, exactly the same month as an information plaque was mounted near Father De Deken's statue, a monument to another Belgian missionary, Pieter Jan De Smet, was removed from the campus of Saint Louis University in Missouri. The monument depicted him with two Native Americans in an arrangement that many felt as colonial and racist, De Smet raising his crucifix over the others. After repeated complaints from students and staff, the university authorities put the statue in the adjacent university museum.

Five years later there was a new fuss about a statue of a Belgian missionary in the United States. In the wake of the 2020 'Black Lives Matter' protest, U.S. Congresswoman Alexandria Ocasio-Cortez ('AOC') denounced "patriarchy" and the "culture of white supremacy" by referring to Father Damien. More specifically, she lamented that so many white men are honoured in the National Statuary Hall Collection, a kind of Capitol pantheon where each state is allowed to place two statues (and Damien has represented Hawaii since 1969). Her demarche sparked fierce reactions, both among Republicans in the U.S. and among Flemish nationalists in Belgium, who were remarkably strongly supported by Flemish media. They all opposed AOC's alleged iconoclasm of Damien. However, she did not call to remove the statue, but only use it as an example of the under-representation of female and non-white historical figures in collective memory.

Damien was not the only missionary who found himself at the heart of turmoil in the summer of 2020. In California, anti-racist activists inspired by 'Black Lives Matter' drew attention to the Spanish Franciscan Junípero Serra, who had spread Catholicism in the region in the 18th century (and was canonized in 2015). Serra was accused of having destroyed the culture of local populations. His statues in Los Angeles, San Francisco and Sacramento were torn down by protesters, the one in Ventura was removed as a precaution by the city authorities, and the statue in Palma, Spain, on his native island of Mallorca, was defaced with red paint and the word *racista*.

In neighbouring Mexico, a 'Belgian' missionary was indirectly affected by the 'Black Lives Matter' campaign. In October 2020, the administration of Mexico City removed a number of statues of figures who had played a role in the Spanish conquest and occupation. Officially, it did so because the monuments were in dire need of restoration after the 1992 earthquake. In reality, however, it anticipated social media calls to storm the statues on the anniversary of Christopher Columbus's arrival in the New World. Among the removed monuments was the statue of Pedro de Gante, a Franciscan who had been active in New Spain (Mexico) between 1523 and 1572.

Conclusion: The Polyphony of Memory

It is clear that missionaries are being remembered in various ways. Even in the 'Black Lives Matter' summer of 2020, there was ambiguity. While many statues were taken down on both sides of the Atlantic, residents of the Greenlandic capital Nuuk voted to preserve the statue of Danish missionary Hans Egede. It had been vandalized with red paint and the inscription 'decolonize' both in the previous weeks and in earlier years, though.

There is even disparity within groups that are usually regarded as homogeneous. For example, Native Americans in the northwest of the United States have different memories about Pieter Jan De Smet. Some among smaller tribes, such as the *Nez Percé* and the *Cœur d'Alène*, look back to the missionary past with few misgivings. Their exhibitions mirror admiration and their guides talk about the European missionaries with appreciation. Others in the Coast Salish tribes are actively grappling with the missionary legacy, particularly with regard to education. Larger tribes, such as the Sioux, are also generally more critical. For example, the curator of the National Museum of the American Indian in Washington DC is very negative: "They took everything from us" [https://blog.associatie.kuleuven.be/lucvints/2015/05/].

Similarly, my research in India has yielded ambiguous opinions. Sometimes respondents are particularly nostalgic. For example, in January 2019, during a campfire in a village near the Jesuit parish of Tongo, memories were recalled of Walter Pillen, who had died seven years earlier. Someone said with respect that this Jesuit from Bruges spoke Kurukh (the local tribal language) much more beautifully and correctly than most Oroans did (one of the ethnic groups in Jharkhand). But other Indians rage against mission and modernization. Even an Adivasi Jesuit in Ranchi once railed against what had happened to his country, in the same way as the curator in Washington: "They destroyed everything".

Scholars also disagree. Karen Vallgårda in an article with the telling title "Were Christian missionaries colonizers? Reorienting the debate and exploring new research trajectories" (Vallgårda, 2016) emphasized the inextricable links between mission and empire. Colonialism went far beyond political, economic or military dominance and included cultural, social and psychological hegemony. Missionaries were crucial actors in achieving the latter. They spread a discourse of European and Christian superiority that portrayed local populations as childish, primitive and backward. They reinforced racial classifications and created rifts between pagans and believers. They transformed social structures by introducing new concepts (such as the nuclear family) and moral standards (such as chastity). They separated children from their environment and turned them into controllable subjects. And in the metropole, they were key actors in the mobilization for and legitimation of the colonial project.

In contrast, researchers from Africa or Asia often approach missionaries positively, sometimes even hagiographically. During the first session of MiMoRA, the Mission and Modernity Research Academy organized at KADOC in Leuven, Kenyan researcher Mary Chepkemoi presented her oral history project. She talked to compatriots who had been ripped out of their traditional communities by missionaries in the 1920s and 1930s and were raised as Christians. Chepkemoi shows that these elderly Kenyans nevertheless are still grateful for the missions. The Indian professor Parimala Rao did not criticize missionaries during the MiMoRA meeting either. She built a whole keynote lecture around the idea that missionaries and colonials invariably opposed each other and that missionary and colonialism cannot be lumped together (Goddeeris, 2021).

My Leuven colleagues and I immediately had reservations. “Those Kenyan women were brainwashed by their educators”. “The exaltation of missionaries by left-wing thinkers in India is a reaction against the Hindu nationalist government that is increasingly attacking Western imperialism and Christianity”. But who are we to make these declarations and assumptions? To write off other opinions as brainwashing or instrumentalization? Would it not be better to be open to those visions and accept the polyphony of memory?

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‘The indigenous, I presume?’ A Digital Study of Mental Models and Mental Decolonization in the *Biographie Coloniale Belge* and *Biographie Belge d’Outre-Mer*[*]

by

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Keywords. — Belgian Colonial History; Congo; Scientific Colonialism; Mental Models; Digital Humanities.

Summary. — The *Biographie Coloniale Belge* (*BCB*; 1948-1958) and *Biographie Belge d’Outre-Mer* (*BBOM*; 1968-2015) are the scientific flagships of the Belgian colonial enterprise. The *BCB*/*BBOM* is a nine-volume encyclopaedia with biographic sketches of people who contributed to the colonial project. Although the majority of them are ‘westerners’, a few Congolese received a lemma too, and even more of them played a part in the background of other biographies. This paper analyses the constructed mental models concerning the Congolese population in the *BCB*/*BBOM*. How often are Congolese mentioned, how are they portrayed, from which contexts are they absent and how do the ‘westerners’ position themselves in relationship to them? To enable a discourse analysis of this scale, we digitised the complete *BCB*/*BBOM* semi-automatically and made it computationally searchable for future studies.

Trefwoorden. — Belgische koloniale geschiedenis; Congo; Wetenschappelijk kolonialisme; Mentale modellen; Digitale menswetenschappen.

Samenvatting. — ‘The indigenous, I presume?’ *Een digitale verkenning van mentale modellen en mentale dekolonisatie in de Belgische Koloniale Biografie en de Belgische Overzeese Biografie.* — De *Belgische Koloniale Biografie* (1948-1958) en de *Belgische Overzeese Biografie* (1968-2015) vormen het wetenschappelijke vlaggenschip van de Belgische koloniale onderneming. De negendelige encyclopedie bestaat uit lemma’s van mensen die bijgedragen hebben tot het koloniale project. Hoewel de meerderheid van hen ‘westerlingen’ waren, kregen sommige Congolezen zelf ook een lemma. Nog veel meer van hen figureerden in de lemmata van anderen. Dit artikel analyseert de geconstrueerde mentale modellen met betrekking tot de Congolese bevolking in de *BKB*/*BOB*. Hoe vaak worden Congolezen genoemd, hoe worden ze geportretteerd, in welke contexten zijn ze afwezig en hoe positioneren de ‘westerlingen’ zich ten opzichte van hen? Om een discoursanalyse op zulke schaal mogelijk te maken, hebben we het hele naslagwerk gedigitaliseerd en volautomatisch doorzoekbaar gemaakt voor vervolgonderzoek.

1. Introduction

Just like its neighbouring colonial powers, the Belgian propaganda machine wanted to honour the ‘achievements’ that its ‘pioneers’ had accomplished in Africa (Stanard, 2011, 2020). Like elsewhere, the endeavour went hand in hand with a nationalistic discourse that propagated the colonial pioneers as national heroes (Vanthemsche, 2011). Some of them received a statue

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in their hometowns, others gave their names to streets or public buildings (Stanard, 2011; Goddeeris, 2015a,b; 2020). Until well after the Congolese independence, the idea prevailed that these protagonists of the imperial project had ‘conquered’, ‘civilised’ and ‘moralised’ the African population (Vanthemsche, 2011). Until recently, this ideological influence of Belgian colonialists being portrayed as ‘enlightened’ or ‘legendary’ could still be found in historical scientific works (Van Bilsen, 1993). This narrative turned out to be very effective: long after Congo’s independence in 1960, many in Belgium still thought of their colonial history as a story of civilization and remained unaware of the systematic atrocities committed there (Vanhee & Castryck, 2002). A more nuanced and critical view of these so-called heroes has only recently begun to emerge (Goddeeris & Kiangu, 2011; Goddeeris, 2015a,b).

A major driving force of Western European imperialism is the idea of scientific progress (Seth, 2009; Whitt, 2009). Scientific know-how was not only a practical prerequisite for the colonization to happen in the first place (*e.g.*, the creation of steamships and guns), it also motivated the endeavour in spirit. In this light, the Congolese scholar Valentin Mudimbe (1988) introduced the notion of ‘colonial library’, a body of scientific knowledge, certain historical paradigms, and a political project, consisting of information gathered by Europeans since antiquity right up to the ‘Scramble for Africa’ in the second half of the 19th century. Such ‘colonial libraries’ frame everything and everyone that is ‘Non-Western’ or ‘Other’ above all as not being ‘Western’, which in turn makes it subject to conversion and transmutation. Mudimbe’s argument is in line with Foucault’s “objectification” (1983), where through social dividing practices, people of a particular group are classified as ‘different’ through the mediation of (pseudo) science and the value attached to the power of these scientific claims. In this process of social objectification, a dichotomy is established, where the ‘westerner’ is portrayed as the superior and ‘modern’, whilst the ‘Other’ is objectified as being inferior and backward (Mudimbe, 1988, 1997; Mudimbe & Kavwahirehi, 2021). As Hudson wrote:

> ‘Othering’ as a ‘colonial’ tool is a complex yet systematic process of subjugation, reflecting a pattern where the Self first establishes dominance by making the colonial Other aware of who holds the power, then entrenches the Other’s inferiority, culminating in the denial of access to knowledge and technology (Hudson, 2016, p. 5).

By framing a certain narrative as scientifically true, its inventors can impose it upon other people and exploit it to sway the power balance in their favour, ultimately creating European culture as ‘universal’. This narrative then enabled Europeans to justify their attempts to introduce the concept of ‘modernity’ in the African continent (Táíwò, 2010).

Belgian colonialism was no exception to the rule; as Ruben Mantels (2020, p. 338) wrote: “the colonization of Congo was preceded by science”. In 1876, Leopold II organized a conference on the geography of his soon-to-be colony (Foeken, 1985). The territory that was being visited by his ‘pioneers’ was seen as Africa’s last uncharted territory, in dire need of mapping (Poncelet, 2020). Scientific know-how between 1884 and 1908 shifted its emphasis to medicine, ethnological and anthropological ideas, but remained devoted to the taming of the ‘wild’ colony (Vellut, 1992; Mantels, 2020). In 1908, Leopold II was forced to sell his colony to the Belgian state due to the ‘red rubber’ atrocities that were exposed by the works of Roger Casement and Edmund D. Morel and their organization, the Congo Reform Association (Hochschild, 1998; Vangroenweghe, 2004). The Belgian government eventually took over the colony (Viaene, 2009). In an effort to legitimize its colonial project, Belgium aspired to be as efficient and ‘modern’ a colonizer as possible. The 1920s saw a rapid series of scientific institutions being

set up to enhance the knowledge of the Congo (Poncelet, 2008, 2020). One such institution was the Royal Belgian Colonial Institute (RBCI). Founded in 1928, the RBCI was responsible for expanding the scientific knowledge about Congo and served as a think tank, debate forum, and showcase for Belgium's colonial project (Poncelet, 2008; Vanthemsche, 2011). The organization changed its name twice: in 1954 to the Academy for Colonial Sciences, and in 1959 to the Royal Academy for Overseas Sciences, which it remains known as today. After the Second World War, some scientists tried to systematically distance themselves from the colonial project and its ideology (Mantels, 2020). The Belgian missionary Placide Tempels (1946), for instance, questioned the classical colonization and evangelization doctrines in his famous work *Bantu Philosophy*. Yet, science, through a series of social and economic reforms, still played an important role in presenting Congo as a 'model colony' (Etambala, 2008; Vanthemsche, 2020).

In combination with the desire to propagate colonial 'heroes', the ideal of scientific progress through colonial ideology led the Royal Belgian Colonial Institute to command the creation of the *Biographie Coloniale Belge* (*BCB*) in 1941, an encyclopaedia dedicated to the lives of the early colonials in Congo. The first volume was finished seven years after the initiative. It comprised the lives of Belgians, Europeans and Americans — henceforth 'westerners' — who had contributed to the colonial project of Leopold II (Vanthemsche, 2011), but some Africans received their own lemma too. Since the original aim was to include as many people as possible, also those who played only a minor role in the enterprise were taken up. While some individuals' lemmas spread over several pages, others only contained a few sentences. The first volume, finished in 1948, was received enthusiastically, and more would soon follow suit (Dellicour, 1950). In contrast to the earliest volumes, the later ones also included biographies of people, 'western' and African, who had worked for Belgian Congo after Leopold II's death. By then, an entire network of 'colonial specialists' in Congo and the Belgian scientific institutions had been established (Poncelet, 2020). People from and active in the mandate territories of Ruanda (Rwanda) and Urundi (Burundi) would also be incorporated. Even historical figures that predated the colonization, like Kongo kings with Portuguese names such as João II of Lemba (Nzuzi a Ntamba), would appear. By 2015, nine volumes were released in the shape of eleven publications [1]*.

Drawing on this information, figure 1 shows the dispersion of the lemmas through time. In 1968, with the publication of volume VI, the encyclopaedia changed its name to *Biographie Belge d'Outre-Mer* (*BBOM*) to reflect the Congolese independence in 1960. With a total of around 3.3 million words, processed into five thousand three hundred lemmas and spread over eight thousand one hundred and thirty-six pages, it had become a hefty tome. Although the majority of the lemmas are written in French, a substantial share is in Dutch and a few negligible exceptions in English and German.

When it comes to the colonization process itself, the scientific quality of the 'Biography' is rather questionable (Vanthemsche, 2011). The editorial guidelines of the central committee of the RBCI stipulated that lemmas needed to both praise the individual and be critical at the same time (Devroey, 1946). This implied that the encyclopaedia was being subjected to censorship by the central committee, as they decided what would be published (Vanthemsche, 2011). At times the lemmas take the shape of hagiographies rather than biographies and in the introductions to the first volumes, Leopold II is hailed as a genius. This is in line with Belgian colonial propaganda at the time (Stanard, 2020). Especially entries that deal with relations with the local

* Numbers in brackets [ ] refer to the notes, pp. 288-289.

population contain some questionable value judgements, as historian Jean Stengers had already noted in 1949. The first authors were so-called ‘pioneers’: people who were active in or around the colonial project, like engineers and doctors (Vanthemsche, 2006). Later, this generation would be gradually replaced by people who had come into contact with developing countries through their academic education (Vanthemsche, 2011). But all of them remained European.

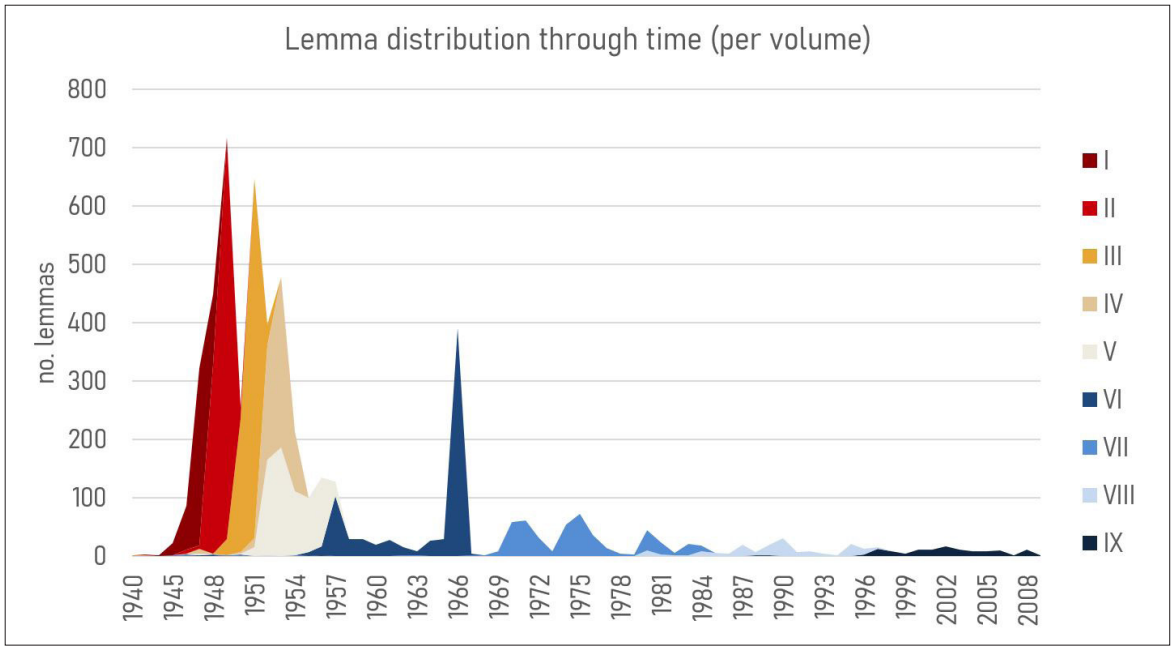

Fig. 1. — Distribution of individual lemmas through the nine volumes over time.

Although the *BCB* and *BBOM* were a prestigious project of the scientific colonial endeavour, the content of the source has thus far remained largely *terra incognita*. Researchers, such as Zana Etambala (2023), have used its ‘scientific’ content for their own research. The only recent studies of the colonial biographies themselves, however, are the ones by the historian Guy Vanthemsche (2006, 2011), but his analysis focusses more on the creation of the work itself and how it fits in with Belgian colonial history than on the actual content. The *BCB* and *BBOM* contain a wealth of information on discoveries of Congolese fauna and flora, its resources, geography, geology, diseases, ethnological and cultural studies gathered by the so-called ‘pioneers’. In other words, the *BCB* and *BBOM* reveal the mental model, the internal representation of an external reality, of what the authors thought of as Congo, both on a geographical and social level. Such mental models can tell something about the way an individual or a group interprets a certain structure, a social group, or themselves (Norman, 1983).

Our contribution is the first to put the emphasis on the contents of the encyclopaedia at large. In an effort to extract a small part of the constructed mental models in this source, our pilot study aims to deconstruct the mental image of the Congolese — not Burundian or Rwandan — prevalent in the *BCB*/*BBOM*, either in the biographies of ‘westerners’ or, exceptionally, in lemmata of their own. It is important to note that names of tribes or clans have not been included into this study. An analogy from feminist studies could provide a useful insight. In her work *Women and history* (vol. 1: *The creation of patriarchy*), the feminist historian Gerda Lerner (1986) explained the patriarchal system by means of a metaphor from the realm of

theatre. Women and men, she argued, live and perform on the same stage. Everyone is assigned a role and both are needed to make the play work, but the play has been written by men who have assigned themselves the most interesting roles. Women, by contrast, have been cast as mere supporting actors (Lerner, 1986). In other words, men created a mental model of the world in which they 'Othered' women. Similarly, the *BCB* and *BBOM* can be described as a play, written by 'westerners', in which the Congolese play a supporting role. To extend the analogy, our research investigates the discourse used by these 'westerners' and the specific roles they have assigned to the Congolese people. As Carley & Palmquist (1992) argued, mental models must be unveiled through language. In order to extract the social mental images, this paper takes a closer look at the (post)colonial discourse of the *BCB*/*BBOM* in order to investigate (1) the ways in which the Congolese people are portrayed and (2) whether that discourse changes over time. Is there a distinction between the image of the 'Other' as an object and later on as a human subject? If so, could there be a notion of a 'mental (de)colonization'? In this contribution, 'mental decolonization' is understood as the notion of either appearing or disappearing of colonial ideological ideas in the discourse of the authors (*i.e.* the mental models). We have extracted the images of Congolese people portrayed in the *BCB*/*BBOM*, paying particular attention to stories of coercion and repression and also analysing commonalities, without reducing them to oversimplifications.

In addition, our research will focus on how 'westerners' position themselves in relation to the Congolese population. In his *Orientalism*, Edward Said (1978) developed the notions of strategic location — the author's position in his text about the Orient — and strategic formation, a method of analysis to compare texts written about the Orient. Using these two concepts, we aim to unveil how 'westerners' are portrayed by the authors of the *BCB*/*BBOM*, at the same time comparing these views through the different volumes, guided by two crucial concepts introduced by Valentin Mudimbe (1988): epistemological and cultural ethnocentrism. The first describes the idea that nothing scientifically is to be learned from the 'Other' (Congolese), and if so, it is part of the Western universe. The latter describes the behavioural and intellectual attitudes of the 'Other'. Simplified, the African 'is' like this, because the 'westerner' is like this. In the 1950s, the French politician and essayist Aimé Césaire (1955), who battled the notion of the created dichotomy, noted that 'westerners' tended to portray themselves as heroes and take all the credit for colonial achievements, whilst the colonized were the ones needed saving. In the case of the *BCB*/*BBOM*, our research looks at ways in which the biographies of 'westerners' implicitly or explicitly rely on a highly-stylised portrait of the Congolese population as a basis of comparison.

Our study is embedded in existing literature on colonial images of the 'Other', or to a larger extent the colony itself, by 'westerners', in the vein of the works by Martin Thomas (2011), who used the same notion of mental maps, and David Cannadine (2001), who looked into how the French and British viewed their colonies. On a smaller scale, Ideland (2018) studied how science is culturally dependent, by extracting both the images of and the silences on colonial scientific knowledge in Swedish science textbooks. In the case of Belgium and Congo, Depaepe, Vinck & Herman (2009) studied images of Congolese in Belgian history books, whilst Bentrovato & Van Nieuwenhuyse (2019) focussed on the evolving representation of the colonial past in both Congolese and Belgian textbooks. Landmeters & Tousignant (2019) analysed the notion of 'civilization' in Belgian legal journals, using the same methodology as we do in our study.

Moreover, encyclopaedias like the *BCB* and *BBOM* have been created by all of Belgium's neighbouring states who were involved in colonial affairs. At the turn of the 19th century, Maxime Petit's *Les colonies françaises, petite encyclopédie coloniale* was published in France. In the Netherlands, the *Encyclopaedie van Nederlandsch West-Indië* appeared in 1917. Shortly after, in 1920, former colonial Heinrich Schnee produced a *Deutsches Kolonial-Lexikon* for Germany. Great Britain followed suit in 1925, with Charles Domville-Fife's *The Encyclopedia of the British Empire: The first encyclopedic record of the greatest empire in the history of the world*. All four encyclopaedias contain lemmas about geographical places, people, animals and events, but the *BCB*/*BBOM* is unique in its restriction to people. It thus seems that Belgium was a late adopter, which isn't entirely surprising given the country's lack of experience with expansionism or colonialism. However, none of these encyclopaedias have been subject to a large-scale and systematic discourse analysis. The German encyclopaedia is mentioned by Winfried Speitkamp (2015, p. 55), but his chapter on German colonial heritage only refers to the work itself and its place in the German African memory, rather than the content. As far as we are aware, no study like ours has been done yet on a scientific colonial biography.

Because a large-scale analysis of such an extensive source requires computational searchability, we first decided to digitise the entire *BCB*/*BBOM* through a series of semi-automated steps. First, we converted the images of the printed volumes into digital text by means of open-source OCR software. Next, we divided each volume into the original lemmas by means of tailormade python-scripts. To ensure that all lemmas had been successfully extracted, we automatically matched all names in the page headers to the ones in the page's running text and manually corrected the pages where the matching process threw an error. In a final step, we enriched all lemmas with some metadata by semi-automatically extracting each lemma's language, author and date of writing. These metadata were then converted into excel sheets and manually cleaned up and corrected to get rid of all inconsistencies. Methodologically, our approach is composed of a quantitative and qualitative part. The first part makes use of distant reading techniques and charts how often Congolese people show up throughout the entire *BCB*/*BBOM* as well as the terminology that is used to describe them (section 2). In Lerner's analogy, this bird's eye view of our primary source serves as an analysis of the stage. The second part, by contrast, zooms in on the actors themselves by means of a systematic discourse analysis of the text fragments detected in the first part of our study (section 3). Instead of charting how often Congolese people are mentioned, this part tries to uncover recurrent patterns in the roles they have been assigned to in the *BCB*/*BBOM*, using discourse analytical methods (Beyen, 2019).

2. The Stage

The first part of our analysis focusses on the mentions of Congolese people in the *BCB*/*BBOM* as well as the terminology that is used to describe them. The aim is to get a sense of the presence of the Congolese in the encyclopaedia. To do so, we first carefully selected seventy-nine (spelling variants of) French and Dutch terms that could be used to describe Congolese people. The list was compiled by means of secondary literature (Ceuppens, 2003a,b; Poncelet, 2008) in combination with a manual search through various random samples of texts taken from the *BCB*/*BBOM*. The resulting keywords were grouped into four categories — 'administrative', 'geographical', 'dehumanizing' and 'phenotype-based traits' — based on the provenance and meaning of the term at stake. The last category has been split into two parts:

'phenotype-based black' and 'phenotype-based n-word', as we believe that the latter has a different connotation, yet it remains phenotype-based (tab. 1).

Table 1

Overview of French and Dutch keywords per category

	French	**Dutch**
Administrative	Indigène; Évolué	Boy; Inlander; Inboorling; Évolué
Geographical	Congolais; Africain	Congolees; Afrikaans
Dehumanizing	Sauvage; Civilisé	Wilde; Wildeman; Wildeling; Beschaafd
Phenotype-based traits	Nègre; Noir	Neger; Negerin; Zwarten; Zwartjes; Negerjongen, -bevolking, -chef, -dokter, -hoofd, -koning, -predikant, -volk

Because the majority of our keywords are not exclusively used to describe humans, we manually went through all hits and marked the ones that described human beings, either as a noun or an adjective, illustrated respectively by two examples from volume IV (1955): "Mais ce vieil africain était trop attaché à l'Afrique pour y renoncer" [2] and "Badjoko laisse le souvenir d'une figure congolaise de premier plan qui, pendant près d'un demi-siècle, a magnifiquement participé au développement économique de son pays" [3].

Figures 2 and 3 show the frequency of each category of terms through time [4]. A first finding to be noted is that the total presence of Congolese people is only small. This result is not surprising, since the main goal of the source was to honour the western 'heroes' of the colonial project. In addition, we see a more or less steady decline in the total number of mentions through time. The decline is more volatile in the Dutch corpus, but that might be due to rather small absolute numbers. The dotted line indicates the period when Congo gained its political independence.

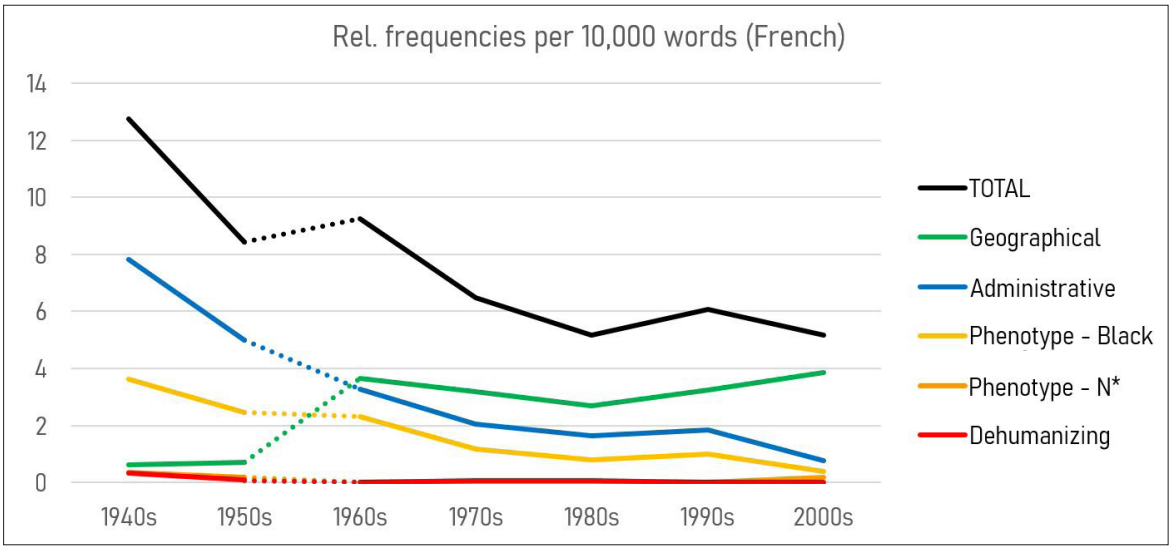

Fig. 2. — Quantitative overview of the four categories through time (French lemmas).

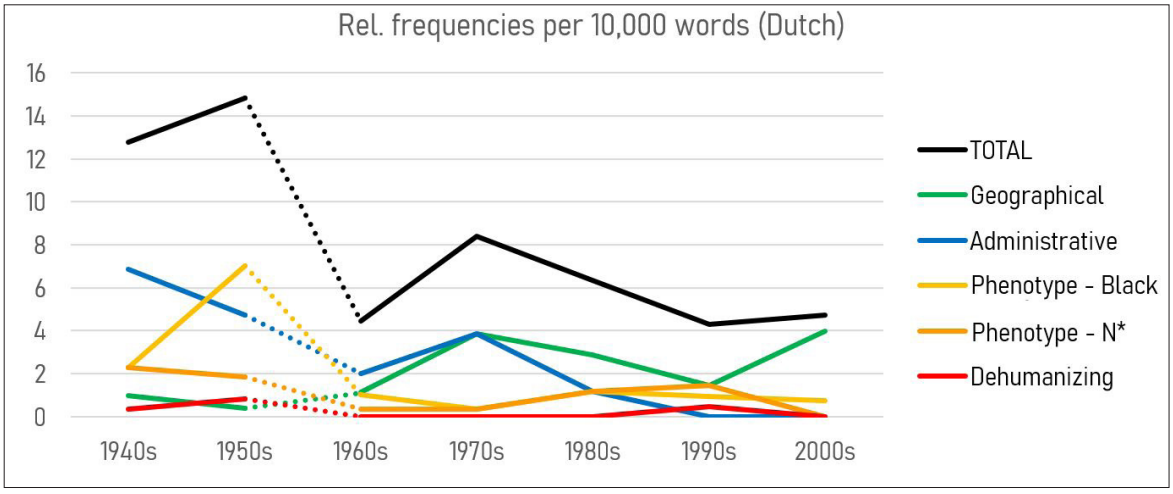

Fig. 3. — Quantitative overview of the four categories through time (Dutch lemmas).

2.1. Geographical

The geographical keywords consist of the terms referring to landmasses or geographical locations, the most common of which are *Congolais*/*Congolees* and *Africain*/*Afrikaan*. Initial research showed that this category was the largest in absolute numbers in all volumes of the *BCB*/*BBOM*. After the noise removal stage, however, it turned out that the majority of references describe actual geographical landmasses or items originating from the region (*e.g.*, flora and fauna, companies, the African club, or an honorary award).

When the relative frequency of the geographical terms is compared to those of the others, the geographical keywords are actually the odd ones out: whereas the importance of the other categories decreases over time, the geographical terms grow more frequent, in both the Dutch and the French subcorpus. This evolution is probably an effect of the Congolese independence in 1960: from that period onwards, the geographical terms clearly outnumber the other categories. Another factor might be the semantic neutrality of the term. In the present paper, we also chose to refer to the Congolese population by means of a geographical term, simply because this is the most descriptive adjective available.

2.2. Administrative Constructs

The second category consists of words created for judicial and administrative purposes that were commonly used by jurists, lawyers and civil servants. Although Congolese people received the right to Belgian citizenship after the annexation by Belgium in 1908, this did not automatically make them full Belgian citizens. The Colonial Charter established four categories: Belgians, registered Congolese, foreigners, and the indigenous population (Braillon, 2011). These designations were legal, administrative and colonial constructs and served to define the rights and duties of each category (Dufrénoy, 1946). The keywords *indigène*/*inheems* and *évolué* are examples of this.

In the *BCB* and *BBOM*, administrative constructions, both for the French and Dutch, start off as the biggest category but their rate rapidly drops in the later volumes. Interestingly

though, the rate of decline is different in French and in Dutch. While administrative terms have almost entirely disappeared from the Dutch lemmas by the time the *BCB*/*BBOM* was completed, the terms still occasionally show up in the most recent French lemmata.

The keyword *indigène* appears to be linked with more loaded terms such as 'untrustworthy' and 'aggressive' than, for instance, the keyword *noir*. As Tom De Meester (1998) and Mutamba Makombo (2020) argued, racial discrimination found its way into judicial and administrative practices despite new terminology. Throughout volume I (1948) to volume V (1958) there are many references to Congolese as *indigènes* who appear as 'primitive tribes': they are portrayed as aggressive, attacking people with spears, shouting loudly and living tribal lives. When Congo became an independent state, these people lost their Belgian nationality, which in turn made the word *indigène* grow obsolete in that sense. After 1960, the word either implied a continued presence of colonial consciousness from the part of the writer, or a reference to Congolese people as indigenous to their own country. The latter use of the word has an anthropological touch to it (Béteille, 1998). Equally striking is that the word *évolué* barely appears in the source. Even though this social group played a prominent intermediary role in upkeeping, and eventually dismantling, the colonial project and somewhat broke the traditional image of the 'inferior' Congolese (Tödt, 2018). *Évolués* were seen as a separate category created after the Second World War (Mutamba Makombo, 1998). They had 'enjoyed' a higher education, something the Belgian colonial government was rather suspicious of (Depaepe, 2017). According to the constructed racial hierarchical ideal, they were more 'evolved' than other Congolese and thus received more privileges, but they were not treated equally to 'westerners' and remained the 'Other' (Tödt, 2020) (*e.g.*, lemma of Jeanne-Marie Rogissart in volume VI (1968): "C'est à cette tâche dont l'importance et l'urgence aujourd'hui soulignées par les plaintes de nos évolués à la recherche souvent vaine d'épouses assorties à leur évolution […] [5]"). The use of *nos* or *ons* (our) suggests a possessive relationship that indicates a power relationship. At the same time, 'our' suggests an idea of affection, partially masking the power relationship (Ceuppens, 2003a,b). This could indicate that a paternalistic ideal was still present in 1968.

2.3. Phenotype-based Traits

The phenotype-based traits category contains keywords that refer to skin colour, such as *noir*/*zwart* for 'phenotype-based black' and *nègre*/*neger* for 'phenotype-based n-word'. Throughout the volumes other phenotype-based traits are also mentioned or used to describe Congolese, such as height, weight and physique. Adjectives such as *physique robuste* (robust physique), *avantageux* (advantageous), *musclé* (muscular), *sterk* (strong) and *klein* (small) are used to describe Congolese.

The use of phenotype-based words remains present in both languages throughout the volumes of the *BCB* and *BBOM* (*cf.* figs. 2 & 3). With around four out of ten thousand words, the rate of usage is the highest in volume I for French. From this point on, the category declines slowly, but never disappears. The phenotype-based n-word in French hardly even appears in any volume. Curiously enough, this category reappears in the last volume (2015), due to several references in Victor Wallenda's lemma to *l'art nègre*. In Dutch, phenotype-based language is much more frequent, at times even increasing. Eventually the usage of n-word variant disappears in volume IX (2015).

The *BCB*/*BBOM* consistently emphasizes that there is a distinction between ‘whites’ and ‘blacks’, while not acknowledging that cultural mixtures existed. The colonial government tried to enforce a harsh hierarchical separation between ‘whites’ and ‘blacks’ (Mutamba Makombo, 2020). Jan Breman (2021, p. 178) articulated it as a ‘colour line’, giving society a dualistic character. As Gloria Wekker (2016) argued, the reality is more nuanced. The explicit and frequent use of the word ‘race’ by authors in a post-world war II scientific colonial encyclopaedia is also interesting, since the term and the ideas behind it had become sensitive in the west due to the Holocaust (Poncelet, 2020). This could indicate that former ethnographic ideas, which became popular in Belgian scientific circles at the end of the 19th century, remained present with these ‘colonial experts’ (Couttenier, 2014). It is known that amongst Belgian colonizers, the word ‘race’ was a synonym for *ethnie* or a ‘population group’ (Mutamba Makombo, 2020). For example, the concept is found in every volume in conjunction with skin colour. From this flows the idea that there is a difference between a ‘white race’ and a ‘black’ one, which, to make clear, has no scientific ground.

2.4. Dehumanizing

The last category deals with keywords that strip the Congolese away of human elements, where they are positioned as completely different from ‘westerners’. In both French and Dutch, the dehumanizing keywords constitute the smallest category and hardly occur in the *BCB* and *BBOM*, most probably because of the scientific aspirations of the source. Nevertheless, there remain some attestations of Congolese people described as *sauvage* or ‘savage’, which is in line with the imperial ideology that colonialism was meant to ‘civilize’, ‘develop’ or ‘educate’ Africans (*e.g.*, Hendrina-Margo Kloekers (vol. II, 1951): “M^{me} Bentley était la première Européenne, qui visitât la région; aussi l’effet fut-il décisif sur les sauvages, pour qui une femme blanche avec un bébé constituait une véritable apparition [6]”). Surprisingly, as section 3 further shows, these keywords are not used for loaded contexts.

For French, dehumanizing terms only occur in volume I (1948). In Dutch, however, dehumanizing keywords are used at a higher rate. In the volumes published between 1950 and 1960, they even overtake the geographical category. The rate drops again around the 1960s, where it remains the smallest category until the 1990s, when it briefly outnumbers the administrative construct category — due to the name Wildeman — before its final decline and disappearance in volume IX (2015).

3. The Actors

The first part of our research has painted a picture of how often Congolese people occurred in the *BCB*/*BBOM* and what terms were used to describe them. In the second part, we have shifted the focus from the stage to the actors, or from bare word counts to the more detailed discursive strategies that were used to characterize Congolese individuals. Following Michel Foucault’s (1969) ideas surrounding discourse, it being a body of statements wherein representations and relations about a certain matter are present, section 3 of our study does not zoom in on a text’s literal meaning, but rather on the cultural conventions, norms, values and mindset that underpin it, in order to get a better understanding of the constructed mental social models. In order to retrieve recurrent patterns in the discourse of the *BCB*/*BBOM*, we took all

keywords referring to human beings that we collected in section 2, and we subjected them to a close reading analysis. In a scientifically representative approach, we analysed a random sample of half the attestations for all keywords with over thirty hits. The contexts of keywords with less than thirty hits were analysed exhaustively. This close reading stage has unveiled four different roles — to keep with the Lerner analogy — in which Congolese regularly appear throughout the Biography: 'Congolese in a grateful role', 'Congolese in need of help role', 'Congolese in a dangerous role', and 'Congolese in a supporting role'.

3.1. Congolese in a Grateful Role

The first role that can be distinguished — the one that is the most prominent and stable throughout all volumes — is the portrayal of the 'Congolese in a grateful role'. The ideals to 'advance' and 'develop' the Africans were at times translated into an idea that Congolese were depicted as children and the colonizers as father figures (Pomeranz, 2005; Vanthemsche, 1999). This was a very paternalistic way of thinking, which has clearly found its way into the *BCB* and *BBOM* in the shape of passages stating that the Congolese are affectionate towards the colonizers and grateful for the work they have done.

In volumes I (1948) and V (1958), this role is dominated by the presence of an external enemy who had to be defeated. One of the main arguments used by Leopold II and his supporters to legitimize their colonial ambitions was that the Congolese were victims of the Arabo-Swahili slave traders and had to be rescued from their clutches (De Roo, 2020). These were Arabs who came from Africa's east coast — present-day Tanzania and Zanzibar — and traded in slaves and ivory (Nzongola-Ntalaja, 2002). Some examples are the small empires of Msiri and Tippu Tip, who captured Congolese and enslaved them. Fighting the Arabs was thus seen as a progressive mission. As of 1890, the Congo Free State was officially at war with these slave traders (Vanthemsche, 2012). Between 1892 and 1894 this conflict reached its height, but kept on going until 1912 (Marechal, 1992) (*e.g.*, Van Kerckhoven's lemma (vol. I, 1948): "Ponthier, d'accord avec Van Kerckhoven, toujours à Bima, eut à nettoyer le pays des Arabes qui s'y étaient établis, notamment sur la Makongo et dans les îles du Bomokandi, pour procéder à leurs razzias habituelles. Il y parvint au prix de quelques combats assez vifs, aidé du reste par les indigènes, auxquels la présence des esclavagistes était devenue insupportable [7]"). The situation was apparently so tenuous for the Congolese that they fought along with 'westerners' against the Arabs. This suggests that if 'westerners' had not intervened, they would not have been liberated, which subtly expresses the supposed, or even required, gratitude on the part of the Congolese. Using the word *nettoyer* (to clean) in reference to Arabs makes it seem as if there were dirt present that needed to be cleaned up. It shows that the image of Arabo-Swahili traders in the *BCB*/*BBOM* was particularly negative, which in turn made the 'westerners' the heroes of the story. From volume V (1958) to volume VIII (1998), the *topos* of grateful Congolese occurs abundantly in the biographies of 'westerners' — often missionaries — who are told to have brought civilization through religion, education and labour, the three elements that became the pillars of Congolese emancipation. By equating Christianity with modernity, these missionaries are celebrated for having created new Christian societies that look like European ones (Christopher, 1984; Táíwò, 2010). In these biographies, the 'westerner' was portrayed almost as a friend whom the local population looked up to, and who was praised for his devotion. The few times women appear, is in this role. In some cases, the biographies discuss the

love the Congolese feel for these individuals, who are viewed as a father or mother figure (*e.g.*, Rhyove's lemma (vol. VI, 1968): "Les Congolais de Léopoldville considéraient le P. de la Kethulle — Sango Raphaël — comme leur père et leur ami [8]"). This becomes very clear in the text excerpts when a 'westerner' leaves Africa or dies, where sadness reigns among 'whites' and 'blacks' (*e.g.*, Verstraete's lemma (*id*., 1968): "De Zwarten, zeer gehecht aan hun bwana Luwi (mijnheer Louis), zagen hem met lede ogen vertrekken [9]"). The 'westerner' taught the Congolese a lot and had won their respect. Usually this was done in a friendly manner, yet sometimes respect was commanded through insolence (*e.g.*, Vermaesen's Lemma (vol. V, 1958): "Hij, die altijd, door zijn eenvoudige opgewektheid, door zijn vrijmoedig en rond optreden bij Blanken en Zwarten enkel sympathie en meewerken had gevonden, zocht nu nog enkel stille ingekeerdheid en rust [10]"). Again, it is striking how 'westerners' and Congolese are presented segregated in a racial discourse, where multiple references are made to *blancs*/*witten* and *noirs*/*zwarten* (*e.g.*, Geldof's lemma (*id*., 1958): "Il n'est pas étonnant dès lors, que sa mort prématurée le fit [*sic*] regretter par tous, Blancs et Noirs [11]"). In volume VIII (1998), the role decreases, but the discourse remains the same (*e.g.*, Antoine Sohier's lemma: "Encore à ce jour, les Africains se souviennent de ce maître prestigieux à suivre et à s'inspirer et c'est bien là justice à lui rendre [12]").

The image of the Congolese as a grateful people keeps recurring until the very end of the *BCB*/*BBOM*, despite the variety of authors on the different contributions. This is especially interesting when contrasted to Belgium's official stance towards paternalism: in her article about international adoption, Chiara Candaele (2020) wrote that after 1960, Belgium wanted to present itself as a 'colour-blind' nation and exchanged the paternalistic idea for a more caring 'motherland' ideal, a nation that should take care of the ex-colony. As it turns out, this shift in mentality appears not to have made it into the *BCB*/*BBOM*, where a distinction and narrative persists that Congolese were actually grateful for the work done by 'westerners' and that the passed-on-knowledge and presence of Belgians in the Congo was good for them. Up until the end, the colonials, as 'experts' 'or 'geniuses', often remain the heroes of this grand imperial narrative (*e.g.*, Bricteux's lemma (vol. IX, 2015): "La vie d'Auguste Bricteux fut celle d'un génie par le bon sens, un bon sens touchant à la sagesse antique [13]"). The next role has similar characteristics to 'Congolese in a grateful role', but has nuanced differences.

3.2. Congolese in Need of Help Role

The idea of 'civilization' was a pervasive and essential motivating factor of imperialism (Pomeranz, 2005). Colonial officials were responsible for 'civilizing', and later on 'developing', 'primitive' populations to a higher moral and spiritual level, modelling them after 'modern' European societies (Christopher, 1984). Missionaries ensured that 'barbaric' practices and superstitious forces such as witchcraft were eradicated (Táíwò, 2010). The latter was seen as a typical idea of backwardness, as opposed to European scientific intellectualism (Mudimbe, 1988). Raising the 'poor Africans' was exactly what Rudyard Kipling once so famously called "a white man's burden". In Congo this translated into educating what Belgians perceived as a 'lower race' (Depaepe & Lembagusala Kikumbi, 2020). In the *BCB* and *BBOM*, these ideas come together into the second role: 'Congolese in need of help'.

From the very start of the *BCB*/*BBOM* Congolese appeared regularly as victims that had to be helped and freed from the Arabo-Swahili traders (*e.g.*, Dhanis' lemma (1948): "Dans tout

le pays il n'était question que de ce jeune lieutenant, hier encore inconnu et qui avait par son initiative hardie anéanti la puissance arabe, délivrant ainsi la race noire du cauchemar de l'esclavage [14]"). Many battles had erupted between these Arabo-Swahili traders and the *Force publique*. Belgian propaganda presented this campaign as a justification for colonization (De Roo, 2020). In volume I (1948), an additional role comes to the fore, in which 'westerners' have to assist Congolese in educating them to move toward a society where Congolese can take care of themselves (*e.g.*, de Witte's lemma: "Il dressa beaucoup de noirs en ces différents métiers et dota ainsi les Missions et les postes de l'État de bons et précieux artisans [15]". Note especially the use of the term *dresser* ('tame') in reference to Congolese). In volume V (1958) the work of developing and moralizing the Congolese becomes more prominent (*e.g.*, Guillemé's lemma: "On moralisait cette gent enfantine par l'enseignement, la prière et le travail. On formait ces enfants à divers métiers. Les plus grands se mariaient et travaillaient à la culture des champs pour nourrir leur famille. À Kibanga est une magnifique mission, pleine d'avenir, comprenant un immense terrain où sont établis nos villages chrétiens. Ensuite viennent les villages indigènes où nous exerçons l'apostolat [16]"). The three great pillars of the civilizing offensive are discussed: (primary) education, labour and faith. The words 'civilization' and 'moralization' are also used explicitly in the Biography. Mission education had been present since the beginning of the Congo Free State, but was characterized by a low level and patronizing nature. Starting in the 1920s, there was a greater commitment to the education of the Congolese in cooperation with the missions (Depaepe & Lembagusala Kikumbi, 2020). The emphasis was on elementary learning content and, of course, religious education (Mantels, 2007). This trend continued in volume VI (1968), albeit with a growing emphasis on independence. Although true independence is an anachronistic concept, the idea reigned that Congo had to be prepared to become an independent society, which could only be achieved with the help of 'westerners'. Volumes VIIB (1977) through IX (2015) describe a new flavour of the 'Congolese in need of help'. From the late 1970s onwards, the Congolese are portrayed as victims of colonization. While this may seem at odds with the very purpose of the *BCB*/*BBOM*, the 'western' point of view still dominates in these fragments (*e.g.*, Archbishop Malula's lemma (vol. IX, 2015): "Un témoignage du père Ceuppens de 1949 le décrit comme blessé que les Européens sous-estiment la capacité intellectuelle des évolués [17]"). In contrast to the previous role, this lemma, where the need was felt to take care of the ex-colony and its inhabitants, illustrates that the abandonment of paternalistic feelings for a 'colour-blind' ideal, as Candaele (2020) argued, can be found in the last volume of the *BCB*/*BBOM*. This shows that different colonial ideas could be associated with various roles.

As we have shown, the trope of 'Congolese in need of help' is the most varied one, as it displays three different sub-variants (liberation from the Arab yoke; need for education, moralization and civilization; and finally help for victims of colonization). It differs from the previous role, in the sense that the focus lies more on Congolese as victims, rather as them undertaking actions (*i.e.* expressing their gratitude). The word 'develop' was still used by some authors in 2015, in line with the Belgian colonial efforts of the late 1940s (Vanthemsche, 2020). Ultimately, an image emerges, both from the role and the discourse, that Congolese had to be raised like a child and then let go, but failed to do so without help from the colonizer.

3.3. Congolese in a Dangerous Role

A third portrayal that stands out is the idea that Congolese are dangerous. It is now known that Congo was conquered *manu militari*. Belgian colonial propaganda presented this takeover at first as peaceful, with the Congolese welcoming them, but in fact Congo was conquered only gradually by Belgian officers and their colonial troops (Etambala, 2023). The idea of the Congolese as military opponents is especially present in the first two volumes, because these zoom in on the early stages of colonization. Here it is very often the heroic 'westerners' who somehow managed to overcome the 'wild cannibals' or fall victim — after putting up a memorable fight — to the excesses of Congolese.

There are two variations of this role, in lemmas written before and after the independence. After the independence — the minority of *BCB*/*BBOM* lemmas (*cf.* fig. 1) — there is a discourse shift. In volume I (1948), Congolese were described as untrustworthy, aggressive, primitive peoples who had not yet been subjugated. This had already been noted by historian Jean Stengers' (1949) review of volume I, in which he called the role of Congolese 'notorious'. Terms like *massacrer* ('to butcher') occur frequently in a pejorative context. They must be overcome and subdued, by force or charm (*cf.* Hanssens' lemma (1948): "Il avait l'aspect imposant; sa voix sonore, sa belle barbe pleine impressionnaient les indigènes et son franc sourire lui gagnait leur cœur [18]"). The image of heroic colonials triumphing despite all adversity is evident (*e.g.*, sister Lentz' lemma (vol. V, 1958): "Nooit hadden blanke vrouwen de voet gezet in het zwarte land; waar ze ook kwamen, stonden ze bloot aan de grootste gevaren: zowel van de kant van wilde inboorlingen als van gevaarlijke dieren [19]"). In general, there was indignation among the authors that Congolese dared to attack 'westerners', when in reality these people were simply defending themselves against what was a takeover of their territory. Violence was a last resort for the Congolese (Gondola, 2020). This language, in which Congolese threatened 'westerners' with spears, occurs up to volume VI (1968), but the discourse is no longer infused with negative terms such as *inconstance* ('fickleness') and *insouciance* ('recklessness'). From then onwards, the authors described Congolese as more 'civilized', most probably because the authors assumed that the Belgian endeavours had actually elevated the Congolese through education, religion and labour. This interpretation is supported by narratives where 'westerners' are almost surprised that they are being attacked, as they are only there to help the 'poor' Africans.

From volume VIIB (1977) onwards, this discourse is interrupted by fourteen lemmata on the 1962 event when troops of the Congolese National Army shot twenty — nineteen Belgian and one Dutch — missionaries. The discourse on this issue is divided, with one half speaking of 'killed' and the other of 'massacre' or 'mass murder'. In any case, 'westerners' here are portrayed in a victim role. In the following volumes, there is a variety of reasons why Congolese are aggressive. The category of 'Congolese in a dangerous role' finally disappears in volume IX (2015). Interestingly enough, as section two shows, 'dehumanizing' words were not numerous, which could seem somewhat surprising and contradictory concerning the context in this role. This indicates that there is a distinction between language and context, and that authors could describe Congolese with more neutral terms, yet position them in loaded circumstances. The examples shown in this section confirm this stance.

3.4. Congolese in a Supporting Role

A fourth and final category is formed by ‘Congolese in a supporting role’, in which ‘westerners’ see Congolese merely as a labour force. Labour conditions in both the Congo Free State and Belgian Congo were poor, although they did improve as time went on (Dibwe dia Mwembu, 2020). Congolese had to assist the colonizer and it was almost taken for granted that they were actually willing to carry out these jobs. Whenever Congolese refused to fulfil their tasks, they were seen as ungrateful. Running like a thread through this category is the discrepancy between the perceived work ethic of ‘westerners’ and that of Congolese.

In volume I (1948), and partly in later volumes, Congolese appear in this role as troops of the *Force publique*: as auxiliaries or porters to a caravan, native Congolese men helped the ‘westerners’. This police/military force formed the public resistance troops of the Congo Free State and its (first) main objective was to destroy the Arabo-Swahili traders. It also had to preserve the order and assist ‘westerners’ on their tours of the Congo. Regular rebellions took place in this army, which had to be suppressed (Vanthemsche, 2012). Even as late as volume IX (2015) Congolese still appear in this role (*e.g.*, de Witte’s lemma (2015): “Par voie terrestre, il fit avec des porteurs indigènes le trajet à Stanleyville (environ 365 km) en dix jours, sans voir un seul Européen [20]”). In volumes V (1958) and VI (1968), Congolese mainly appear as workers and soldiers of the *Force publique* during the First World War. Work appears in many ways, often as manual labour in agriculture. The dominant image here is of Congolese appearing in the background and performing their duties. In a rare case, Congolese are portrayed in a positive light, but this is an anomaly. The lemma on Aupiais, a French missionary and ethnographer in volume V (1958), describes what he saw as the ideal ‘black person’: “Par son attachement à la communauté familiale, par sa fidélité à la tradition, par son sens de l’autorité et sa soumission à elle, par son étroite communion avec la nature et ses mystères, par son habitude de remonter directement, par-delà les causes secondes, jusqu’à la divinité, maîtresse des éléments, en qui il a une absolue confiance, ce paysan noir a une moralité vigoureuse et délicate [21]”. Here a comment on what follows in the same text is appropriate: “par son sens de l’autorité et sa soumission à elle [22]”. Another passage from volume VI about Nepper, the head of an export company, clearly shows that it is the ‘westerners’ who ensure that Congolese are helpful: “Deux années durant, sans voir un seul Européen, courant jour et nuit de grands dangers, Nepper chercha le contact avec les indigènes, qu’il réussit finalement à se rallier et dont il fit de nouveaux récolteurs [23]”. The ‘westerner’ continued despite all the dangers, while Congolese were eventually hired as workforce. Interestingly, this role disappears more into the background in volumes VIIB (1977) and VIIC (1989), only to reappear in VIII (1998) and IX (2015). A quote from volume VIIC (1989) reads as follows: “Étienne Capelle était non seulement un grand constructeur et un maître agriculteur, mais il savait partager ses connaissances avec les Africains qui travaillaient avec lui [24]”. ‘Westerners’ continued to pass the buck by transferring their knowledge to Congolese working for them. Traces of this kind of language still surface in volume IX (2015) in Mortier’s lemma: “Transposés dans leurs parcelles définitives de la ville, aidés de leur main-d’œuvre africaine qui partageait au moins provisoirement leur sort [25]”. This incorporates, as Bambi Ceuppens (2003a,b) argued, a paternalistic idea by describing them as ‘their’ labour force.

Up to and including the last volume, Congolese appear as people supposed and/or eager to help. The *BCB* and *BBOM* are mostly silent on forced labour in relation to Congolese, creating

a traditional monolithic picture in this source where Congolese were free to work. More recent research on forced labour (Seibert, 2020) has shown that there was no hard break between working conditions in the Congo Free State and the Belgian Congo. There is also no mention of the poor working conditions of the first decades of Belgian colonization, even in the later volumes. These were, according to Dibwe dia Mwembu (2020, pp. 146-147), 'abysmal' and many Congolese fell ill or died due to these substandard conditions between 1906 and 1928. This, as Jan Breman (2021) argued, is hidden behind the façade of the idea of the model colony. The idea is recreated into this portrayed image of Congo in the encyclopaedia. Although the occasional exception exists, most Congolese are not praised for their labour or help, and as soon as they do something wrong, they are immediately punished by the authors in negative terms. 'Westerners', on the other hand, are given full credit for their work and contribution.

4. Discussion and Conclusion

As Lerner (1986) stated that the image of women was created by men, we can conclude that images of Congolese were created by 'westerners'. The *Biographie Coloniale Belge* (1948-1968) and *Biographie Belge d'Outre-Mer* (1968-2015) can almost be described as a microcosm of colonialism, where different complex images of the colonized come together. The source presents at times a black and white picture concerning the relations between the 'westerner' and the 'Other'. However, in this juxtaposition, nuance exists in how the 'Other' is viewed. Our research has taken a first significant step in dissecting some of the constructed mental models that are presented in the *Biographie Coloniale Belge* and *Biographie Belge d'Outre-Mer* regarding the way it portrays Congolese people, and has shown patterns of continuity and change.

First, we have shown that the presence of the Congolese in this encyclopaedic work is extremely low. Even if the source is dedicated to 'westerners', their presence merely resembles that of extras. Secondly, Congolese are not portrayed in a uniform way in this scientific colonial encyclopaedia; four *topoi*, or roles, which Congolese people have been assigned throughout the Biography have been identified. A clear evolution concerning the discourse towards a less colonial ideology has been demonstrated. As our frequency overviews show, a more neutral geographical discourse gains ground at the expense of administrative, phenotype-based traits and dehumanizing terms. Regarding diachronic shift, the discourse of the *BCB* does not appear to show a hard break with the colonial past in the *BBOM* after 1960. The decrease in the total number of mentions, combined with a slight increase in the number of positive mentions of Congolese in the later volumes suggests a move toward 'mental decolonization', but the lingering presence of the colonial *topoi* in the representation of the Congolese shows that the shift is only gradual. The later volumes subtly differ from their predecessors: they include more colonially critical lemmas, indicating that a 'mental decolonization' has taken place in at least some lemmas of the *BBOM*. At the same time, however, continuities with the old colonial ideals found in the earlier volumes persist even in the most recent contributions, and new colonially critical concerns are regularly projected onto the past. Thirdly, throughout the *BCB*/*BBOM*, the 'westerner' remains the protagonist, as he is consequently positioned against the 'Other' and gains all the credit. Of course, the encyclopaedia is dedicated to these 'westerners', but the way they are portrayed as paternalistic heroes, who first 'civilized' and later on 'developed' the Congolese through hard work and diligence, remains surprisingly present up to the

last volumes. Loaded images of the colonization and the adventurous colonizer of the first volumes might have disappeared, but the notion of a 'good colonizer' who taught and modelled the 'Other' in the way perceived by 'the West', is still there. In this way, it does seem that the Congolese is trapped in his role as the 'object'. Our findings tie in with Mudimbe's (1988) epistemological and cultural ethnocentrism — the idea that nothing is to be learned from the 'Other'. Images of the Congolese are seen through the lens of another culture. They have little to no agency in the events described in the source, nor how they are framed in it. This indicates that while 'mental decolonization' might have happened at a surface level, with the disappearance of the most offensive terminology, beneath that first layer remains, at times, a whiff of colonial ideology.

Two crucial points concerning our extracted roles and the discourse need to be addressed. First, it is important to point out that the roles we discussed are not mutually exclusive categories. In fact, they repeatedly co-occur and several are present in the same lemmas. Moreover, the roles were not always easy to identify, as the use of language was frequently subtly obfuscating. Interestingly, the four roles did not straightforwardly map onto the categories of keywords we identified in the first part of our research. We had expected that the trope of 'Congolese in a dangerous role' would have patterned with words from the 'dehumanizing' category, but no such connections turned out to exist. Secondly, regarding chronology, it should be noted that the roles fluctuate less by volume than by the period an individual lemma is about. In the early colonization — the Congo Free State period (1885-1908) — we mainly find the first 'explorers' and 'colonial heroes'. The second period is that of World War I and the interwar period, from 1910 to 1940. The third period runs from World War II to Congo's independence in 1960. The last period is the post-colonial (political) period and runs from 1960 to the present, which received remarkably little coverage. Our study has revealed some shifts in comparison with the older volumes, but these changes were not sufficiently consistent to be considered genuine breaks. While the number of colonially critical lemmas does rise, decolonization awareness remains limited. Various attitudes to colonization often co-exist within the same volume: a volume can acknowledge that Congolese were victims of colonization while at the same time elaborating on the positive aspects of the ten-year plan, an important element of the Belgian development ambitions. As already mentioned, some roles shift more to the foreground, such as 'Congolese in a supporting role', and others get backgrounded or disappear entirely, such as 'Congolese in a dangerous role'.

Our findings thus concur with Vanthemsche's remark about the scientific content of the Biography (Vanthemsche, 2011). Although the source was meant as a scientific encyclopaedia, which is underscored by a low presence of dehumanizing keywords, it is very clear that at times the opinions of authors found their way into this work. The fact that the *BCB* and *BBOM* are 'scientific' makes it at times troublesome. The source itself holds a certain authority, by which it can be seen as a justification for the colonial project. A scientific narrative is created in which Congolese appear in certain roles. This narrative, however, is embedded in colonialism, as colonialism and science go hand in hand (Ideland, 2018). Because of its scientific nature, the Biography's colonial images of Congolese come across as facts rather than as tropes, and as such implicitly legitimize the colonial endeavour.

Above all, our study has made clear that further research is absolutely needed on multiple fronts. Our study has focused on the portrayal of Congolese in this colossal encyclopaedia, but there is still a wealth of ethnographical and geographical material. With our state-of-the-art

digital methodology, further research of this scope is possible. Instead of analysing mental images of social phenomena, one could also examine the mental geographical map. What was the Congo that the authors portrayed, and how can it be compared to the actual Congo? Could there also be evolutions here? Our methodology shows that research questions of this scope can be answered. Another obvious avenue for further investigation would be a biography or prosopography of the authors. The current research has extracted the predominant images of Congolese, but how did these come about? A series of critical questions about the authors should be asked. To broaden the scope, we would like to point out two bigger research inquiries. First, this encyclopaedia could form a passageway to extract the constructed mental models of the entire Belgian scientific corpus. Research on the relationship between colonialism and (colonial) science in Belgium is starting to grow (Poncelet, 2008, 2020; Mantels, 2007, 2020). These works, however, never depict the actual mental models (maps and social images) that the Belgian scientific institutions created. This is an entirely untapped research field, which could show a potential link between contemporary (popular) images of Congo, or even Africa, and the mental models that the Belgian scientific institutions created. Secondly, the British, French, German and Dutch equivalent to the *BCB* and *BBOM* have remained relatively untouched. A comparative study would chart whether the same images reappear in these sources, which could indicate a broader imperialistic idea at play, or whether they are more nationalistically determined.

If Mudimbe's (1988) 'colonial library' were an actual library, the *BCB* and *BBOM* would make a fine addition for the shelves. In order to understand the 'Other', one must deconstruct the mental map(s) of the person(s) who portrayed them. By separating the events that are described from the language that is used and the discourse they are embedded in, this paper has aimed to demonstrate that science and ideology are by no means mutually exclusive.

NOTES

[1] Volume 7 consists of three tomes.
[2] "But this old African was too attached to Africa to give it up".
[3] "And Badjoko is remembered as a leading Congolese figure who, for almost half a century, contributed magnificently to his country's economic development".
[4] To trace the diachronic evolution of each term in an accurate way, we grouped all lemmas per decade, worked out the number of hits for each keyword category for each decade, divided this by the total number of words written in that decade to get rid of differences in corpus size and multiplied the resulting number by ten thousand for the sake of legibility. As such, the numbers in the following graphs represent how often every (group of) terms shows up on average in any random sample of ten thousand words taken from the lemmas written in the relevant decade.
[5] "This is the task the importance and urgency of which is underlined today by the complaints of our advanced for wives to match their evolution".
[6] "Mrs Bentley was the first European to visit the region, so the effect was decisive on the savages, for whom a white woman with a baby was a real apparition".
[7] "Ponthier, in agreement with Van Kerckhoven, still in Bima, had to clean the country of the Arabs who had settled there, particularly on the Makongo and on the isles of Bomokandi, to set about their habitual razzias".
[8] "The Congolese of Leopoldville considered the P. de la Kethulle — Sango Raphael — their father and their friend".
[9] "The Black, very much attached to their bwana Luwi (mister Louis), regretted his departure".

[10] “He, who always, through his simple cheerfulness, through his bold and fair conduct, had found sympathy and collaboration with Blacks and Whites, now only looked for quiet reflection and peace of mind”.
[11] “It is not surprising that his untimely death was regretted by all, blacks and whites”.
[12] “Even then, the Africans remembered to follow, be inspired by and do justice to that prestigious tutor”.
[13] “Auguste Bricteux’s life was that of a genious with common sense, a common sense that touched upon ancient wisdom”.
[14] “In the entire country, all people could talk about was this young lieutenant, yesterday still unknown, who had annihilated the Arab powers by his headstrong initiative, as such liberating the black race of the nightmare of slavery”.
[15] “He tamed a lot of blacks in these different trades and thus endowed the Missions and the state post with good and valuable artisans”.
[16] “We moralised this child-like people through education, prayer and labour. We trained their children in various trades. The oldest got married and worked out on the field to feed their family. In Kibanga is a wonderful mission, full of future, consisting of a vast domain where our Christian villages have settled. Next are the native towns where we carry out the apostolate”.
[17] “A testimony of father Ceuppens in 1949 describes him as blessed that the Europeans underestimate the intellectual powers of the ‘évolués’”.
[18] “He was an imposing figure; his resonant voice and beautiful, full beard impressed the natives and his heartfelt smile conquered their hearts”.
[19] “Never before had white women set foot in the black country; wherever they went, they were exposed to the gravest dangers: both coming from wild natives as from dangerous animals”.
[20] “With the help of native porters, he completed the trajectory to Stanleyville (about 365 km) on land in ten days, without ever seeing a European soul”.
[21] “By his attachment to the family community, by his fidelity to tradition, by his sense of authority and submission to it, by his close communion with nature and its mysteries, because of his habit to go straight, bypassing secondary causes, to divinity, mistress of the elements, in whom he has absolute confidence, that black farmer has a vigorous and delicate morality”.
[22] “because of his sense of authority and his submission to her”.
[23] “During two years, in which he didn’t see a single European, in grave danger night and day, Nepper tried to get in touch with the natives, whom he finally managed to win over and turn into new harvesters”.
[24] “Étienne Capelle was not only an important builder and a master farmer, but he also knew how to share his knowledge with the Africans who worked with him”.
[25] “Settled in their final plots of the town, helped by their African workers who shared at least temporarily their fate”.

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La fable mystique (Mudimbe, Hesse): une littérature micropolitique*

par

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Mots-clés. — Mystique; Quête existentielle; Positionnement politique; Valentin-Yves Mudimbe; Hermann Hesse.

Résumé. — Si l'œuvre philosophique de Mudimbe reprend à son compte plusieurs éléments centraux de la pensée foucaldienne, une autre lecture de son œuvre permet d'y déceler une forte empreinte métaphysique par endroits doublée d'une réelle dimension mystique. L'analyse de son roman *Shaba deux: les carnets de mère Marie-Gertrude* et de son récit autobiographique *Les corps glorieux des mots et des êtres: esquisse d'un jardin africain à la bénédictine* sera menée à la lumière de l'œuvre de l'écrivain allemand Hermann Hesse. Le mouvement général de quête existentielle et de cheminement intérieur entre sensations, aspirations et sentiment moral et religieux rejoint la question de l'engagement politique (ou du non-engagement) de l'auteur pris dans la tourmente de son époque dans la région d'où il vient/où il vit (l'Allemagne nazie pour Hesse, l'Afrique centrale en proie aux guerres et massacres pour Mudimbe).

Keywords. — Mysticism; Existential Quest; Political Position; Valentin-Yves Mudimbe; Hermann Hesse.

Summary. — *The Mystical Fable (Mudimbe, Hesse): A Micropolitical Literature.* — Although Mudimbe's philosophical work includes several central elements of Foucauldian thought, another reading of his work reveals a strong metaphysical trend, coupled here and there with a genuine mystical dimension. An analysis of his novel *Shaba deux: les carnets de mère Marie-Gertrude* and his autobiographical story *Les corps glorieux des mots et des êtres: esquisse d'un jardin africain à la bénédictine* will be examined in the light of the work of German writer Hermann Hesse. The general movement of existential quest and inner journey between sensations, aspirations and moral/religious sentiment is linked to the question of political commitment (or non-commitment) of the author caught up in the turmoil of his time in the region where he comes from/where he lives (Nazi Germany for Hesse, Central Africa and its wars for Mudimbe).

Introduction***

L'œuvre philosophique de Valentin-Yves Mudimbe est devenue une référence majeure de la pensée postcoloniale. L'usage de son concept de «bibliothèque coloniale», notamment, est devenu quasi métonymique pour désigner la manière dont l'Afrique a été «inventée» (*The invention of Africa*) par un corpus de récits européens, la manière dont une certaine «idée» de

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l'Afrique (*The idea of Africa*) a émergé au XVIII^e^ siècle et a été entretenue jusqu'à nos jours. La reviviscence actuelle de ces deux textes majeurs, écrits et publiés dans les années 1980-1990, et leur empreinte foucaldienne revendiquée font de Mudimbe un auteur politique dont la pensée s'accorde avec les sensibilités contemporaines, et en particulier avec l'impératif de plus en plus largement partagé — non plus seulement dans un microcosme universitaire, mais aussi dans l'espace politique et médiatique — de décolonisation des savoirs, des pratiques et des mentalités.

Pourtant, la lecture d'un de ses textes autobiographiques, *Les corps glorieux des mots et des êtres: esquisse d'un jardin africain à la bénédictine* (1992) [1]*, fait apparaître un mouvement d'écart qui semble être une constante de son positionnement face au monde. De son choix précoce pour l'engagement dans l'ordre des bénédictins, suivi par l'abandon du noviciat deux ans plus tard, à son exil assumé aux États-Unis, Mudimbe apparaît avant tout comme un sceptique et une sorte de transfuge. Penseur à l'obédience intellectuelle inclassable, il doute de tout, de la religion comme de la politique, et même de sa propre perspective analytique. Il y a chez lui une forme de «radicalisation du doute», comme le remarque justement Anthony Mangeon, lisant *The invention of Africa* [2].

Après avoir rappelé que le penseur avait toujours défendu la subjectivité contre une certaine conception radicale du structuralisme [3], Anthony Mangeon s'attache à examiner la genèse du concept de gnose qui est au cœur de *The invention of Africa* [4]. La gnose désigne d'abord un savoir caché [5] et Mudimbe emprunte explicitement le terme à l'anthropologue Johannes Fabian qui l'utilisa dans les années 1970 pour qualifier la transmission, dans le milieu minier de Kolwezi au Shaba (l'actuelle province du Katanga en RD Congo), d'un enseignement philosophico-religieux teinté d'ésotérisme, le *Jamaa*, né au début des années 1950 et inspiré par le livre de Placide Tempels, *La philosophie bantoue* [6]. Aussi, ce que l'étude d'Anthony Mangeon met très pertinemment au jour, c'est que même les textes *a priori* les plus foucaldiens de Mudimbe sont en réalité empreints d'une dimension mystique que son autobiographie et ses romans, eux, ne dissimulent pas.

Dans le cadre de cette étude de la fable mystique chez Mudimbe, ce sont les derniers qui m'intéresseront et que je tenterai de lire en miroir de l'œuvre de Hermann Hesse.

Mais avant d'en venir à la présentation du corpus ainsi qu'à la justification de cette comparaison, il convient de préciser ce que j'entends ici par mystique. Je me référerai principalement au riche essai de Michel de Certeau, *La fable mystique*, consacré à l'étude de textes chrétiens relatant une expérience directe, personnelle et même intime avec Dieu. Ses analyses structureront mon argumentaire.

La pensée certalienne a longuement nourri la réflexion de Mudimbe sur l'histoire, comme il l'explique dans *Les corps glorieux des mots et des êtres*, au point d'emprunter au philosophe français un de ses grands concepts. La notion d'invention, telle que convoquée dans *L'invention de l'Afrique*, est en effet directement inspirée de l'essai désormais classique de Michel de Certeau, *L'invention du quotidien*, et utilisée pour exprimer «la découverte et l'appropriation» [7]. Dans son ouvrage consacré à Mudimbe, Pierre-Philippe Fraiture revient sur la discussion conceptuelle que Mudimbe engage avec de Certeau, entre autres penseurs avec lesquels il dialogue [8].

* Les chiffres entre crochets [ ] renvoient aux notes, pp. 311-315.

Luce Giard, éditrice de l'œuvre de Michel de Certeau, — à qui l'on doit l'édition posthume du deuxième tome de *La fable mystique* —, considère que «La mystique peut se définir comme une prise de parole par laquelle un événement se transforme en une expérience singulière de Dieu» [9]. Elle ajoute encore que «le mystique parle en tant qu'individu d'une expérience qui lui est advenue en propre et dont il est, par définition, le seul témoin. La singularité de cette expérience s'oppose à l'universalité du dogme institutionnel» [10]. Une expérience, une parole à propos de cette expérience et une attitude singulière: la mystique est tout cela à la fois, ainsi que l'énonce le *Dictionnaire de théologie catholique* [11].

Ces caractéristiques me semblent parfaitement s'appliquer aux protagonistes qui parlent de leurs expériences intérieures dans les récits de Mudimbe étudiés: *Les corps glorieux des mots et des êtres: esquisse d'un jardin africain à la bénédictine* et *Shaba deux: les carnets de mère Marie-Gertrude*, en miroir des récits de Hermann Hesse (je traiterai principalement de *Peter Camenzind* et de *Narcisse et Goldmund*).

C'est donc cette dimension mystique que je tenterai de mettre en lumière, avec les précautions qu'imposent à la fois le maniement de cet «objet» intellectuel difficilement identifiable qu'est la mystique et la comparaison entre deux penseurs éloignés par l'époque comme par la géographie.

L'objet de Michel de Certeau, dans *La fable mystique I*, est d'abord de montrer la façon dont la mystique est apparue dans le champ des savoirs à la fin du XVI^{e} siècle, comment elle s'est progressivement constituée en un genre cohérent par un corpus de textes qui se répondaient les uns aux autres, ou qui ont pu être mis en relation par des exégètes et des commentateurs. Il renonce, dans le tome I, à proposer une définition close et exacte de la mystique dès lors que ce mouvement se caractérise par son aspect fragmentaire, circulaire et obscur [12]:

> Une fois pourvue d'une unité substantive, la mystique devait déterminer ses procédures et définir son objet. Si, on le verra, elle a réussi la première partie de ce programme, la seconde lui était une tâche impossible. Son objet n'est-il pas in-fini? Il n'est jamais que la métaphore instable d'un inaccessible. Chaque «objet» du discours mystique s'inverse en trace d'un Sujet toujours passant. La mystique ne rassemble donc ses pratiques et ne les règle qu'au nom de quelque chose dont elle ne saurait faire un objet (sinon mystique) et qui ne cesse de la juger en lui échappant. Elle s'évanouit en son origine. Sa naissance la voue à l'impossible, comme si, malade de l'absolu dès le commencement, elle mourait finalement de la question qui l'a formée. Pendant un temps, cette science n'est soutenue que par le poème (ou par ses équivalents: le songe, l'extase, etc.) (de Certeau, 2002 [1982]).

Consciente de cette indistinction constitutive de la mystique, qui invite à une forme de prudence dans le maniement de cette notion, je m'attacherai dans un premier temps à identifier, chez Hesse et Mudimbe, une communauté de thématiques appartenant à la pensée mystique. Dans un second temps, et plus brièvement, je montrerai en quoi leurs textes romanesques et autobiographiques peuvent être considérés comme des fables mystiques et je conclurai en posant l'hypothèse d'une corrélation entre fable mystique et rapport (anti-)politique au monde. En effet, ce que la fable mystique vient questionner par le truchement de ses protagonistes, c'est bien le positionnement vis-à-vis du politique — singulier et difficile à cerner — des individus mystiques ou soupçonnés de l'être.

Des vertus de la comparaison

Pourquoi comparer ces deux auteurs? Pour répondre à cette question, commençons par retracer à grands traits leurs trajectoires respectives.

V.-Y. (Valentin-Yves, ou Vumbi-Yoka) Mudimbe est un auteur de la fin du XX^{e} siècle, né en 1941 au Congo belge où il a grandi, plus précisément au Katanga, au sud-est du pays, bordant la région des Grands Lacs, dont fait partie le Rwanda où il vécut un temps, avant de partir faire son doctorat en philologie à l'Université de Louvain. À son retour au pays (qui était alors le Zaïre de Mobutu des années 1970), il occupa la fonction de doyen de la faculté des lettres à l'Université de Lubumbashi, période au cours de laquelle il écrivit non seulement de la poésie et des romans mais aussi deux de ses essais majeurs, *L'odeur du père* et *L'autre face du royaume*. En 1980, il émigra aux États-Unis où il mena l'essentiel de sa carrière académique, à Haverford College, à l'Université de Stanford puis de Duke, non loin de laquelle il s'éteignit en 2025.

De son côté, Hermann Hesse est un auteur germanique (Allemand, ayant longtemps résidé en Suisse où il finit ses jours) qui a évolué dans cet espace culturel transfrontalier qu'on appelle la *Mittel-Europa* au début du XX^{e} siècle (né en 1877, mort en 1962). Auteur de nombreux romans mettant en scène des personnages caractérisés par une sorte de quête d'idéal spirituel, il s'inscrit dans le sillage de «l'indomanie romantique» qui connut un grand nombre de représentants dans le monde germanophone [13]. Il est le récipiendaire du prix Nobel de littérature en 1946.

Quoique ces deux auteurs n'appartiennent ni à la même époque ni à la même aire culturelle, ils présentent un certain nombre de convergences non seulement entre leurs œuvres, mais aussi d'ordre biographique.

Tout d'abord, ils ont eu une éducation similaire, dans des contextes certes très différents, mais avec un socle commun puisque Hermann Hesse, issu d'une famille de pasteurs missionnaires en Inde, a, comme Mudimbe, fait des études classiques au grand séminaire. Ils ont donc, au moins pour partie, eu les mêmes lectures et partagent les mêmes références culturelles. Citons notamment Saint François d'Assise, abondamment cité dans *Peter Camenzind* par le héros éponyme qui chérit ce personnage historique au point de lui consacrer un pèlerinage jusqu'à la ville d'Assise et ses alentours en Italie, suivi d'une sorte de séjour de recherche concernant la vie du saint. La figure de Saint François traverse aussi l'œuvre mudimbéenne. Marie-Gertrude, la narratrice de *Shaba deux*, le mentionne comme son personnage historique favori dans ses réponses au «questionnaire de Proust» [14], ainsi que dans un autre passage où elle situe son engagement religieux par rapport à lui (voir *infra*). Toujours dans l'œuvre de Mudimbe, François d'Assise apparaît aussi dans deux épisodes narratifs qui présentent des points communs. L'écrivain raconte en effet dans son autobiographie que, très jeune encore, il a lu un récit du jésuite Auguste Valensin, intitulé *François* (cité dans *Les corps glorieux* à deux reprises [15]); ce récit se présente comme une sorte de biographie d'un enfant doué d'un vrai talent d'écrivain, qui est aspirant jésuite et dont l'auteur s'était beaucoup occupé, étant alors son directeur de conscience. Le jeune garçon mourut prématurément à l'âge de dix-huit ans [16]. Or, cette fin tragique parce que précoce ressemble beaucoup à celle de la jeune Jacqueline dont s'occupe la franciscaine Marie-Gertrude — sa «petite malade» — au début du récit et qu'elle veille jusqu'à son dernier souffle. Et c'est bien dans la congrégation franciscaine que l'écrivain congolais situe le cadre de son récit *Shaba deux: les carnets de mère Marie-Gertrude*.

Hesse et Mudimbe partagent aussi, en partie, les mêmes aspirations pour leur œuvre, et quant à leur rôle dans le monde. Ces aspirations, influencées par leur éducation chrétienne et par un rapport spirituel au monde, les conduisent à considérer la création de l'esprit comme un acte sinon inspiré par Dieu, en tout cas caractérisé par une vocation sotériologique. Il y a, autrement dit, chez les deux auteurs un soubassement religieux comparable, un commun rapport judéo-chrétien au monde (même s'il est plus marqué chez Mudimbe que chez Hesse tout autant pénétré de spiritualité védique indienne), imprégné des notions de salut et de rédemption, qui pourrait peut-être expliquer de semblables attitudes.

Il restera ensuite à voir de quelle manière ces attitudes orientent leur positionnement vis-à-vis de la politique dans et par l'écriture.

À cet égard, il me semble notamment important de souligner que Mudimbe comme Hesse campent en toile de fond de leurs textes respectifs une situation de conflit à caractère ethnique. Celle-ci affleure discrètement dans *Narcisse et Goldmund* de Hermann Hesse sous la forme de la persécution et du massacre des Juifs durant l'épisode de la Grande Peste en Europe, ainsi que dans *Les corps glorieux des mots et des êtres* de Mudimbe via la mention des massacres des Tutsi en 1959 au Rwanda qu'on désigne sous le nom de «Toussaint rwandaise» (je reviens sur la convergence de ces deux contextes dans la troisième partie de cet article). Mais c'est dans *Shaba deux* de Mudimbe que le caractère ethnique du conflit est le plus déterminant. Le titre même du roman renvoie auxdites guerres «du Shaba» qui se sont déroulées à la fin des années 1970 dans la province du Katanga, rebaptisée «Shaba» (cuivre en swahili) à l'époque du Zaïre de Mobutu [17]. La deuxième guerre du Shaba constitue en effet le pivot de l'intrigue du roman puisque sœur Marie-Gertrude devient mère supérieure au moment où la guerre éclate suite au départ des sœurs européennes. Ces deux guerres successives — la «guerre de quatre-vingts jours» de 1977 et la deuxième guerre du Shaba de 1978 — furent provoquées par l'assaut, depuis le versant frontalier du sud du pays (par l'Angola, puis par la Zambie), des ex-«gendarmes katangais», artisans de la Sécession du Katanga à l'indépendance en 1960, pour qui la revendication de la démocratisation du pays allait de pair avec l'idée d'une reconquête du pouvoir par les Katangais dits «originaires» (par opposition à ceux dont les parents et grands-parents avaient migré des provinces voisines).

Par ailleurs, la dimension autobiographique de leurs textes est un autre marqueur commun. En effet, toute l'œuvre romanesque de Hesse peut se lire, d'après certains critiques, comme une autobiographie romancée à jamais recommencée d'un roman à l'autre [18], *Peter Camenzind* et *Narcisse et Goldmund* peut-être au premier chef. Quant à Mudimbe, non seulement il a écrit une autobiographie en deux volets (dont *Les corps glorieux des mots et des êtres*), mais l'on entend dans ses textes romanesques d'évidents échos autobiographiques, qu'il s'agisse de *Shaba deux* ou d'*Entre les eaux* dont l'auteur reconnaît d'ailleurs pudiquement le caractère autobiographique [19]. En outre, ces deux romans empruntent au genre diariste favorisant sans doute l'investissement personnel d'un écrivain dans le personnage-narrateur de sa fiction. Dans *Les corps glorieux des mots et des êtres*, Mudimbe n'hésite pas à se mettre en scène par une série de dispositifs d'énonciation d'un soi reconstruit à la faveur du recul et parfois d'une mystification partiellement inconsciente, en tout cas inavouée, à la manière de Sartre dans *Les Mots* [20]. Plusieurs clins d'œil au fameux récit de Sartre se trouvent dans ses romans [21] et son autobiographie comporte une référence directe à ce récit [22].

Un dernier détail, plus anecdotique mais néanmoins intéressant: on notera que Hesse comme Mudimbe ont tous deux choisi le prénom — pas si commun — de «Gertrude» pour les protagonistes féminins du roman éponyme de Hermann Hesse [23] et du roman à l'étude de Mudimbe, *Shaba deux*.

Ne disposant pour autant d'aucune preuve que Mudimbe ait lu Hesse, on ne peut pas parler de lien intertextuel explicite, comme c'est par exemple le cas des deux auteurs, pareillement éloignés dans le temps et l'espace, qu'étudie János Riesz: Cheikh Hamidou Kane et Rainer Maria Rilke, le premier citant le second dans *L'aventure ambiguë*, en se référant plus précisément aux *Carnets de Malte Laurids Brigge* [24].

J'émettrai donc l'hypothèse d'un lien intertextuel implicite entre les deux œuvres, basé sur une communauté de thématiques propres à la pensée mystique et sur des traits structurels caractéristiques de la fable mystique.

La comparaison de Mudimbe avec Hesse, à la lumière de l'essai de Michel de Certeau, *La fable mystique*, devrait permettre de montrer que Mudimbe est aussi un penseur mystique et que cette dimension de son rapport au monde pourrait éclairer un positionnement politique caractérisé par une forme de retrait ou de réserve.

Expression de la pensée mystique chez Hesse et Mudimbe: traits communs

Plusieurs traits communs caractéristiques du récit mystique se retrouvent dans l'œuvre des deux auteurs.

Le récit qui met en scène une expérience mystique s'articule autour de la figure de celui — et souvent de celle — qui fait cette expérience, soit un «individu-hors-du-monde» pour reprendre la formulation de Max Weber. Quoique Weber distingue l'ascète du mystique, voyant dans la première un être actif (tout en étant détaché du monde) contrairement à la seconde qui refuserait «l'action au profit de la contemplation» [25], mon corpus montre que l'ascète peut tout à fait vivre une expérience mystique qui le transforme en profondeur. C'est ce que nous montrent les protagonistes de Hesse et Mudimbe.

La figure de l'ascète

Le premier trait commun qui s'impose à la lecture concomitante des textes de Mudimbe et Hesse, c'est la figure de l'ascète, personnage prédisposé au mysticisme par son dépouillement, choisi comme mode d'accès à Dieu. Cet ascète peut être religieux comme Narcisse, laïc comme Goldmund et Peter Camenzind; ou les deux successivement, comme Mudimbe ainsi qu'il le relate dans son autobiographie. Dans le roman *Shaba deux* (désormais *Sh II*), sœur Marie-Gertrude, qui deviendra mère supérieure, affirme fermement, dès le début de son journal, qu'elle se reconnaît moins dans «l'aridité et l'ascèse» (*Sh II*, p. 37) de Marie que dans la «vive présence de Marthe» (*ibid*.) [26]. Mais c'est précisément dans cette foi vivante et incarnée que pourra prendre corps l'expérience mystique de Marie-Gertrude, qu'elle mettra du temps à reconnaître et accepter elle-même, tant elle sait cet abandon répréhensible aux yeux de l'institution. En effet, à deux reprises, une scène la montrant dans la dénégation d'une image d'elle-même comme étant sensible à la mystique se trouve contredite dans les scènes suivantes. Par exemple, la première fois qu'elle nie être sensible à la mystique de la prière du père Marc à laquelle elle assiste, elle se trouve prise de désespoir devant l'autel, avec le sentiment d'être

coupable d'un péché d'«inauthenticité» (*Sh II*, p. 42), confirmant combien elle se sent coupée du sens de la foi. Mais dans la scène suivante, ayant quitté la chapelle et rejoint sa chambre, elle connaît une expérience intime que nous pouvons qualifier de mystique. Les sens y sont dûment convoqués mais d'une manière indirecte, quasi transverse. À la vue qui se dérobe, quelque chose d'intangible se substitue:

> À la tombée du jour en effet, dans le vague de la nuit montante, Ses traits se sont évanouis et j'ai cru reconnaître, dans l'ombre entourée de cierges, l'objet de mon amour. Il n'était d'aucune race. Le regard sec, la pensée claire et le cœur grésillant, j'ai pensé rencontrer mon propre amour pour Lui. Il était ma signification et mon corps a vibré. Ce soir, je m'interroge sur cette émotion. Elle a tout l'air d'un péché monstrueux. J'en ai honte, comme femme et comme religieuse (Mudimbe, 1989, p. 42).

Quelque chose se produit qui n'est pas décrit comme une apparition (d'un être divin) mais comme une reconnaissance, par le sujet qui éprouve, de ce qui est là. Plus encore que la reconnaissance d'un autre, fût-il de nature divine, c'est la reconnaissance de son «propre amour pour Lui» qui se fait jour en elle, et soudain lui donne accès à «[sa propre] signification», c'est-à-dire au sens de ce qu'est et doit être sa vie.

La scène de révélation mystique semble être une tendance assez nettement féminine, comme le montre l'étude de Michel de Certeau [27] qui consacre une large part à Sainte Thérèse d'Avila, une des saintes à laquelle Marie-Gertrude s'identifie, avec Jeanne d'Arc ainsi que sœur Annuarite, sainte congolaise largement vénérée à travers le pays, béatifiée en 1985, vingt ans après son assassinat par les rebelles simba à Kisangani [28].

Relatant son abandon mystique, elle s'inscrit explicitement dans la lignée des grandes mystiques telle Sainte Thérèse d'Avila et, tandis que se fait la révélation mystique dans cette scène d'épiphanie, il lui semble que sa vocation était en réalité davantage contemplative que caritative:

> Mon esprit reprenait son propre rythme. Brusquement, deux images s'imposèrent à mon imagination. D'une part, saint François, en public se défaisait de ses riches habits et remettait tous ses biens à son père. Humble, reconnaissant, il acceptait le manteau que lui tendait l'évêque pour couvrir sa nudité. D'autre part, sainte Thérèse, seule, à genoux, ravagée, criant dans l'église déserte: «Il n'y a que Vous et moi». J'allais en un vertige, d'un tableau à l'autre. Tout est maintenant clair. J'aurais dû être Clarisse ou Carmélite (Mudimbe, 1989, p. 132).

Cette scène fondatrice de son mysticisme ne peut advenir que parce qu'elle est dans la solitude de sa chambre et, hors de portée des regards de ses condisciples, abîmée dans une contemplation à laquelle elle peut s'abandonner et dans les pénitences qu'elle s'inflige.

De fait, c'est toujours et forcément loin des regards des ordres que peut advenir l'expérience mystique, dont la caractéristique est de s'affirmer par-delà les limites de ce qui est socialement acceptable, de ce qui est autorisé par la société, ainsi que nous le rappelle Michel de Certeau. Il ajoute qu'en dehors des récits des mystiques eux-mêmes, si l'Église a certes reconnu et même fini par canoniser certaines figures mystiques, un très grand nombre de pièces relatives à de telles expériences se trouvent plutôt dans les archives des procédures disciplinaires (procès notamment) [29].

Marie-Gertrude ne sera pas poursuivie pour mysticisme mais verra néanmoins ses consœurs lui faire le reproche de céder à des penchants mystiques. La mère supérieure, mère Laetitia, surprendra la scène de son abandon mystique et la condamnera du regard; c'est du moins ainsi

que Marie-Gertrude comprend le silence qu'elle lui oppose alors (*Sh II*, pp. 29-31). Puis, plus tard dans le récit, sœur Véronique exprimera sa réserve à l'endroit de la méditation de Marie-Gertrude qu'elle juge éthérée:

> Repensé à la méditation que j'ai donnée à haute voix ce matin. Sœur Véronique m'a dit, au sortir de la chapelle, que certains de mes termes et raisonnements avaient l'air peu usuels. […]
> Mes phrases du matin me remontaient à la mémoire. «Le Seigneur est Source et Centre… L'Alpha et l'Omega de nos livres le situent aux extrémités de notre expérience humaine: au commencement de la vie et dans l'achèvement de la création… Ces métaphores peuvent en faire un étranger à notre condition, à ses désordres et désespoirs… Il est, au contraire, l'architecture même de nos angoisses et de nos aspirations… Il est force vitale, esprit, fleuve d'énergie qui, de l'inanimé à l'animé, des choses de ce monde à l'éternité de son règne, transporte et anime vie et espérance… Dieu n'est pas une ombre sur le monde et nos existences, mais le cœur et le génie de sa propre création».
> – Je ne vous condamne pas, Sœur Marie-Gertrude, croyez-le bien. Vos méditations viennent du cœur. Elles sont prenantes et je les aime bien. Ce matin, j'ai juste été un peu effrayée, c'est tout (Mudimbe, 1989, pp. 129-130).

Enfin, vers la fin du roman, tandis que la guerre fait rage à Kolwezi et pénètre l'enceinte du couvent où elle se traduit par une forme de crispation généralisée chez les sœurs qui rejouent le conflit en se positionnant pour l'un ou l'autre camp, Marie-Gertrude, devenue mère supérieure du couvent, se verra vertement tancer par sœur Marie-Cécile qui lui reproche de s'abîmer dans l'extase au lieu de prendre position politiquement:

> Elle me coupa, d'une voix cassante:
> – N'invoquez donc pas Dieu à tout bout de champ comme s'Il vous parlait… [...] Il y a trop de morts à Kolwezi au nom d'une raison d'État qui, à mes yeux, relève de la déraison pure. Vous me parlez de Dieu, et pas assez de Satan comme si celui-ci n'existait pas [...] On m'a enseigné à moi, et beaucoup, la mission prophétique de l'Église. Il n'y a pas d'échappatoire au devoir de témoignage […] (*ibid.*, pp. 139-140).

Le fait que la pénitence, la punition, le rappel à l'ordre guettent toujours les mystiques est évident chez Hermann Hesse. Dans *Narcisse et Goldmund*, Narcisse, le séminariste, se verra, dès le début du récit, reprendre par l'abbé qui s'inquiète de sa ferveur exceptionnelle. Narcisse lui tient ce discours: «Je puis voir, Père, que vous avez des dispositions fort bienveillantes. Voici ce que vous vous dites: "Ce jeune homme court quelque danger. Il a des visions; peut-être a-t-il trop médité. Peut-être pourrais-je lui imposer une pénitence, elle ne lui fera pas de mal"» [30].

Quant à Goldmund, le séminariste contrarié qui quitte le séminaire pour s'en aller mener une vie errante, libre de toutes contraintes, il a tout loisir de laisser se déployer ses penchants mystiques, qui s'expriment chez lui en priorité par le contact avec la nature.

La communion avec la nature

La communion avec la nature est une des situations favorisant le plus l'extase mystique; c'est le cas lorsqu'une rencontre prend la forme d'une osmose qui va favoriser la création artistique. Dans la solitude et le silence, l'«individu-hors-du-monde» qui mène une vie monacale peut entrer en communion mystique avec la nature. Sans doute peut-on aussi voir s'expri-

mer ici la sensibilité franciscaine qui insiste nettement sur l'importance de la proximité, de la familiarité même, avec la nature, ainsi que l'exprime sœur Marie-Gertrude:

> Passé la matinée au potager à remuer les parterres. Ils sont encore tendres, malgré les rigueurs de la saison. La terre noire, enrichie d'engrais que j'y mêle, m'enveloppe de son odeur forte. Je me suis dit, malgré ma répulsion: c'est un reflet de mon intégration en la fécondité de notre sœur, la nature. Très franciscaine, cette indulgence à l'égard des choses et des êtres (Mudimbe, 1989, pp. 116-117).

Dans *Shaba deux* comme dans *Les corps glorieux des mots et des êtres*, c'est le contact avec la nature qui va calmer les personnages, les ramener à eux, à ce qui compte, à leurs affects. Dans les deux textes, la nature dont il est question est celle, domestiquée, de l'espace du jardin ou d'un bois artificiellement créé. Le jardin est l'espace refuge tant du narrateur dans *Les corps glorieux* que de mère Marie-Gertrude dans *Shaba deux*. Les personnages s'y réfugient régulièrement pour y réfléchir et méditer en marchant. Le jardin est l'espace par excellence de domestication de la nature par l'homme. La création d'un jardin qui consiste à sculpter la nature en y inscrivant son tracé est par ailleurs un acte éminemment colonial, ainsi que le rappelle Pierre Halen:

> […] le fait même du jardin, importé dans un milieu africain qui ne le connaissait pas sous cette forme, paraissait témoigner de la supériorité d'un Occident […]. Ensuite la dimension somptuaire manifestait la réussite matérielle du dominant, et sans doute plus encore le résultat ordonné de la «pacification» [31].

Le jardin, incarnant une mise en ordre de la nature pour une production rationnelle (qui obéit à des contraintes et besoins d'aménagement urbain), offre un cadre de choix à Mudimbe pour sa réflexion en marche; il y reconnaît la discipline qu'il impose à son esprit:

> J'ai couru à la poste chercher un colis de livres. Tu me suivais, Quinque, mon chien, mon frère. Et je suis rentré, ensuite, par le bois, tout artificiel, mais d'une telle beauté […] Je pensais à une amie d'Afrique. C'était le moment idéal pour une conversation. J'avais les mots qu'il fallait. Ils s'imposaient à moi. Je pense, elle les aurait aimés. Ils prenaient, littéralement, forme dans mon esprit. Les arbres alentour marquaient une permanence des choses. La force de la nature, la rationalité d'une continuité de la vie naturelle. En œuvre depuis quand? Je sais bien: ce bois est un arrangement du siècle dernier. C'est ce qu'il signifie comme raison naturelle qui m'importait (Mudimbe, 1994, p. 137).

Cet extrait des *Corps glorieux* montre bien comment la marche dans la nature et la contemplation des arbres provoquent comme un éclaircissement de l'esprit, une ouverture du cœur qui le rend disposé à parler à une amie, à lui adresser les mots qui conviennent pour accompagner une situation difficile. Dans l'extrait suivant, la contemplation de l'éclosion d'une petite fleur le conduit à une considération métaphysique:

> Ce printemps, comme les autres, me surprend. Comme contraste, par rapport à l'hiver, il est plus fort que notre passage africain de la saison sèche à celle de la pluie, sous les tropiques. Plus que de coutume, ce qu'il dévoile m'a étonné: une naissance qui est une renaissance. Comment j'aurais aimé croire à la réincarnation! Tout a eu lieu, rapidement, ce matin. En quittant ma maison pour le bureau, j'ai remarqué à l'entrée, la présence d'une petite fleur sauvage à l'ombre d'un sapin. Elle n'était pas là hier soir. Mais je me souviens d'elle. Enfin, je veux dire, l'année dernière, une fleur similaire se trouvait là, tôt dans la saison. Et puis, elle a vite disparu. L'ombre d'une autre essence n'est pas le meilleur espace pour croître. Vais-je sauver cette petite

> beauté en la déplaçant? Le problème est devenu insistant: je ne parvenais pas à dissocier le symbole de la mort de la vitalité et du courage dont semblait témoigner cette petite plante. La mort, comme défaite provisoire, est-ce le prix à payer pour refleurir? (Mudimbe, 1994, p. 68).

Dans un autre passage des *Corps glorieux*, on trouve en outre l'usage figuré du jardin dans le sens de «jardin secret», dans le sens de l'espace intime du quant à soi, au moment où l'auteur raconte son entrée en psychanalyse: «Depuis lors, deux ou trois fois par semaine, je vis en un décor où aimablement, elle me force à nommer les fleurs et les ronces de mon jardin, aussi bien qu'un désir manqué» (*ibid.*, p. 27).

C'est que, comme le souligne Pierre Lepape (1976): «l'art des jardins est nominaliste», et son rapport premier à la nature, sa première prise de possession, le premier acte de l'initiation passe invariablement par le vocabulaire. Cet espace enclos et organisé qu'est le jardin sert le désir de beauté des hommes — il y a lieu d'y voir une «artialisation» de la nature [32] —, tout autant qu'il répond au besoin humain de sécurité. Il est significatif à cet égard que Mudimbe ait recours au motif du jardin pour métaphoriser ce qui émerge de l'enfance: «Mon enfance remonte, un art, une vocation. J'en ai émergé et depuis tourne en un jardin, surpris» (*ibid.*, p. 158).

Chez Hermann Hesse, les personnages nouent eux aussi un rapport singulier avec la nature qui est toujours le support d'une contemplation porteuse d'une réflexion métaphysique [33]. Le personnage de Peter Camenzind est emblématique de ce point de vue, qui fait de la contemplation extatique de la nature — et plus encore, de la recherche d'une synesthésie — la voie de l'amour des hommes:

> Quand je me mis à aimer la nature comme une personne, à l'écouter comme une camarade et une compagne de voyage, qui parle une langue étrangère, ma mélancolie ne s'en trouva pas guérie, certes, mais elle fut ennoblie, purifiée. Mon oreille et mon œil s'affinèrent. J'appris à percevoir ses nuances et sa diversité, j'aspirai à entendre de plus en plus près, de plus en plus clairement, les pulsations de tous les êtres vivants pour, peut-être, les comprendre un jour et même, peut-être, recevoir un jour le don de les exprimer dans la langue de la poésie [34] (Hesse, 1999 [1904], pp. 98-99).

La contemplation de la nature, en inspirant de nobles sentiments moraux (l'amour des êtres vivants), favorise la création artistique («recevoir le don de les exprimer dans la langue de la poésie»). Cette dernière est rendue possible par une relation ontologique non dualiste entre le poète et la nature, ainsi que l'extrait suivant le laisse entendre:

> La nuit, au moment de me mettre au lit, je songeais soudain par exemple, à une colline, à l'orée d'un bois, à un arbre solitaire que je chérissais entre tous et que je n'avais pas vu depuis longtemps. Et maintenant dans la nuit, il se dressait dans le vent, rêvait, sommeillait peut-être, soupirait et agitait ses branches. Quel aspect pouvait-il bien avoir? Et je quittais la maison, j'allais le trouver, je regardais sa silhouette imprécise se dresser dans les ténèbres, le contemplais avec une tendre surprise et j'emportais en moi sa vague image. […] Mais comment trouver, de là, la voie qui menait à l'amour des hommes? […] Et si cette tendresse pour les choses m'amenait un jour à parler en poète la langue des forêts et des fleuves, qui donc en jouirait alors? Pas seulement le monde inanimé qui m'était cher, mais avant tout les hommes, pour lesquels je voulais être un guide, un initiateur dans l'amour (Hesse, 1999 [1904], p. 100)

La contemplation d'une œuvre d'art

Quand ce n'est pas la contemplation de la nature ou, plus largement, l'expérience sensorielle éprouvée à son contact qui provoque l'expérience mystique, c'est parfois une œuvre d'art religieuse dont la contemplation plonge les personnages dans ce qui semble bien relever de l'extase.

Il s'agit là aussi d'une scène typique de la mystique, qu'on retrouve abondamment chez Hesse. C'est en contemplant les tableaux du Titien que le personnage de Peter Camenzind comprend le sens du divin; c'est significativement en évoquant François d'Assise qu'il retrace le cheminement intérieur qui l'a conduit du tableau à l'amour de Dieu et des humains:

> Pourquoi Titien, cet ami des réalités tangibles et corporelles, a-t-il donné parfois à des tableaux où sa vision du monde se présente sans mystère ces arrière-plans et ces lointains doucement azurés? […] Ainsi, me semblait-il, l'art s'était efforcé de tout temps de donner un moyen d'expression à ce besoin inexprimé de divin qui est en nous. Saint François l'a dit de façon plus mûre, plus belle et pourtant plus enfantine. C'est seulement alors que je l'ai compris tout à fait, englobant dans son amour de Dieu toute la terre, les plantes, les astres, les animaux, les vents et l'eau, il a pris les devants sur le Moyen-Âge et sur Dante lui-même et trouvé la langue de ce qui est éternellement humain. Il appelle de toutes les forces et tous les phénomènes de la nature «ses chers frères, ses chères sœurs» (Hesse, 1999 [1904], pp. 98-99).

Par ailleurs, l'ensemble du roman *Narcisse et Goldmund* peut se lire comme une quête de la révélation divine du sens de la vie qui doit passer par l'étape de création artistique. À un moment de son vagabondage, Goldmund tombe en pâmoison devant une statue de la Vierge, œuvre du sculpteur Niklaus. Quittant l'église «tout transformé» (Hesse, 1999 [1930], p. 1255), Goldmund se mettra alors immédiatement en route pour la ville épiscopale où vit ledit sculpteur afin de le supplier de le laisser devenir son apprenti. L'expérience de la contemplation a profondément modifié sa perception du monde et l'a fait passer à une autre étape de sa vie: «ses pas le portaient à travers un monde transfiguré» (*ibid*.).

Chez Mudimbe, dans *Les corps glorieux*, cette réflexion sur ce que la peinture engage chez lui de mystique est amenée au moment où il évoque le tableau de Rouault intitulé «La Sainte Face», dont il décrit l'effet qu'il eut sur lui alors. Cette évocation se situe dans le passage qui relate le moment où ses maîtres tentent de le sensibiliser à différentes œuvres de l'esprit et elle suit immédiatement la deuxième mention du récit inspiré par Saint François d'Assise déjà cité: *François* d'Auguste Valensin. Décrivant le tableau, il écrit:

> *La Sainte Face*, comme le mysticisme, relevait de la saine terreur. Je préférais l'oublier. Elle signifiait, comme disait Dom Maur, une raison mystique. Ce que couvrait cette expression, parce que mystérieux, m'agaçait mais, aussi, m'attirait irrésistiblement. En jouer donc! J'aura[i] mis du temps à m'en rendre compte. Mes exercices de peinture et de poésie, engagés à partir d'une attente mystique, n'auront été qu'une fureur d'adolescence: vertiges, cris, ou jeux de couleurs réduisant le sacré à l'ordinaire, et, souvent, à la boue de mes fantasmes les plus quotidiens: en somme, en opposition à la beauté de la peinture que je me sentais incapable de créer (Mudimbe, 1994, p. 159).

La peinture religieuse comme support de méditation va ainsi provoquer, par la contemplation, la réflexion qu'elle engage ou l'inspiration qu'elle déclenche, un transport de l'âme, une réflexion qui va illuminer le personnage et agir sur lui comme une déflagration, ainsi que l'illustre cet extrait de *Shaba deux* qui dépeint le trouble de Marie-Gertrude:

> J'avais le verre à la bouche lorsque, comme saisie et guidée par une main invisible, ma tête a fait le tour du mur et mes yeux se sont fixés sur la grande reproduction de la Cène d'Andrea del Castagno […] Je ne sais combien de temps j'étais là à le contempler lorsque j'ai senti une présence. J'ai sursauté. C'était Mère Laetitia […] Mes mains tremblaient légèrement. Une catastrophe? Non, c'était plutôt le sentiment de libération au sortir d'une surprise. Mais laquelle? (Mudimbe, 1989, pp. 29-31).

Qu'il s'agisse de peinture religieuse ou profane, le transport de l'âme, l'illumination intérieure ou carrément l'effroi provoqués par la contemplation d'un tableau constituent un topos assez connu du roman d'initiation comme du roman de formation et d'apprentissage; que l'on pense au classique *Chef-d'œuvre inconnu* de Balzac [35].

Fables mystiques chez Mudimbe et Hermann Hesse

À l'aune des romans de Hermann Hesse, si les récits et romans de Mudimbe peuvent sans peine être considérés comme des récits mystiques, sont-ils pour autant des fables mystiques, au sens où l'entend de Certeau? Autrement dit, présentent-ils des traits narratifs susceptibles de faire d'eux des fables mystiques? Se réalisent-ils, par exemple, dans certains genres littéraires plus que dans d'autres?

Les genres littéraires les plus adaptés à relater cette expérience singulière, éminemment intime, sont incontestablement les écrits de soi, soit l'autobiographie et le récit diariste, ainsi qu'en témoigne l'ensemble des textes étudiés par de Certeau. Cela se vérifie aussi dans le corpus mudimbéen puisque *Les corps glorieux* est une autobiographie et *Shaba deux* un roman bâti sur la structure du journal intime.

Dans le domaine de la fiction, le roman, et singulièrement le roman d'initiation, est un genre qui permet de bâtir, à l'intérieur des conventions romanesques, une fable mystique. Dans son article «Littérature mystique et micropolitique de la démocratie», Xavier Garnier (2007) démontre en effet comment tant *L'aventure ambiguë* de Cheikh Hamidou Kane — un classique du roman d'initiation en littérature africaine — que les romans de Sony Labou Tansi peuvent être considérés comme de la littérature mystique répondant à une «éthique de l'irresponsabilité» [36], à rebours de la vocation sociale — citoyenne du moins — de la littérature africaine telle qu'elle s'est construite dès les prémices de son expression écrite dans les langues européennes. Ce qui, d'après Garnier, réunit les œuvres de ces écrivains dans cette catégorie, c'est qu'elles sont, comme tout récit mystique, une littérature sans énonciation:

> Michel de Certeau montre que l'énonciation mystique est indissociable de ce qu'il appelle «la figure du sauvage», caractérisée par le retrait hors de toute place énonciative programmée. Il ne s'agit plus de savoir si l'énonciation est collective ou personnelle, mais de s'interroger sur la possibilité d'une littérature sans énonciation [37].

Néanmoins, cette analyse ne se vérifie pas dans les textes de mon corpus. Par exemple, dans *Shaba deux*, il y a bien une énonciation située — en la personne de Marie-Gertrude — même s'il est vrai qu'elle est peu à peu comme éclatée par l'irruption d'une voix qui lui parle depuis d'insondables profondeurs. Dans la solitude du recueillement dans la chapelle, cette voix en elle se fait entendre par la transformation intérieure résultant d'une mutation du discours, d'une énonciation incarnée à une énonciation privée d'agent: «[…] ma prière de grâce se transforma

d'elle-même en don. Les mots, en la docilité de leurs significations, ponctuèrent mon oblation» (*Sh II*, p. 98).

Or l'écho d'une voix *de profundis* est la condition du discours mystique, ainsi que l'affirme de Certeau:

> Apprendre à écouter: autre thème des mystiques. *Audi filia*, le titre du célèbre traité de Juan de Avila (Madrid 1588) résume une tradition. «Écoute, ma fille», est-il dit à «l'âme». L'injonction porte d'abord sur l'attention à la parole. Mais pour Juan de Avila comme pour cent autres, elle vise aussi toutes les formes du «colloque» ou du converser: la relation du prédicateur à son public, du «maître spirituel» à ses «dirigé(e)s», de chacun aux autres ou à soi-même. Comment l'homme (qui a presque toujours la figure féminine de «l'âme») peut-il reconnaître la langue qui s'éveille chez les autres ou qu'il parle à son insu? (de Certeau, 2013, p. 218).

Entendre la voix profonde de Dieu en lui, c'est l'expérience du jeune Narcisse qui s'en ouvre à l'abbé, lequel le sermonne et le rappelle à l'ordre [38]. C'est aussi celle de sœur Marie-Gertrude, qui aborde régulièrement dans son journal la manière de gérer au mieux ses accès mystiques: de l'autocensure, elle évoluera peu à peu vers un déploiement assumé de son mysticisme (comme on l'a vu dans la section «la figure de l'ascète»).

Aussi, mon hypothèse est que ce qui fonde le genre de la fable mystique a à voir avec l'énonciation. Quand les thématiques abordées dans les textes constituent de simples *topoï*, comme autant de balises pouvant indiquer, par une orientation thématique particulière, une sensibilité à l'un ou l'autre genre, l'énonciation, elle, est ce qui situe proprement un texte dans un genre plutôt qu'un autre.

Ce qui caractérise l'énonciation singulière de la fable mystique telle que théorisée par de Certeau, c'est d'abord qu'elle est le fait d'une voix intime et personnelle; ensuite qu'elle a recours à un langage «de biais», quelque peu en décalage avec le langage ordinaire structuré par la logique et la rationalité; un langage qui parle depuis un autre endroit — plus profond, moins aisément accessible — que le langage ordinaire:

> Le récit mystique raconte l'expérience d'un sujet qui témoigne pour lui-même et qui, à ce titre, est le seul à pouvoir témoigner de ce qui lui est advenu. La nature même des phénomènes qu'il vit l'empêche de recourir aux énoncés intellectuels et aux catégories théologiques traditionnelles. Il parle de «quelque chose» qui ne peut plus vraiment se dire avec les mots. Il procède donc à une description qui parcourt des sensations, il met en scène toutes les atteintes que cette expérience peut avoir sur son corps. L'originalité de l'analyse certalienne vient du fait qu'il prend au sérieux l'ensemble de ces éléments et valorise ce langage du corps par lequel l'expérience mystique se raconte (Giard & Schlegel, 2013, p. 159)

Si l'on entre ensuite plus avant dans les détails de la construction du récit mystique suivant de Certeau, l'on retrouve chez Mudimbe (et Hesse) les éléments structurants de la scène de l'énonciation mystique:

> 1. la coupure qui sert de préalable au discours et qui instaure un contrat avec les destinataires (l'accord sur un *volo* – un «je veux» initial); 2. la place «vide», «site sans site», qui marque dans le discours son lieu de locution (le je); 3. la représentation de cette place par une figure narrative qui forme le cadre du récit (l'insularité de «l'âme»: un cercle, un château, une île, etc.) (de Certeau, 2013, p. 225)

Dans *Shaba deux*, on pourrait en effet considérer qu'il y a un *volo* initial qui fait suite à une «coupure», ce fracas de peur et de mort qu'est la guerre du Shaba. Il y a bien un «je veux» de Marie-Gertrude lorsqu'elle décide finalement — après une phase préliminaire de remords et de doute — de persévérer dans sa vocation, à savoir le soin de son prochain (la population civile exposée à la guerre) et la direction du couvent.

Ce *volo* trouve son origine dans ce que de Certeau nomme la «place vide». Le lieu de locution, dans *Shaba deux*, est profondément ancré en Marie-Gertrude: au fur et à mesure qu'elle prend ses responsabilités à la tête de la communauté, elle affirme de plus en plus fermement sa place en son sein et sa voix singulière qui s'assume dans son mysticisme.

Enfin, le déploiement de cette locution, cette voix qui s'affirme, se fait dans un décor qui répond tout à fait à l'insularité de l'âme dont parle de Certeau. Le couvent est bien cet îlot préservé des violences, grondant à ses murailles, de la guerre qui se livre en ville.

Dans *Narcisse et Goldmund*, lors de l'épisode de la peste, la forêt, qui devient le décor principal de l'intrigue, présente la même insularité, les ravages de la peste étant *a priori* circonscrits à l'enceinte des villes. La nuit où sa compagne Lene agonisera au cœur de la forêt, finalement atteinte par la peste, Goldmund aura une apparition d'Ève la Mère éternelle, cette figure divine qui jalonnera sa quête spirituelle.

Lorsque les personnages sont confrontés à l'effet de cette «coupure» sur autrui, c'est-à-dire quand ils sont les témoins — choqués, affectés — de la mort d'autrui, non seulement ils affirment leur voix/voie, mais en outre leur locution se trouve habitée par une voix autre, profondément spirituelle, qui les transforme. Confrontée à la guerre, Marie-Gertrude est traversée par un sentiment mélangé de culpabilité et d'impatience, inspiré par son désir d'être sur la ligne de front pour soigner les malades au lieu d'être cantonnée à la bibliothèque comme la mère supérieure le lui ordonnera dans un premier temps. Dans le passage suivant, elle fait part de son sentiment de culpabilité provoqué par le simple fait d'être katangaise comme les belligérants:

> Une conviction épouvantable s'était instaurée en moi. Je pouvais aussi la sentir dans l'air: j'avais, d'une manière ou d'une autre, mais très directement, pris part à ce péché de haine qui tourmentait ce pays et venait de détruire cette communauté. […] Pareil geste aurait suprêmement déplu à la Supérieure qui se méfie autant des flexions et tressaillements du cœur que des ardeurs mystiques. […] Je retins donc ma folie. Toutefois, ma prière de grâce se transforma d'elle-même en don. Les mots, en la docilité de leurs significations, ponctuèrent mon oblation (Mudimbe, 1989, pp. 97-98)

Quoiqu'elle se prévale de toute «folie» mystique, cette conscience aiguë de la responsabilité qu'elle porte, sinon en tant que katangaise, du moins en tant que religieuse (*a fortiori* en tant que mère supérieure d'un couvent dans une ville livrée à la violence de la guerre), la conduit, peu de temps après, à ce qu'elle nomme «abandon»: «Le miracle de ma Foi s'exprimait en cet abandon. Spontanément, je retrouvais la quiétude de l'esprit. Comment puis-je nommer cette grâce? […] Je le sais: cette haine qui rôde dans la nuit de cette ville me déchiquètera, mais je me sais aussi un oratoire de Sa présence» (*ibid.*, p. 142).

Cet abandon, condition de l'amour de Dieu, qui survient lorsque le personnage entend monter en soi une voix *de profundis*, le transforme en lui donnant accès à un autre niveau de conscience. S'agissant de l'amour d'Ulrich et d'Agathe dans *L'homme sans qualités* de Musil,

Pierre Fasula apporte cette nuance qui s'applique parfaitement à *Shaba deux*: «Il y a un type d'amour dont l'effet n'est pas seulement de modifier l'image du monde, de montrer le monde d'une autre manière. L'amour mystique donne accès à un autre monde» [39]. L'amour mystique de Marie-Gertrude — ici dirigé vers Dieu — lui donne accès à un autre monde, en transformant son rapport à la vie, à sa présence au monde, en en révélant le sens.

Chez Hesse comme chez Mudimbe, cet autre monde, auquel les protagonistes ont finalement accès lorsqu'ils s'abandonnent à cet amour, les conduit *in fine* à la mort. Il semble en effet y avoir une corrélation entre le fait d'entendre cette voix divine, puis de lui donner corps, de s'y dévouer comme à un absolu, et d'en mourir. De fait, toute l'œuvre romanesque de Hesse est habitée par cet apparent paradoxe d'une proximité irréductible entre l'extase et la mort: un nombre important de ses protagonistes présentent une forme de morbidité. Il suffit de penser aux penchants suicidaires du narrateur de *Gertrude*, à ceux d'Henry Haller dans *Le loup des steppes*, ou encore à ceux de *Peter Camenzind* [40]. Mudimbe lui-même, sans se dire suicidaire à proprement parler, exprime néanmoins, à la fin des *Corps glorieux*, un regret de se savoir sain et sauf quand il s'imaginait être sur le point de mourir [41], et c'est ce passage qui clôture l'autobiographie.

Dans *Shaba deux*, il ne s'agit pas tant d'un penchant morbide que d'un cheminement progressif de Marie-Gertrude vers la mort. En effet, son élan mystique, qui s'affirme de plus en plus nettement à mesure que progresse l'intrigue, se confond avec son désir de s'impliquer dans la communauté; et la confiance qu'elle met en son prochain — même en temps de guerre — la conduira *in fine* à la mort. De fait, c'est parce qu'elle sort du couvent pour aller faire son apostolat au milieu des combats — aller enseigner le catéchisme à la Cité (c'est-à-dire dans les quartiers populaires) — qu'elle éveille l'attention des militaires qui viennent ensuite au couvent la soumettre à un interrogatoire soupçonneux et musclé.

Deux jours plus tard, le 30 juin, jour anniversaire de l'indépendance du Congo, un nouveau narrateur (omniscient) relate dans l'épilogue la disparition de mère Marie-Gertrude tandis qu'elle se rendait au commandement militaire où elle avait été convoquée, et conclut en mentionnant qu'un corps de femme, affublé des stigmates de la torture, avait été repêché dans le Lualaba.

La fable mystique, une littérature apolitique?

Selon Michel de Certeau, si le spectacle de personnes blessées et souffrantes est le levier d'une énonciation mystique, c'est parce que le registre mystique fait saillie quand il y a politisation outrancière du monde, avec son lot de violence.

Il parle en effet d'une poussée du discours mystique, d'un «spiritualisme», sous l'effet d'une évolution sociale allant dans le sens d'une «politisation» générale de la société, d'un engagement partisan, clivant et générateur de tensions sociales faisant elles-mêmes le lit de conflits:

> Ainsi René d'Argenson distingue des institutions politiques un «État mystique», silencieux et vivant royaume «intérieur» dont la réalité échappe à l'intelligence comme à la vue. Cette opposition traverse les milieux catholiques eux-mêmes, qui tantôt passés par l'apologétique antiprotestante, soulignent le caractère extérieur et visible de l'Église, tantôt cherchent dans le «spiritualisme» un contrepoint à la politisation de l'État ou du «monde». Le développement de l'adjectif «mystique» marque cette frontière et ses effets sur le champ qu'elle réorganise (de Certeau, 2002 [1982], p. 127)

Ce phénomène se vérifie chez Hesse, dans sa vie comme dans *Narcisse et Goldmund*: au début de la Première Guerre mondiale, Hesse fait en effet partie des rares intellectuels appelant à la paix et à l'union de part et d'autre du Rhin. Il se positionne explicitement contre le nationalisme et signe un texte intitulé «Amis, ne tenez pas ce discours» (publié dans la *Neue Zürcher Zeitung* le 3 novembre 1914), qui l'isole sur la scène intellectuelle entièrement partisane. Il se rapproche alors d'un écrivain outre-Rhin avec lequel il partage cet appel à l'unité au nom de l'art et de la culture. Il s'agit de Romain Rolland, qui avait fait paraître deux mois auparavant, en septembre 1914, dans le *Journal de Genève*, son célèbre manifeste pacifique, *Au-dessus de la mêlée*. Dans sa correspondance, Hesse explicite clairement les ressorts de sa propre résistance à la situation politique, ce qu'il nomme son «sabotage» de la politique mortifère en cours:

> À quoi bon les protestations? À quoi bon les satires sur Hitler ou les traits d'esprit sur les attitudes des Allemands pour l'état de sous-officier? En quoi ce talent me concerne-t-il? Je n'y peux rien changer. En revanche, je peux apporter quelque secours à tous ceux qui, comme moi, s'emploient à saboter par leurs actes et leur pensée toute cette politique répugnante et cette immonde aspiration au pouvoir, à tous ceux qui aménagent des îlots d'humanité et d'amour au milieu d'un océan de satanisme et de massacres (Lettre à Joseph Englert, in Hesse, 1994) [42].

Dans *Narcisse et Goldmund*, face à la stigmatisation des Juifs durant l'épisode fatal de l'épidémie de peste, Goldmund choisit une nouvelle fois la fuite et le vagabondage, se refusant à participer aux opérations de traque des Juifs, tandis que Narcisse, cloîtré dans son couvent, reste également en dehors de ce fracas [43]. Les deux protagonistes se singularisent de leurs concitoyens en se tenant littéralement, et chacun à sa façon, au-dessus de la mêlée. Quoique le pays où se déroule l'intrigue du roman soit imaginaire, le fait que le groupe stigmatisé soit juif et que cette traque survienne suite à une crise sociale de grande ampleur (ici un épisode de peste) est évidemment tout à fait référentiel, le roman paraissant en 1930.

Chez Mudimbe également, la mobilisation du registre mystique peut s'expliquer par la recherche d'un «contrepoint à la politisation de l'État ou du monde», pour reprendre les termes de Michel de Certeau. Dans *Shaba deux*, c'est sous la poussée des événements politiques traumatiques que s'épanouit le discours mystique. Il survient lorsque Marie-Gertrude perçoit avec plus d'acuité la guerre qui se trame hors des murs du couvent, au moment où elle devient mère supérieure. Refusant de prendre parti pour l'un ou l'autre camp des belligérants, elle doit néanmoins gérer les tensions raciales suscitées par la situation — un couvent de sœurs majoritairement blanches dans un pays africain en proie à un conflit présenté comme «ethnique». Elle voit en effet sa légitimité remise en question du fait de sa couleur de peau.

Toujours chez Mudimbe, un épisode relaté très brièvement dans *Les corps glorieux* témoigne du retrait qu'il opère en réaction à la violence du monde. En effet, alors qu'il est encore novice au monastère de Gihindimuyaga au Rwanda, il quitte les ordres après avoir été témoin des premiers massacres de 1959 [44].

Les situations vécues par les protagonistes apparaissent donc en miroir, et ce également d'un point de vue historique. En effet, les historiens de l'Afrique des Grands Lacs, comme Jean-Pierre Chrétien et Marcel Kabanda qui ont patiemment établi la généalogie du racisme anti-tutsi ayant conduit au génocide, ont montré que la discrimination envers les Tutsi est liée à la discrimination envers les Juifs:

> De fait, tout se passe comme si les ressorts de la haine du Juif dans l'histoire européenne s'étaient trouvé un écho dans la haine du Tutsi en Afrique. Le rôle de bouc émissaire imparti aux Juifs d'Europe est connu, depuis la Grande Peste du XIV^e^ siècle et les pogromes qui l'avaient accompagnée jusqu'à la crise sociale des années 1930 dans laquelle s'est inscrite la montée du nazisme en Allemagne. On a vu que les Tutsi du Rwanda ont joué bon gré mal gré le même rôle à chaque crise politique, en 1963, 1973, dans les années 1990 [45].

De fait, Nadia Yala Kisukidi met en lumière la façon dont Mudimbe présente le christianisme comme lieu inaugural de l'expérience du conflit et souligne que, à l'instar d'un autre de ses romans, *Entre les eaux*, *Shaba deux* est traversé par une tension, entre le corps institutionnel de l'Église et l'expérience chrétienne: «l'Église apparaît non seulement comme corps mystique du Christ, mais aussi comme corps social qui ne résiste pas aux lignes de partage politiques et raciales» [46]. Ce désengagement religieux est évidemment un tournant important dans sa vie et marque une sorte de mise en retrait, y compris vis-à-vis du Congo. Depuis le début des guerres qui déchirent le Congo à partir de 1996, il ne s'habillera plus qu'en noir, en signe de deuil, tout en demeurant dans une réserve certaine vis-à-vis du pays et de ses remous [47].

Ces personnages enclins au mysticisme se situent en retrait des querelles idéologiques, voire des situations politiques réelles. Dans le cas de Hesse, ce retrait découle directement de son imprégnation des vedas et de la tradition philosophique indienne, ainsi que l'analyse Aurélie Choné:

> […] cherchant refuge dans la vision de l'éternel retour des anciens peuples indiens, […] la pensée [chez Hesse] du cercle infini des choses semble refléter la déception éprouvée face à la situation politique en Allemagne et son scepticisme par rapport à tout réel changement. Contre le «progrès» et ses conséquences problématiques, contre «l'action» ratée, Hesse prône une philosophie de l'intériorité et de la contemplation [48].

Quoi qu'il en soit, il s'agit là d'un positionnement intenable dans certaines situations (au risque d'une mise au ban), qui peut faire d'eux des traîtres, voire des parjures. Bertrand Lévy rappelle que le choix du retrait chez Hermann Hesse ainsi que son manque d'intégrité morale lui ont été reprochés par ses pairs:

> Hermann Hesse, dans sa pratique des années de crise, ne s'est pas illustré autrement qu'en être soucieux de rester à l'écart de l'Histoire, pour ménager ses peines […] Ainsi Walter Widmer, dans la *National-Zeitung* de Bâle du 27 janvier 1962, dit sa déception vis-à-vis de celui qui n'a jamais pris la parole dans les journaux suisses pendant les mille ans que devait durer le Reich… Il n'aurait aidé que des personnes dont il attendait des avantages, comme son éditeur ou des confrères amis ou estimés. Widmer manifeste son scepticisme au regard d'un Hesse incarnant une idée supérieure de l'humanité et se taisant devant l'inhumanité. Dans le même registre mais de façon plus nuancée, Ralph Freedman, dans sa biographie, qualifie de défection ou de faute (*failure*) le refus de Hesse de suivre l'éditeur Bermann-Fischer ainsi que les auteurs de l'émigration chassés par le nazisme en 1936 (Lévy, 1992, *op. cit.*, p. 205)

Bien sûr, il convient de ne pas systématiquement voir une intentionnalité politique dans tout acte transgressif vis-à-vis de la morale, d'une idée de la justice. Néanmoins, qu'il s'agisse de *Narcisse et Goldmund* (et de chacun des deux protagonistes à sa façon), du provocateur et antimondain *Peter Camenzind* — semblable en cela au héros du *Loup des steppes*, Harry Haller —, ou bien encore de Marie-Gertrude et de l'inclassable Mudimbe, ne pourrait-on pas voir dans les comportements des personnages mystiques chez les deux auteurs et dans leur propre

positionnement face au monde, non un acte de protestation politique *stricto sensu*, mais un refus — certes silencieux — de l'ordre établi? Par ordre établi, j'entends ici ce qui apparaît dans le corpus comme une série d'attitudes idéologiques dominantes, assorties de leur traduction en actions politiques xénophobes et violentes (la stigmatisation d'un groupe de personnes sur base de critères raciaux, nationaux, ethniques et religieux, *a fortiori* la guerre).

À rebours d'une tendance dominante de la littérature africaine qui, historiquement, s'est plutôt caractérisée par sa vocation sociale, voire son ambition politique, la littérature mystique ne cherche pas à bâtir des mondes nouveaux ou à énoncer les formules pour des lendemains qui chantent. Au contraire, peut être n'a-t-elle pas d'autre vocation, comme le dit Xavier Garnier, que celle «d'inscrire des échos» [49].

Afin de mieux qualifier la seconde par rapport à la première, il ajoute: «Une littérature citoyenne parle depuis l'intérieur du monde, elle cherche à participer, alors qu'une littérature mystique parle du dehors, depuis des mondes brisés, c'est-à-dire des anti-mondes» [50]. Je dirais plutôt qu'une littérature mystique, en tout cas celle qui est étudiée ici, parle depuis le dedans, l'intérieur de soi, et non depuis le dehors, le monde extérieur. Elle ne cherche pas, en effet, à se jucher sur les barricades comme le ferait une littérature citoyenne, mais bien plutôt à dire l'écho d'une voix des profondeurs qui s'élève dans le for intérieur des protagonistes par-delà le chaos du monde.

Pour autant, le refus manifeste de positionnement politique vis-à-vis du fracas du monde ferait-il de la fable mystique une littérature apolitique? Si l'attitude mystique, par sa position de retrait et d'intériorité, n'implique pas un engagement manifeste en faveur d'une transformation vertueuse de la Cité comme le ferait une littérature citoyenne, les trajectoires des personnages de mystiques étudiés montrent qu'ils ne se situent pas en dehors du politique, à telle enseigne que sous la poussée des événements, ils peuvent même sortir de leur retraite. C'est le cas de Marie-Gertrude dont Pierre-Philippe Fraiture rappelle le dégoût que lui inspire son confinement dans la bibliothèque quand le conflit gronde à l'extérieur, et qui par la suite sortira du couvent, ce qui précipitera d'ailleurs sa fin [51].

Quoi qu'il en soit, les mystiques dérangent l'ordre établi par le seul fait de leur existence et parce qu'ils font entendre une voix singulière, oblique. Ils dérangent d'autant plus quand ils refusent la violence en ne souscrivant pas aux discours de haine et d'exclusion, et en tentant de se préserver — et les autres avec soi — du déferlement de cette violence. Mère Marie-Gertrude face aux gendarmes katangais pendant la guerre du Shaba et Goldmund face à l'échauffement xénophobe durant l'épidémie de peste, sont des personnages politiques.

Conclusion

La comparaison entre les deux auteurs s'est révélée féconde et leur proximité par-delà le temps et l'espace est intrigante. Le profil que Bertrand Lévy esquisse de Hermann Hesse dans l'essai qu'il lui consacre pourrait tout aussi bien s'appliquer à Mudimbe et à la dimension mystique de son œuvre, notamment dans les deux textes étudiés, *Shaba deux* et *Les corps glorieux*:

> Inclassable, n'appartenant à aucune école de pensée du siècle, farouchement individualiste, il s'adresse à la personne, à l'homme non-uniformisé, à la part irréductible de marginalité et

> d'indépendance qui subsiste au cœur des êtres. […] Un personnage hessien se laisse dévorer par le doute, brûler par la foi [52].

En outre, il y aurait bien d'autres éléments de convergence entre les deux œuvres, qui marquent le signe d'une pensée mystique imprégnant l'œuvre en profondeur. On en mentionnera trois à titre indicatif. Tout d'abord, quoique les personnages mystiques aient en partage le goût pour la solitude, on notera l'importance d'une amitié spirituelle (Floribert Songa-Songa, archevêque du Katanga, et Mudimbe, Narcisse et Goldmund, Peter Camenzind et Richard). Il y aurait aussi une certaine vocation sotériologique des personnages ainsi qu'une mystique de l'âme indissociable du corps et de la sexualité, que cette dernière soit assumée (à travers la sexualité libre de Goldmund) ou corsetée (mère Marie-Gertrude).

Au-delà des convergences insoupçonnées entre les deux auteurs que la dimension mystique rend visibles, le riche essai de Michel de Certeau sur la fable mystique offre des pistes très stimulantes pour penser à nouveaux frais une dimension à mes yeux sous-évaluée de l'œuvre de V.-Y. Mudimbe. Lire son œuvre sous l'angle de sa dimension mystique et en la comparant avec celle de Hermann Hesse, rédigée dans une autre langue et à une autre époque, apporte un éclairage singulier qui vient complexifier encore la pensée d'un auteur irréductible. Si ses essais les plus connus constituent une référence majeure des études postcoloniales en retraçant et en analysant la manière dont l'Afrique a été inventée par la constitution d'une «bibliothèque coloniale», concept désormais consacré, le concept de gnose, et surtout la manière dont il s'incarne dans sa vie et ses récits, sont moins connus.

En outre, étudier ce corpus dans une perspective comparatiste éclaire, nous semble-t-il d'un jour nouveau, la question difficile de l'engagement (ou du non-engagement) politique d'une famille particulière d'écrivains, caractérisée à la fois par le retrait par rapport au politique et par leur dimension religieuse. Or celle-ci se détermine avant tout par la volonté non d'échapper à la mêlée pour s'abriter dans une position de confort, mais de rejoindre une position qui soit «au-delà de la mêlée», inhérente aux violences sociales dans ce qu'elles ont d'absurde et d'insensé. En cela, dans ce potentiel de déploiement et d'affirmation d'une subjectivité, ces littératures mystiques seraient micropolitiques, au sens que lui donne X. Garnier qui rappelle que le politique «ne concerne pas simplement la façon dont les sujets vont s'organiser en société, mais commence en amont de la constitution du sujet» [53].

NOTES

[1] L'autre texte autobiographique de V.-Y. Mudimbe est *Cheminements: carnets de Berlin (avril-juin 1999)* (Montréal: Humanitas, 2006).

[2] «Tout en justifiant […] l'émergence de la gnose africaine comme une alternative à l'ordre colonial du discours, ou plus exactement comme une alternative à la bibliothèque coloniale, Mudimbe anticipe son possible échec puisqu'elle demeure elle-même, de son point de vue, dans un pur rapport d'extériorité, ou à tout le moins dans un rapport métaphorique, par ses jeux de langage, vis-à-vis d'une réalité qu'il resterait donc toujours à nommer»: A. Mangeon, «La "gnose africaine" de Valentin-Yves Mudimbe», in J. K. Bisanswa (dir.), *Entre inscriptions et prescriptions: V. Y. Mudimbe et l'engendrement de la parole* (Paris, Champion, 2013), p. 117.

[3] «Mudimbe, on le sait, n'a cessé d'invoquer "contre le structuralisme, les droits du sujet et le caractère toujours aussi impératif d'une philosophie de la subjectivité", ainsi qu'il le souligne dans sa préface à *Parables and Fables*», in A. Mangeon, *op. cit.* p. 114.

[4] Mudimbe prend soin de justifier le choix de ce terme dès les premières lignes de l'introduction de son ouvrage: «Etymologically, gnosis is related to *gnosko*, which, in the ancient Greek means "to know". Specifically, gnosis means seeking to know, inquiry, methods of knowing, investigation, and even acquaintance with someone. Often the word is used in a more specialized sense, that of higher and esoteric knowledge, but one strictly under the control of specific procedures for its use as well as transmission», in V. Y. Mudimbe, *The invention of Africa: Gnosis, philosophy, and the order of knowledge* (Bloomington and Indianapolis: Indiana University Press; London: James Currey, 1988), p. ix.

[5] Définition de la gnose par le Centre national de ressources textuelles et lexicales (CNRTL): «Connaissance se présentant non comme un savoir acquis, mais comme une intuition salvatrice, une révélation intérieure, reposant sur le dualisme de la connaissance et de l'ignorance, du bien et du mal, de l'esprit et du corps, et se fondant sur l'idée que le monde sensible est dominé par des puissances mauvaises, hostiles au Dieu transcendant, source du monde spirituel que le gnostique cherche à connaître».

[6] J. Fabian, *Jamaa: A charismatic movement in Katanga* (Evanston: Northwestern University Press, 1971); P. Tempels, *La philosophie bantoue*. Traduit du néerlandais par A. Rubbens. Avant-propos de J. Quels. Préface de E. Possoz (Élisabethville: Lovania, 1945; rééditions chez Présence africaine en 1949, 1965 et 2013). Cet ouvrage inspira par la suite celui, non moins célèbre, d'Alexis Kagame, *La philosophie bǎntu-rwandaise de l'Être* (Bruxelles: Académie royale des Sciences coloniales, Classe des Sciences morales et politiques, Mémoires, 12(1), 1956, 448 pp.).

[7] V. Y. Mudimbe, *Les corps glorieux des mots et des êtres: esquisse d'un jardin africain à la bénédictine* (Montréal: Humanitas; Paris: Présence africaine, 1994), pp. 175-176.

[8] P.-P. Fraiture, *V. Y. Mudimbe: Undisciplined africanism* (Liverpool: Liverpool University Press, coll. «Contemporary French and Francophone Cultures», 2013). Voir aussi: P.-P. Fraiture, «V. Y. Mudimbe's modernities: Towards a temporal and spatial excavation of (neo)colonialism», in S. Abdelmadjid, M.-A. Fouéré & M. Le Lay (dir.), *Thinking Africa with V. Y. Mudimbe* (Nairobi, Kenya: Twaweza Communications, 2025), pp. 77-102.

[9] Entretien avec Luce Giard par Jean-Louis Schlegel, «Michel de Certeau, la mystique et l'écriture. À propos de la parution du tome II de *la fable mystique*», in *Esprit* (août-septembre 2013), p. 156.

[10] *Id*., p. 160.

[11] «On appelle souvent mystique un ordre de pensées inaccessible à l'intelligence commune, un aperçu qui échappe à la raison claire, qui ne relève point des procédés discursifs de l'esprit, ni d'aucune démonstration, mais de la foi, de l'intuition, de l'instinct, d'une sorte de "divination" (Sophrone, *loc. cit.*, p. 555). Nombreux sont les procédés non rationnels qui permettraient de connaître Dieu: la foi, le sentiment, l'intuition, l'expérience; mais ils peuvent, semble t-il, se ranger en deux classes: ceux qui supposent et ceux qui ne supposent pas quelque "expérience" de Dieu. C'est au premier que nous réserverons le qualificatif de "mystiques"», in A. Vacant, E. Mangenot & Mgr E. Amann (dir.), *Dictionnaire de théologie catholique contenant l'exposé des doctrines de la théologie catholique, leurs preuves et leur histoire* (Paris: Librairie Letouzey et Ané, 1929, t. X-2 [Messe – Mystique]), p. 2600.

[12] M. de Certeau, *La fable mystique (XVI^{e}-XVII^{e} siècle)* (Paris, Gallimard, coll. «Tel», 2002 [1982]), pp. 105-106.

[13] Voir la thèse d'Aurélie Choné, *Rudolf Steiner, Carl Gustav Jung, Hermann Hesse, passeurs entre Orient et Occident. Intégration et transformation des savoirs sur l'Orient dans l'espace germanophone (1890-1940)*. Préface de F. Chenet (Strasbourg: Presses universitaires de Strasbourg, 2009), p. 139.

[14] V. Y. Mudimbe, *Shaba deux: les carnets de mère Marie-Gertrude* (Paris/Dakar: Présence africaine, 1989), p. 54.

[15] V. Y. Mudimbe, *Les corps glorieux des mots et des êtres: esquisse d'un jardin africain à la bénédictine, op. cit.*, p. 21; p. 158.

[16] H. Charasson, «Une grande figure: Auguste Valensin», in *La Revue des Deux Mondes*, 15 octobre 1962, pp. 580-592 (en ligne: https://www.revuedesdeuxmondes.fr/wp-content/uploads/2016/11/083cbde1a4cc18e8fbf52047c4818143.pdf).

[17] Mobutu procéda, dès le début de son règne, à une vaste entreprise de rebaptisation des toponymes du pays.

[18] B. Lévy, *Hermann Hesse: une géographie existentielle* (Paris: José Corti, 1992).

[19] «Quelques critiques ont vu dans *Entre les Eaux*, une manière de confession. Je ne suis pas prêtre et ne me souviens pas d'avoir vécu les tentations violentes du héros de mon livre. Je pense toutefois me retrouver un peu en cet être surgi de mes songes», in V. Y. Mudimbe, *Les corps glorieux des mots et des êtres*, *op. cit.*, p. 102.

[20] Justin Kalulu Bisanswa parle de «mythologies» et de «fables» auréolant la perception de l'auteur, mythologies auxquelles ce dernier participe: «Même le fait d'avoir enlevé l'habit de moine, tout en continuant à réagir, dans ses réflexes, jusque dans sa coiffure même, comme bénédictin — selon ce qu'il dit lui-même dans son autobiographie —, participe de cette fable, ressassée à l'envi par lui-même et par des analystes qui se limitent à constater son occidentalisation»: J. Kalulu Bisanswa, «V. Y. Mudimbe: réflexion sur les sciences humaines et sociales en Afrique», in *Cahiers d'Études Africaines*, 160(XL-4), 705-722 (2000). De son côté, Nadia Yala Kisukidi pointe un passage d'*Entre les eaux* dénonçant la tentative d'imposition d'un discours de mystification, celui où le personnage-narrateur, Landu, exprime sa conscience du rôle de porte-parole de la négritude qu'on veut lui faire jouer: «Non, il me faut à tout prix refuser une glorification de ma négativité, un narcissisme qui m'apaiserait en niant l'être de carence que je suis» (V. Y. Mudimbe. *Entre les eaux*. Paris: Présence africaine, 1973, p. 54): N. Y. Kisukidi, «Du christianisme comme "expérience de conflit": une lecture d'*Entre les eaux* de V. Y. Mudimbe», in *ThéoRèmes*, 4 – 2013 (en ligne: http://journals.openedition.org/theoremes/470; DOI: https://doi.org/10.4000/theoremes.470).

[21] «Le plus explicite [clin d'œil] se trouve sans doute dans l'avertissement de *L'Écart*, où Mudimbe feint de présenter les cahiers d'un étudiant en histoire, Ahmed Nara, à la façon de Sartre, auteur de *La Nausée*. […] Au-delà d'un procédé littéraire classique depuis *Les Lettres persanes*, les deux textes se ressemblent aussi dans leur obéissance aux règles du journal intime: chaque unité est en effet datée et cet "effet de réel" se retrouve également dans *Shaba deux*»: A. Mangeon, «V. Y. Mudimbe, ou l'art de vivre la contradiction», in D. Delas & P. Soubias (dir.), *Le sujet de l'écriture africaine*. Actes du colloque de l'APELA de septembre 1999 (Toulouse: APELA / Département de Lettres modernes de l'Université Toulouse – Le Mirail, 2001), pp. 63-73.

[22] «Je me pense plutôt en une transparence fragile. Lilyan Kesteloot, en savante classificatrice, souhaiterait, probablement, me trouver une niche: suis-je croyant ou athée, nomade ou sédentaire, d'Afrique ou d'ailleurs, bon ou mauvais? Ni meilleur ni pire, juste un homme, comme tous les autres. La fin de *Les Mots* de Jean-Paul Sartre me revient à l'esprit», in V. Y. Mudimbe, *Les corps glorieux des mots et des êtres*, *op. cit.*, p. 166.

[23] H. Hesse, *Gertrude.* Traduit de l'allemand par E. Friedlander (Paris: Le Livre de Poche, coll. «Biblio Romans», 1985 [1910]).

[24] J. Riesz, «L'intertexte des *Cahiers de Malte Laurids Brigge* de Rainer Maria Rilke dans *L'aventure ambiguë* de Cheikh H. Kane: pour une compréhension désenclavée du roman africain», in I. Diagne & H.-J. Lüsebrink (dir.), *L'intertextualité dans les littératures sénégalaises: réseaux, réécritures, palimpsestes* (Paris: L'Harmattan, 2019), pp. 33-55.

[25] P. Fasula, *L'homme du possible: Robert Musil et la question de la vie juste* (Paris: Vrin, coll. «Philosophie du Présent», 2021), pp. 121-122.

[26] Luc, 10: 38-42.

[27] Luce Giard raconte: «L'essor de la mystique est corrélé à la libéralisation de la parole féminine. En effet, dans la période qu'étudie de Certeau (XVI^{e}-XVII^{e} siècles), de nombreuses femmes — des religieuses, mais également des laïques — prennent la parole pour raconter leur expérience mystique», in L. Giard & J.-L. Schlegel, «Michel de Certeau, la mystique et l'écriture…», *op. cit.*, p. 160.

[28] «Mes héroïnes dans l'histoire? / La grande Thérèse d'Avila, Jeanne d'Arc, et Sœur Anwarite», in *Sh II*, p. 56.

[29] M. de Certeau, *La fable mystique (XVI^e^-XVII^e^ siècle)*. T. II (Paris: Gallimard, coll. «Bibliothèque des Histoires», 2013), pp. 24-25.

[30] H. Hesse, *Narcisse et Goldmund*, in H. Hesse, *Romans & nouvelles*. Traduit de l'allemand par F. Delmas (Paris: Le Livre de Poche, coll. «Pochothèque», 1999 [1930], pp. 1144-1367), p. 1159.

[31] P. Halen, «V. Y. Mudimbe, jardinier de l'histoire: les mémoires d'une modernité», in *Revue Canadienne des Études Africaines*, 30(2), 248-256 (1996), p. 248.

[32] A. Roger, *Court traité du paysage* (Paris: Gallimard, coll. «Bibliothèque des Sciences humaines», 1997). C'est en ces termes qu'Alain Roger parle de l'esthétique du jardin.

[33] Le jardin occupe également une place importante dans l'œuvre de Hesse, comme le montre Bertrand Lévy: «Hermann Hesse (1877-1962), Stunden im Garten: eine Idylle [Heures dans le jardin: une idylle]», in M. Jakob (dir.), *Des jardins & des livres* (Genève: MétisPresses, 2018), pp. 162-163.

[34] H. Hesse, *Peter Camenzind*, in H. Hesse, *Romans & nouvelles*. Traduit de l'allemand par F. Delmas (Paris: Le Livre de Poche, coll. «Pochothèque», 1999 [1904], pp. 23-142), p. 100.

[35] Dans la littérature française contemporaine, les romans de Yannick Haenel, quoique ne pouvant être considérés comme des romans de formation, regorgent de ces scènes d'épiphanie suscitées par la contemplation de tableaux: que l'on pense à *La solitude Caravage*, *Bleu Bacon*, *Le désir comme aventure* (méditation sur *La mort de Sardanapale* de Delacroix), *À mon seul désir* (méditation sur La Dame à la licorne). Plus largement, la collection «Ma Nuit au Musée» des éditions Stock cherche à provoquer des récits de rencontres inouïes entre un auteur et une œuvre d'art.

[36] X. Garnier, «Littérature mystique et micropolitique de la démocratie», in M.-B. Basto (dir.), *Enjeux littéraires et construction d'espaces démocratiques en Afrique subsaharienne* (Paris: Centre d'Études africaines/EHESS, coll. «Dossiers africains», 2007, pp. 77-85), p. 78.

[37] *Ibid.*, p. 79.

[38] «L'abbé se leva. Il fit signe en souriant au novice de se retirer. "C'est bon, dit-il. Ne prends pas tes visions trop au sérieux, jeune frère. Dieu exige de nous bien autre chose encore que d'avoir des visions"», in H. Hesse, *Narcisse et Goldmund*, *op. cit.*, p. 1159.

[39] Fasula, *op. cit*., p. 138.

[40] Il m'est impossible d'être exhaustive sur ce point, cette thématique étant récurrente dans l'œuvre de Hesse. Citons seulement, à titre d'exemple, dans *Narcisse et Goldmund*, cette expérience de fusion entre mort et vie, mort et amour, qui est à son paroxysme lors de l'épisode de la peste: «[…] la chanson sauvage du trépas avait, en lui, une autre résonance. Elle ne faisait point songer au bruit sec et dur des os qui se heurtent, elle était plus douce, séduisante; une mère qui vous rappelle en son sein. Là où la mort portait la main sur la vie, ce n'était pas seulement ces sons aigres et guerriers qu'on entendait, mais aussi une musique profonde, tendre, une musique d'automne et d'abondance; dans l'ombre de la mort, la petite lampe de la vie brûlait plus claire et plus intime», in Hesse, *op. cit.*, p. 1305. Citons encore cette parole de Goldmund, prononcée au moment de son agonie, et qui résume finalement son expérience: «J'espère que la mort sera une grande volupté, aussi grande que celle du premier acte d'amour» (p. 1365).

[41] Il se prépare à la mort après qu'on lui a diagnostiqué un cancer des os: «La mort s'imposait comme une nécessité. […] Je pouvais enfin accepter mon destin et assumer mon sort. J'avais autour de moi deux enfants, la joie de la liberté de demain; et le feu, comme mon désir de survivre, était là […] Mes ambitions s'annulaient, et le langage de la vie reprenait sens en l'existence de ces enfants» (Mudimbe, 1994, *op. cit.*, p. 213). Puis, lorsqu'on lui apprend l'erreur de diagnostic: «Le choc. J'aurais dû sourire ou éclater de joie. Je me retournai vers la fenêtre, comme un éclair. Aucune larme ne me vint aux yeux pour m'arrimer aux années qui m'étaient offertes. La fatigue, une fatigue immense s'instaura en cet échec d'une mort que j'avais finalement apprivoisée» (*ibid.*, pp. 213-214).

[42] Lévy, 1992, *op. cit.*, p. 187.

[43] «Dans une ville, Goldmund vit, le cœur soulevé de fureur, toute la rue des juifs en flammes, maison par maison, le peuple se tenait autour, hurlant sa liesse, et repoussant dans le brasier, par la force

des armes, les fugitifs qui hurlaient […] Furieux et écœuré, Goldmund regardait tout cela; le monde semblait ébranlé et empoisonné, in Hesse, 1999 [1930], *op. cit.*, p. 1304.

[44] Opérant un retour réflexif sur le pouvoir religieux et son implication dans la violence sociale dans la région, il remet ainsi en perspective son renoncement au noviciat: «La conversion à l'éthique chrétienne, au pouvoir de l'école, ou à une nouvelle hiérarchie sociale de langues appartient à ce détournement de la mémoire. Mes grands-parents se convertissent au christianisme. Mes parents naissent chrétiens. Et me voici moine au Rwanda. […] J'aimerais tout reprendre, non seulement pour redire cette violence, mais la penser», in Mudimbe, 1994, p. 54.

[45] J.-P. Chrétien & M. Kabanda, *Rwanda, racisme et génocide: l'idéologie hamitique* (Paris: Belin, coll. «Alpha», 2016 [2013]), p. 388.

[46] Kisukidi, *op. cit.*

[47] G. Farred, K. Kavwahirehi & L. Praeg (Eds.), *Violence in/and the Great Lakes: The thought of V-Y Mudimbe and beyond* (Scottsville, University of KwaZulu-Natal Press, «Thinking Africa Series», 2014).

[48] Choné, *op. cit.*, p. 139.

[49] Garnier, *op. cit.*, p. 82.

[50] *Ibid.*, p. 81.

[51] Fraiture, 2013, *op. cit.*, p. 29.

[52] Lévy, 1992, *op. cit.*, p. 3.

[53] Garnier, *op. cit.*, p. 78.

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Mosquito-borne Diseases in Belgium: A Real Threat or just a Hype?[1]

by

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Keywords. — Mosquito-borne Diseases; Belgium; *Aedes*-borne Diseases; Malaria; West-Nile Virus Infection.

Summary. — In Europe several local transmission events of mosquito-borne diseases were reported recently. Similarly, in Belgium mosquito-borne transmission events are likely to occur in the near future. Hence, this paper aims to assess the mosquito-borne disease threats in Belgium by focusing on three scenarios evaluating the risk of autochthonous transmission of (1) arboviruses by exotic *Aedes* mosquitoes, (2) malaria, and (3) West-Nile virus. Based on our assessment it is clear that the situation regarding mosquito-borne disease risk is changing in Belgium and that mosquito-borne diseases need to be considered as a public health threat.

Trefwoorden. — Door muggen overgedragen ziekten; België; Door *Aedes*-muggen overgedragen ziekten; Malaria; West-Nijlvirusinfectie.

Samenvatting. — *Door muggen overgedragen ziekten in België: een reële bedreiging of slechts een hype?* — In Europa werden recent verschillende lokale gevallen van door muggen overgebrachte ziekten gemeld. Ook in België is het waarschijnlijk dat er in de nabije toekomst door muggen overgedragen ziekten zullen voorkomen. Deze studie heeft dan ook tot doel de bedreigingen van door muggen overgedragen ziekten in België te evalueren, met de nadruk op drie scenario's die het risico van autochtone overdracht van (1) arbovirussen door exotische *Aedes* muggen, (2) malaria, en (3) West-Nijl virus evalueren. Op basis van onze evaluatie is het duidelijk dat de situatie met betrekking tot het risico op door muggen overgedragen ziekten aan het veranderen is in België en dat door muggen overgedragen ziekten als een volksgezondheidsprobleem beschouwd moet worden.

Mots-clés. — Maladies transmises par les moustiques; Belgique; Maladies transmises par le moustique *Aedes*; Malaria; Infection par le virus du Nil occidental.

Résumé. — *Maladies transmises par les moustiques en Belgique: menace réelle ou simple battage médiatique?* — En Europe, plusieurs cas de transmission locale de maladies causées par les moustiques ont été signalés récemment. De même, en Belgique, il est fort probable que des maladies transmises par les moustiques surviennent dans un avenir proche. Cet article vise donc à évaluer les menaces de transmission possible de maladies par les moustiques en Belgique par le biais de trois scénarios analysant le risque de transmission autochtone (1) d'arbovirus par des moustiques *Aedes* exotiques, (2) du paludisme,

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et (3) du virus du Nil occidental. Sur base de notre évaluation, il est clair que la situation concernant le risque de maladies causées par les moustiques évolue en Belgique et que ces maladies doivent être considérées comme un problème de santé publique.

Introduction

The year 2007 marked a turning point in Europe when the first local outbreak of chikungunya happened in Italy with more than two hundred confirmed autochthonous cases (Rezza *et al.*, 2007). This event made the EU realize that it was not immune to mosquito-borne disease transmission risk. In the 1970s Europe was freed from malaria and for a long period mosquito-borne diseases were not considered as a major public health concern (WHO Regional Office for Europe, 2016). Although West-Nile virus (WNV) circulated with a significant outbreak in Bucharest in 1996 (Zeller & Schuffenecker, 2004). However, from 2007 onwards several local dengue, chikungunya and Zika transmission events were reported from countries around the Mediterranean Sea (European Centre for Disease Prevention and Control, 2018b; Giron *et al.*, 2019; La Ruche *et al.*, 2010), malaria reappeared in Greece in 2009 (Danis *et al.*, 2011), and more recently sporadic cases of airport malaria were reported from several countries in Europe (European Centre for Disease Prevention and Control, 2017; Van Bortel *et al.*, 2022). Furthermore, in 2010 a major outbreak of WNV occurred in Greece, which marked the start of a systematic EU-wide follow-up of WNV infection by the ECDC during the transmission season (European Centre for Disease Prevention and Control, 2019; Papa, Xanthopoulou, Gewehr & Mourelatos, 2011).

A mosquito-borne disease is characterized by the fact that the pathogen is transmitted from one host to another by a mosquito vector. Transmission can only occur when the pathogen, the vector and a susceptible host are present (Braks *et al.*, 2011). However, the presence of these three factors is not sufficient for transmission to occur. Transmission is also influenced by environmental and socio-economic factors, vector control and access to health structures which are highly interconnected in positive and negative feedback loops (Franklinos, Jones, Redding & Abubakar, 2019; Van Bortel, Versteirt, Van Gompel & Coosemans, 2009). Changes in land use, urbanization, global transport of people and goods, socio-economic factors and climate change are altering transmission patterns of vector-borne diseases in both endemic and non-endemic areas (Franklinos *et al.*, 2019; Mora *et al.*, 2022; Semenza & Suk, 2018). As a consequence, the current situation of mosquito-borne disease events in Europe is not only an effect of increased awareness and surveillance, but also of a changing epidemiology.

In Belgium thirty-three native mosquito species are inventoried (Boukraa *et al.*, 2015; Deblauwe *et al.*, 2020; Versteirt *et al.*, 2013), some of which are potential vectors of viruses or parasites (Versteirt *et al.*, 2013). Additionally, the introduction of exotic *Aedes* mosquitoes is regularly reported and could potentially change the epidemiology of the pathogen transmission in Belgium (Deblauwe *et al.*, 2022). Also pathogens that can be transmitted by native and exotic mosquitoes are regularly introduced in Belgium by travellers (Lernout, Litzroth, Rebolledo & Tersago, 2018). Hence local mosquito-borne transmission events are also likely to occur in the near future in Belgium. Therefore, this paper aims to assess the mosquito-borne disease threats in Belgium by focusing on three scenarios: (1) the import of an exotic pathogen transmitted by an exotic established *Aedes* mosquito addressing the question whether local transmission of exotic *Aedes*-borne pathogens can occur in Belgium (fig. 1A); (2) a local transmission event caused by an imported infectious exotic mosquito species which transmits the pathogen it carries focusing on the transmission risk of malaria in Belgium (fig. 1B); (3) the import of a pathogen through wildlife which

is transmitted by a native mosquito species exploring the risk for local transmission of WNV in Belgium (fig. 1C). Per scenario we discuss the current occurrence of potential mosquito vectors in Belgium after which we focus on the actual threat of the vector-borne disease transmission.

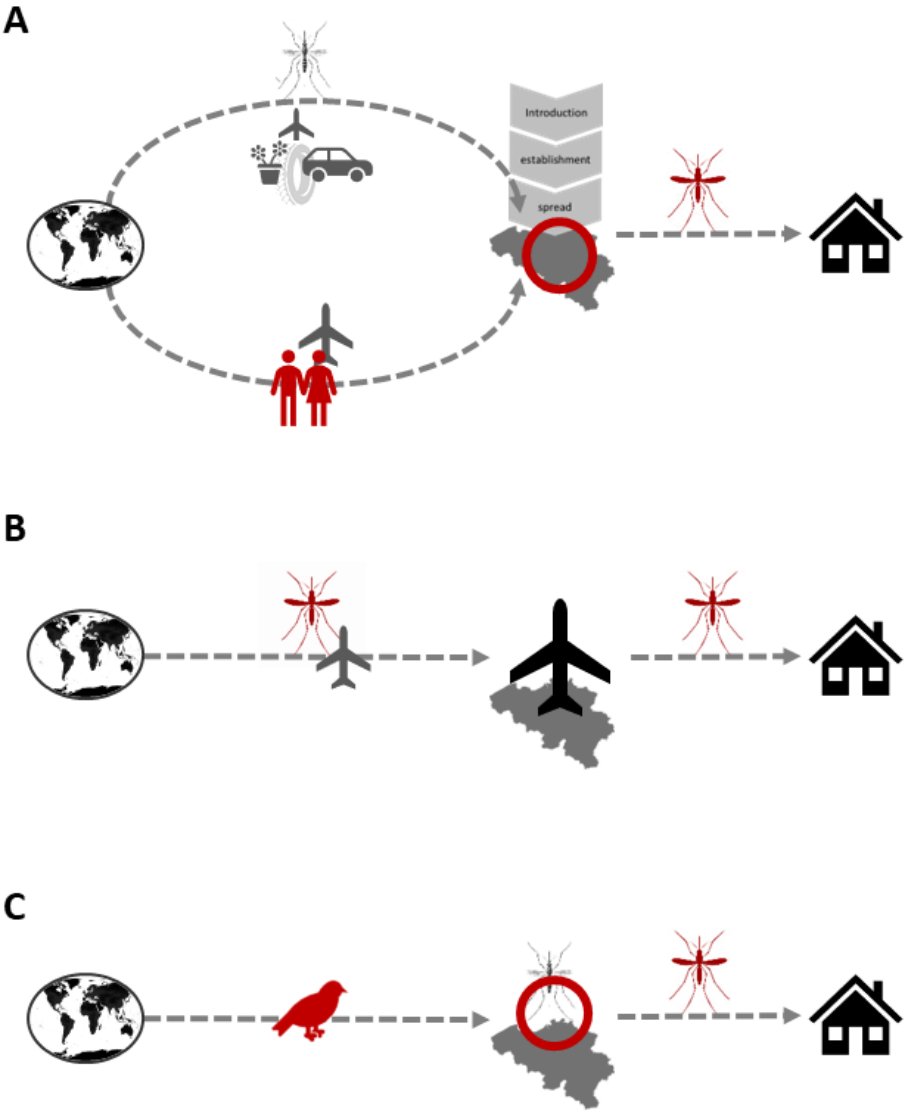

Fig. 1. — Overview of the three possible scenarios related to mosquito-borne disease risk for Belgium. Red-coloured icons indicate an infectious individual, *i.e.* mosquito, bird, or human. Red circles indicate a transmission event from the infectious individual (bird or human) to an established-exotic (scenario A) or a native (scenario C) non-infected mosquito species.

Scenario A: Local Transmission of Exotic *Aedes*-borne Pathogens in Belgium?

The introduction, establishment and spread of exotic *Aedes* mosquito species is a threat to human health in several European countries. Some exotic *Aedes* species display high invasion potential and are vectors of several arboviruses. As these species are not native to Europe, their introduction, establishment and further spread is a first step before an exotic *Aedes*-borne virus transmission can occur.

Current Situation of Exotic *Aedes* Species in Europe and Belgium

In Europe, six exotic *Aedes* mosquitoes have been found at least once since 1979, *i.e. Aedes triseriatus, Ae. atropalpus*, *Ae. japonicus, Ae. koreicus*, *Ae. aegypti* and *Ae. albopictus. Aedes triseriatus*, a North-American species, has been found introduced once in France (Medlock *et al.*, 2012). *Aedes atropalpus*, also known as the American rock pool mosquito, was imported via used tyres into Veneto Province in Italy in 1996 and 1997. In France, two introductions are known: one in 2003 in a used tyre yard in Poitou-Charentes (Vienne) and a second in Normandy (Orne) in 2005. Also the species was imported into the Netherlands in 2009 (Scholte *et al.*, 2009). None of these introductions have led to establishment, hence currently no population of *Ae. atropalpus* is known in Europe (European Centre for Disease Prevention and Control, 2022c; Medlock *et al.*, 2015). *Aedes japonicus* and *Ae. koreicus* have established populations in several European countries, including Belgium, and are both spreading (European Centre for Disease Prevention and Control, 2022d, 2022e). *Aedes aegypti* is present in Europe around the Black Sea, in Cyprus and in Madeira (European Centre for Disease Prevention and Control, 2022a; Vasquez *et al.*, 2023). It has been introduced in the Netherlands through the tyre trade in 2010 (Brown *et al.*, 2011) and through air traffic since 2016 (Ibáñez-Justicia *et al.*, 2020; Nederlandse Voedsel en Warenautoriteit, 2022), once in Germany through exotic plant seedling importation in 2016 (Kampen, Jansen, Schmidt-Chanasit & Walther, 2016a) and in 2018 in the port of Marseilles, France (Jeannin *et al.*, 2019). Its establishment in Belgium is currently unlikely (Trájer, 2021). *Aedes albopictus* was first detected in Albania in 1979, probably introduced via its exclusive exchanges of goods with People's Republic of China. In 1990, the species spread to Italy and to France in 2000 and has now colonized most of southern Europe and is heading north (European Centre for Disease Prevention and Control, 2022b; Medlock *et al.*, 2015). It is fast spreading in Europe with an estimated rate of spread of about 100 km per year, rising to about 150 km per year in the period 2014-2019 (Kraemer *et al.*, 2019). Since 2005, it has been repeatedly introduced into the Netherlands through the import of used tyres, lucky bamboo and air traffic, but each time it was successfully eliminated (Ibáñez-Justicia, 2019). In 2007 the species was detected for the first time in Germany and in 2016 the first overwintering population in Freiburg was a fact (Pluskota *et al.*, 2016). It was also detected in south-eastern U.K. in 2016, 2017 and 2018 (Vaux *et al.*, 2019).

In Belgium, three exotic *Aedes* species, viz. *Ae. albopictus*, *Ae. japonicus* and *Ae. koreicus,* were detected between 2000 and 2020. The first introduction of *Ae. albopictus* in Belgium was linked to tyre trade and dates back to the year 2000 (Schaffner, Van Bortel & Coosemans, 2004). Between 2007 and 2020, which marked a period with more regular project-based mosquito surveillance, this species was intercepted at ten points of entry throughout Belgium (fig. 2) (Deblauwe *et al.*, 2022). *Aedes albopictus* was found at three used-tyre import companies, at one lucky bamboo import company, and since 2018 also at five parking lots along motorways coming from France and Germany, countries where the species has established populations (fig. 2). In Belgium, overwintering populations were not detected until 2020. Summer reproduction, as indicated by detection of different life stages including larvae and nymphs, occurred at some points of entry where control was not implemented, or implemented too late (Deblauwe *et al.*, 2022) (fig. 2). During the surveillance period 2007-2020 the percentage of positive points of entry for *Ae. albopictus* increased, with parking lots contributing significantly to this rise (Deblauwe *et al.*, 2022). In 2022 a citizen science surveillance approach was initiated in Belgium and since then the species has been detected at multiple locations outside the known points of entry. Overwintering also occurred

at two locations (Institute of Tropical Medicine, 2023a,b). *Aedes japonicus* was detected for the first time in Belgium (Natoye, Namur province) in 2002 (Versteirt *et al.*, 2009). This introduction was linked to used tyre trade from Japan and the USA. Since then, *Ae. japonicus* is known to be established at this locality. Between 2012 and 2015 a vector control programme was carried out to eliminate the species from Natoye. Initially this seemed successful, but in 2017 *Ae. japonicus* was found again. Based on a genetic investigation, the current *Ae. japonicus* population in Natoye (2017-2019) results from an admixture between specimens from the initial established population (before the control programme) and from new introduction(s), possibly from Germany via the used tyre trade (Smitz *et al.*, 2021a). The species has also been detected on multiple occasions in an allotment garden along the border with Germany. Both monitoring and genetic results point to the phenomenon of multiple introductions of *Ae. japonicus* in Belgium from the nearby West-German spreading population (Deblauwe *et al.*, 2022; Kampen, Kuhlisch, Fröhlich, Scheuch & Walther, 2016b; Smitz *et al.*, 2021a). Further *Ae. japonicus* was detected once at the industrial area in Maasmechelen in 2018, but its origin could not be determined (fig. 2). *Aedes koreicus* is known to be established at the industrial area in Maasmechelen since 2008. It has also been found as larvae (2014) and as adults (2017-2019) at a used tyre import company in Dilsen-Stokkem at about 5.6 km from the locality where the species is established (Deblauwe *et al.*, 2022) (fig. 2).

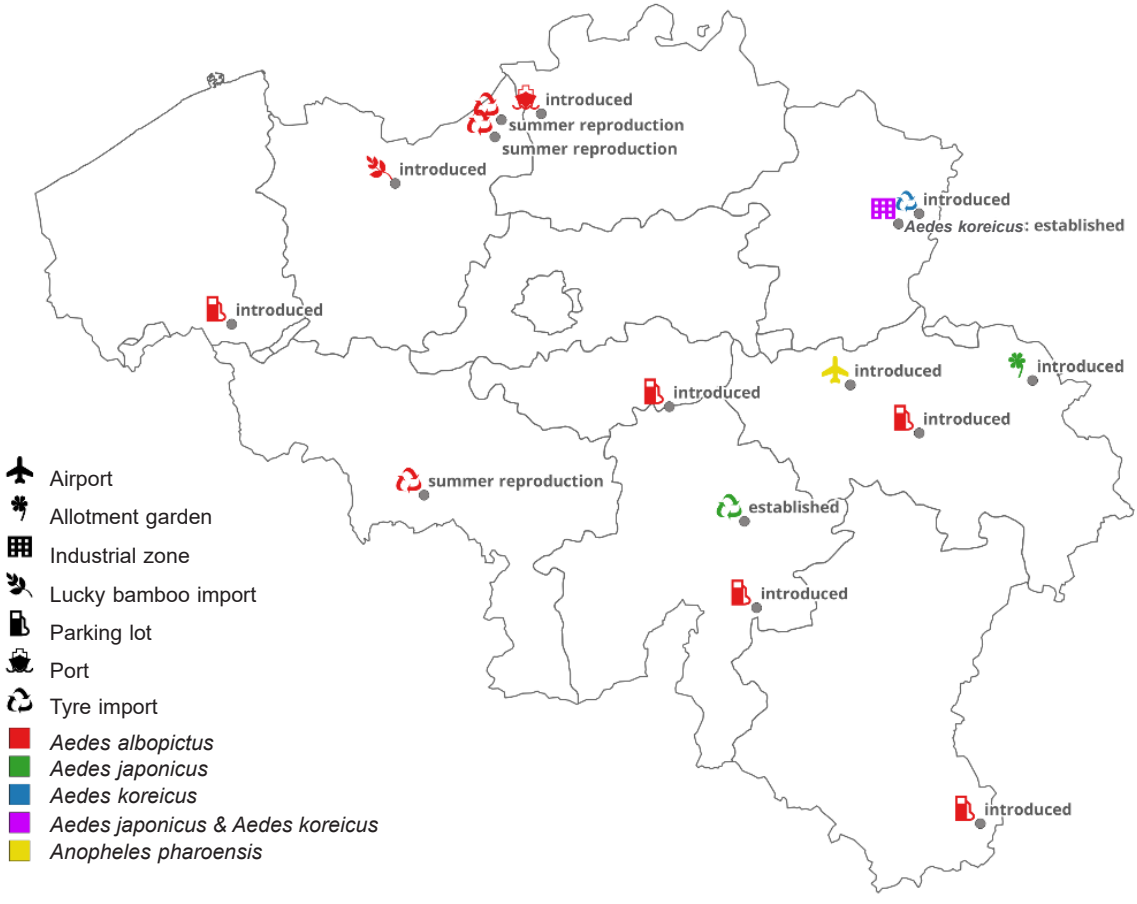

Fig. 2. — Overview of the current known occurrence of exotic Aedes species in Belgium (2000-2020) adapted from Deblauwe *et al.*, 2022. The colour code of the icon indicates the species that was found at the point of entry. Summer reproduction: outdoor summer reproduction as indicated by the detection of adult and immature stages during at least one mosquito season (May-October).

Aedes albopictus is an important vector of chikungunya virus (CHIKV), dengue virus (DENV) and Zika virus (ZIKV). Moreover, the species is a competent experimental vector for at least twenty-two other arboviruses including WNV, Rift Valley fever virus, and Sindbis virus (Gratz, 2004; Medlock *et al.*, 2015; Schaffner, Medlock & Van Bortel, 2013). The species was involved in local transmission of CHIKV in Italy in 2007 and 2017 and in France in 2010 and 2014 (European Centre for Disease Prevention and Control, 2018b). Autochthonous DENV transmitted by *Ae. albopictus* occurred in France (2010, 2013-2015 and 2018-2023), Croatia (2010), Spain (2018, 2019, 2022, 2023), and Italy (2020, 2023) (Cochet *et al.*, 2022; European Centre for Disease Prevention and Control, 2018b, 2023). Also the first local transmission of ZIKV in Europe occurred in France in 2019 during which *Ae. albopictus* was incriminated as vector (Giron *et al.*, 2019).

For an autochthonous virus transmission by *Ae. albopictus* to occur, three steps are necessary (see fig. 1A). The first step implies the introduction and establishment of the exotic competent vector species. The second step includes the introduction of the virus through, for example, an infectious traveller. In the third step the established mosquito bites the viraemic person and can infect another one after the completion of the extrinsic incubation period. In Europe, autochthonous outbreaks of arboviruses transmitted by *Ae. albopictus* typically follow five to fifteen years after the introduction of the species (Kraemer *et al.*, 2019). In Belgium, *Ae. albopictus* was detected at ten points of entry between 2007 and 2020, with no evidence that the species is established in Belgium (Deblauwe *et al.*, 2022). Until 2020 there was no eminent threat of local transmission of arboviruses. However, this is changing as Belgium is currently at the invasion front of this exotic *Aedes* species. Since 2018, the species has entered the country via ground transport and not only via trade of tyres and lucky bamboo. *Aedes albopictus* is in the first stage of its invasion process, *i.e.* the introduction phase, although recent evidence indicates that establishment has started as overwintering at two locations probably occurred. Hence, it is very likely that the species will become established in Belgium in the near future, which will change the epidemiological context of possible arbovirus transmission in Belgium.

Laboratory studies have shown that *Ae. japonicus* is a competent vector of several arboviruses including WNV, CHIKV and DENV. However, *Ae. japonicus* has never been incriminated as a vector of arboviral outbreaks (Schaffner *et al.*, 2013). The vector status of *Ae. koreicus* is unclear. In Russia *Ae. koreicus* has been suspected to be the vector of Japanese encephalitis virus but this has never been confirmed. Further *Ae. koreicus* is a possible vector of *Dirofilaria immitis* to dogs (Schaffner *et al.*, 2013). *Ae. japonicus* and *Ae. koreicus* are locally established, but since their role as a vector is currently questionable, the risk of vector-borne autochthonous transmission by these species seems to be limited at this moment.

Scenario B: Local Transmission of Malaria in Belgium?

In September 2020 two fatal cases of autochthonous *Plasmodium falciparum* malaria occurred in Belgium (Van Bortel *et al.*, 2022). Following the outbreak investigation, the most likely route of transmission was through an infectious exotic *Anopheles* mosquito that was imported via the international airport of Brussels or the military airport Melsbroek and that infected the cases who lived near the airports (Van Bortel *et al.*, 2022) (see fig. 1B). Arising

questions were to determine whether more such events could be expected and whether malaria transmission could occur via local *Anopheles* mosquitoes.

Current Situation of *Anopheles* Species in Europe and Belgium

In Europe, malaria was historically associated with several *Anopheles* species, primarily *Anopheles atroparvus, An. labranchiae, An. sacharovi, An. messeae* and *An. superpictus* (Sinka *et al.*, 2010). Other species, such as *An. claviger*, played a much more local secondary role in *Plasmodium* transmission (Mouchet *et al.*, 2004). Currently, *An. atroparvus* has a wide distribution in Europe from Portugal to Ukraine. The larvae of this species are tolerant to salinity and are associated with brackish water. It is still abundant on the Iberian Peninsula, but in other areas of its historical distribution it has become sporadic and localized. Factors that might have contributed to its decline are land-use changes, pollution, lack of suitable larval habitats, and lack of adult feeding and resting sites (Bertola, Mazzucato, Pombi & Montarsi, 2022). *Anopheles labranchiae, An. sacharovi* and *An. superpictus* are species distributed in southern and eastern Europe. *Anopheles labranchiae* is known to occur in central Italy, Sardinia and Corsica. *Anopheles sacharovi* is frequently found in Greece and Turkey (Bertola *et al.*, 2022) and *An. superpictus* occurs from the Mediterranean region to Southeast Asia. However, its current distribution in Europe is not well known (Bertola *et al.*, 2022).

In Belgium, six *Anopheles* species are reported. Four species of the Maculipennis complex were identified in Belgium, viz. *An. maculipennis* s.s., *An. daciae* sp. Inq., *An. messeae* and *An. atroparvus* (Smitz *et al.*, 2021b). Based on the currently available evidence, *An. maculipennis* s.s. is the most widespread species of the complex in the country as it was found at twenty-one out of twenty-five sampled localities (Smitz *et al.*, 2021b). In contrast, *An. atroparvus* was only found at two localities in the same study, namely in the port of Antwerp and Vrasene (East Flanders) (Smitz *et al.*, 2021b). *Anopheles claviger* was among the top five most abundant species in the inventory study between 2007 and 2010 (Versteirt *et al.*, 2013). In that study it was found at one hundred and eighty-five localities (*i.e.*, in 18.5 % of the sampled sites) and was the species that was found at most localities after *Culex pipiens*, the latter being found in almost 70 % of the sampled localities (Versteirt *et al.*, 2013). The first record of *An. plumbeus* in Belgium goes back to 1938 when Goetghebuer collected this species in Rouvroy near Torgny (Dekoninck *et al.*, 2011). *Anopheles plumbeus* was only collected sporadically and linked to forested areas. In recent years, *An. plumbeus* has exploited artificial breeding habitats such as tyres and large abandoned manure collecting pits of uncleaned pig stables and was found in one hundred and fourteen localities (*i.e.*, in 11.4 % of the sampled sites) spread over Belgium during the large inventory between 2007 and 2010 (Dekoninck *et al.*, 2011; Versteirt *et al.*, 2013). Locally *An. plumbeus* can cause high biting nuisance.

Future Threat of Local Malaria Transmission in Belgium

Historically, malaria in Belgium due to *P. vivax* was associated with wetlands in the north of the country (Flanders) and the presence of *An. atroparvus* (Rodhain & Van Hoof, 1939, 1942, 1943). However, the current vector status of *An. atroparvus* in Belgium is not known. In a recent review, Bertola *et al.* (2022) only considered *An. plumbeus* as an important potential malaria vector of *P. falciparum* and *P. vivax* in Europe nowadays. Yet, this species has never

been implicated in historical *Plasmodium* transmission. In the same review, *An. atroparvus* was labelled as a vector of low importance and *An. maculipennis* s.s., *An. daciae* sp. inq. and *An. messeae* as moderate important potential vectors of *P. vivax* (Bertola *et al.*, 2022).

Currently, malaria is a travel-associated disease in Belgium and local transmission is only sporadically reported. Events of local transmission occurred in 1995 associated with Brussels international airport (Van den Ende *et al.*, 1998); in 1997 a possible case associated with the port of Ghent (Peleman *et al.*, 2000); in 1998 a case linked to the regional airport of Ostend (De Schrijver, 1998); in 2008 a case notified in Brussels and labelled as suitcase malaria (Theunissen *et al.*, 2009); and in 2015 after a *P. falciparum* case detected near Antwerp, suitcase malaria was suspected (Vermeulen *et al.*, 2016). More recently four events of autochthonous malaria transmission in four consecutive years (September 2020, June 2021, June 2022 and September 2023) were reported in Belgium (Van Bortel *et al.*, 2022; Rebolledo & Van Bortel, pers. comm.). All events were labelled as malaria acquired through an "imported infectious exotic *Anopheles* mosquito" (see fig. 1B). Of note, the four events occurred after Belgium experienced temperatures above the long-term mean at the time the transmission event most likely occurred (Koninklijk Meteorologisch Instituut van België, 2023). These weather conditions could have favoured the survival of introduced exotic *Anopheles* mosquitoes. The question raises whether more such transmission events can be expected if such hot spells become more regular in the future. Additionally, it is not clear whether we are confronted with an increased introduction of the exotic *Anopheles* species at airports or only a better survival of the introduced species due to the climate conditions. Exotic *Anopheles* species were in fact detected in Belgium. For example, we found *An. pharoensis*, a malaria vector from Africa, at the airport of Liège in 2017 (Ibáñez-Justicia *et al.*, 2020). Likewise, in the Netherlands exotic *Anopheles* species are occasionally trapped at airports (Ibáñez-Justicia *et al.*, 2020). The local transmission event of 2020 in Belgium occurred during the second COVID-19 wave. We observed a reduction of 65 % of flights from Africa, the most likely continent of origin of the infection based on a genomic analysis, over the period 1 August to 15 September 2020 compared to the same period in 2019 (Van Bortel *et al.*, 2022). Also in France three cases of airport malaria were reported in 2020 (European Centre for Disease Prevention and Control, 2020). These elements point to the possible importance of weather conditions when an exotic *Anopheles* species enters the country for its survival.

Besides the autochthonous malaria transmissions linked to the import of infectious exotic *Anopheles* mosquitoes, it is very unlikely that malaria gains a foothold in Belgium as contact between native *Anopheles* species and humans is low due to the primarily zoophilic nature of most Belgian *Anopheles* species, the low vector status of the native *Anopheles* mosquitoes (Bertola *et al.*, 2022), and the health system that should be able to early detect cases so that establishment of an infectious human reservoir is unlikely.

Local Transmission of West-Nile Virus in Belgium?

Since 2010, the ECDC has systematically followed the human WNV infections during the transmission season (usually between June and November) to inform public health authorities, especially the competent authorities responsible for blood safety in the implementation of the EU blood safety directives (European Union, 2004, 2014). In 2018 the total number of reported autochthonous WNV infections in the EU surpassed the total number of reported cases during

the previous seven years and marked one of the highest WNV seasons (European Centre for Disease Prevention and Control, 2018a). However, the epidemiological situation of WNV in Europe is heterogeneous with countries reporting regular outbreaks in humans and animals and others that have never reported any autochthonous case (Gossner *et al.*, 2017). Hence, the question raises whether Belgium is at risk for human WNV infections.

Vector Species in Europe and Belgium

WNV circulates in a complex bird-mosquito-bird cycle with humans and horses considered as dead-end hosts as the viraemia in humans is not high enough to infect mosquitoes. In Europe, *Cx. pipiens* s.s. is the most efficient vector for transmitting the virus among birds and from birds to humans and other mammalian dead-end hosts (Vogels, Goertz, Pijlman & Koenraadt, 2017a). Birds are important amplifying hosts and they play an important role in the spread of the virus (Mancuso *et al.*, 2022) (see fig. 1C).

Culex pipiens s.s., also known as the northern house mosquito, is a widespread mosquito species in Europe (European Centre for Disease Prevention and Control, 2022f; Haba & McBride, 2022). *Culex pipiens* s.s. belongs to the *Cx. pipiens* complex comprising three species, *i.e.*, *Cx. australicus*, *Cx. pipiens* s.s., and *Cx. quinquefasciatus*. Within *Cx. pipiens* s.s., two biotypes are recognized, namely *Cx. pipiens* biotype *pipiens*, and *Cx. pipiens* biotype *molestus*. The biotypes are morphologically indistinguishable, but they show a number of behavioural differences on which they were initially described and which impact their distribution and potential role as vectors (Haba & McBride, 2022). Females of the biotype *pipiens* need a blood meal to produce a first batch of viable eggs, prefer feeding on birds, breed in open spaces, and overwinter in a state of diapause. In contrast, females of the biotype *molestus* can produce a first batch of viable eggs without a blood meal, prefer feeding on mammals, can breed in confined mating spaces, and do not overwinter in a state of diapause (Haba & McBride, 2022).

In Belgium, *Cx pipiens* s.s. is a very common mosquito which can be found in different types of habitats (Vanderheyden *et al.*, 2022; Versteirt *et al.*, 2013). Between 2007 and 2010, during the nationwide inventory, it was found in almost 70 % of the nine hundred and thirty-six sampled locations (Versteirt *et al.*, 2013). *Culex pipiens* biotype *pipiens* seems to be more common and widespread in Belgium than *Cx. pipiens* biotype *molestus*, although in that study the sample strategy might have been biased towards the collection of the biotype *pipiens* (Vanderheyden *et al.*, 2022). Both biotypes co-occur in urban, agricultural, forest and seminatural habitats. Despite the sympatric occurrence of both biotypes, only few hybrid specimens were found (Vanderheyden *et al.*, 2022).

Culex modestus, a bridge vector of WNV, has also been detected in Belgium; yet its distribution is currently unknown (De Wolf *et al.*, 2021; Wang *et al.*, 2021).

Future Threats of Local WNV Transmission in Belgium

WNV is not new to Europe: in the 1960-1980s the circulation of WNV in humans was suspected based on serological studies conducted in Albania, Portugal, Spain, Romania, and Slovakia (Zeller & Schuffenecker, 2004). Between 1962 and 1963 WNV encephalitis cases occurred in France in humans and horses and in 1996 a large outbreak occurred in Romania

with more than three hundred and ninety confirmed cases. Currently, WNV primarily circulates around the Mediterranean Sea and in Eastern Europe but a more northern spread happened recently with human cases detected in Germany in 2019-2022 and the Netherlands in 2020 (Bakonyi & Haussig, 2020; European Centre for Disease Prevention and Control, 2022g).

In Belgium, no autochthonous mosquito-borne transmission of the WNV has been known so far. Migratory birds might play an important role in the introduction of this virus in new areas along their major routes between Africa and Europe, but also within Europe, although the exact introduction events are difficult to determine (García-Carrasco *et al.*, 2023; Mancuso *et al.*, 2022; Seidowski *et al.*, 2010; Ziegler *et al.*, 2022, 2020). Vogels *et al.* (2017b) did not find any difference in vector competence between *Cx. pipiens* biotype *pipiens* from Italy and from the Netherlands, and concluded that the vector competence of *Cx. pipiens* s.s. is not a limiting factor for the northward spread of the virus. Furthermore, the autochthonous vector-borne related cases reported in the Netherlands and Germany indicate that virus transmission is possible at more northern latitudes including Belgium. Additionally, in the summer of 2016, a widespread circulation of Usutu virus (USUV) in birds was reported from Belgium, France, Germany and the Netherlands (Cadar *et al.*, 2017). USUV is a virus closely related to the WNV and circulates in a similar bird-mosquito-bird cycle. The circulation of USUV is an additional indication that the environment and climate in Belgium are permissive for these arboviruses. All these elements point to one major conclusion: the question is not whether autochthonous mosquito-borne transmission of WNV can happen in Belgium, but rather when.

Conclusion

We have reviewed the three plausible scenarios of mosquito-borne disease transmission in Belgium. First, we find *Ae. albopictus* regularly introduced in Belgium. It is very likely that the species will become established in Belgium in the near future as we observe regular introductions and possible overwintering in recent years. This will change the epidemiological context of *Aedes*-borne arbovirus transmission in Belgium, *i.e.* one of the prerequisites for local arbovirus transmission, being the presence of the vector, will become fulfilled in Belgium. Secondly, transmission of *Plasmodium* through imported infectious exotic *Anopheles* does occur in Belgium with recently four transmission events in four years. Despite these events, it is very unlikely that malaria will get established in Belgium again because of the socio-economic situation and health system ensuring the early detection and treatment of cases and the vectors being primarily zoophilic and having a low vector potential. Thirdly, based on the geographical spread of WNV infections to the Netherlands and Germany and the recent occurrence of USUV in Belgium, it is clear that our country is environmentally suitable for WNV and that mosquito-borne human WNV infections will occur in the near future in Belgium.

As in Europe, mosquito-borne diseases were not considered a public health problem in the past in Belgium. Based on our assessment it is obvious that the situation is changing and that mosquito-borne diseases need to be recognized as a public health threat. In order to improve the risk assessment and preparedness for mosquito-borne diseases, several steps need to be taken. First, an improved knowledge of the occurrence and distribution of vectors is a first step to better assess the risk of mosquito-borne disease transmission. This not only refers to exotic *Aedes* mosquitoes but also to native mosquito species such as *Anopheles* spp. and *Culex* spp. Currently, the monitoring of exotic *Aedes* mosquitoes is done on a project-based approach

which hampers the establishment of a long-term surveillance strategy. Secondly, the integration of entomological, epidemiological, and veterinary and wildlife surveillance data could enhance our understanding of the epidemiology of mosquito-borne diseases and improve the early detection of possible local transmission events. A first step is taken by the recent set-up of the MEMO+ project where Sciensano (https://www.sciensano.be) and the Institute of Tropical Medicine (https://www.itg.be) collaborate to follow the risk of *Aedes*-borne diseases and their vectors in Belgium. Thirdly, research on vector competence and environmental or climatic suitability of mosquito species and mosquito-borne diseases could help to identify target areas for surveillance and control. Fourthly, the development of an overall preparedness plan integrating the different aspects of disease and vector surveillance and their control will be essential to ensure that surveillance will result in the necessary control actions to safeguard the health of humans in Belgium.

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Origins of and Key Contributors to the Economic Botany Collection of Meise Botanic Garden*

by

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Keywords. — Economic Botany; Ethnobotany; *Herbarium Martii*; World Exhibitions; *Materia Medica*; Drug Collections.

Summary. — The economic botany collection housed at the Meise Botanic Garden herbarium (BR) comprises around twenty-five thousand items, encompassing a wide array of materials such as wood samples, fibres, dyes, tanning agents, exudates (like gums, resins, waxes, latex, and manna), fats and oils, essential oils, and *materia medica* (pure and derived substances from plants, animals, and minerals used for medicinal purposes). Broadly, the collection can be categorized into three subcollections: the von Martius' collection spanning 1821 to 1868, the State Botanic Garden collection in Brussels (post-von Martius) from 1856 to 1958, and the van Heurck collection from the early 1800s to 1876. This paper provides an extensive overview of the collection, delving into its key contributors, geographical origins, and historical context. We highlight exemplary specimens, elucidating the understanding of their economic use during that period. The collection serves as a testament to the intriguing history of collaborations and interactions between scientists, naturalists, explorers, and various other contributors involved in assembling economic botany collections. The combined knowledge and dedicated efforts of these contributors have resulted in a collection that vividly showcases the diverse applications of primarily plant-based resources during that historical era. Even today, this knowledge has the potential to contribute to the exploration of novel or rediscovered applications for plants and plant-derived products.

Trefwoorden. — Economische botanie; Etnobotanie; *Herbarium Martii*; Wereldtentoonstellingen; *Materia Medica*; Drogerijenverzamelingen.

Samenvatting. — De economische botaniecollectie in het herbarium van Plantentuin Meise (BR) omvat ongeveer vijfentwintigduizend items, waaronder een brede waaier aan materialen zoals houtstalen, vezels, kleurstoffen, looistoffen, exsudaten (zoals gommen, harsen, wassen, latex en manna), vetten en oliën, etherische oliën en *materia medica* (zuivere en afgeleide stoffen van planten, dieren en mineralen die voor medicinale doeleinden worden gebruikt). In grote lijnen kan de collectie worden onderverdeeld in drie deelcollecties: de von Martius-collectie van 1821 tot 1868, de collectie van de Rijksplantentuin van Brussel (post-von Martius) van 1856 tot 1958 en de van Heurck-collectie van begin 1800 tot 1876. Dit artikel geeft een uitgebreid overzicht van de collectie, waarbij we ingaan op de belangrijkste bijdragers, de geografische oorsprong en de historische context. We belichten typerende exemplaren en verduidelijken hun economisch gebruik in die periode. De collectie getuigt van de intrigerende geschiedenis van samenwerking en interactie tussen wetenschappers, naturalisten, ontdekkingsreizigers en verschillende andere personen die betrokken waren bij het samenstellen van economische botaniecollecties. De gecombineerde kennis en toegewijde inspanningen van deze personen hebben

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geresulteerd in een collectie die op levendige wijze de diverse toepassingen illustreert van voornamelijk plantaardige grondstoffen tijdens dat historische tijdperk. Zelfs vandaag heeft deze kennis het potentieel om bij te dragen aan de verkenning van nieuwe of herontdekte toepassingen van planten en van planten afgeleide producten.

Introduction

The 19th century was a significant era for the exploration of natural products, driven by scientific curiosity, economic interests, and the search for new resources. Numerous explorers, scientists, and naturalists embarked on journeys to remote areas, including colonies, to collect a wide variety of unknown natural products with possible uses to humans (Cornish & Nesbitt, 2014; Nesbitt & Cornish, 2016). These collections comprise a wide range of raw materials of plant, animal or mineral origin, and their derivatives, as well as ethnographic artifacts, the latter sometimes ending up in natural history collections and herbaria, due to the historical overlap in the collection practices of botanists and ethnographers or due to practical considerations in the management of scientific and cultural collections (Stern da Fonseca-Kruel *et al.*, 2019).

National and international exhibitions served as a showcase for these newly-discovered natural resources. The exhibited, previously unknown objects eventually found their place in commercial, industrial and scientific museums, as well as private collections, where they were examined, described, redistributed, and preserved (Crellin, 1967; Widjaja & Kartawinata, 2014; Cornish, Driver & Nesbitt 2017; Bahuchet *et al.*, 2019; Cornish & Driver, 2020; Svensson, 2020). This endeavour was a collaborative effort involving scientists, curators, manufacturing and trading companies, diplomats, and independent collectors, many of whom were also naturalists. The variety of sources makes these collections particularly diverse, not only geographically but also in terms of content. As the 20th century unfolded, the interest in exotic species and ethnographic objects gradually waned, giving way to a focus on colonial agricultural products.

These collections have found their way into natural history museums, botanical gardens or other institutions through various routes, where they are now often conserved and curated as part of or alongside herbarium collections. Commonly known as economic botany collections, they are sometimes referred to as ethnobotanical collections as well. The history of economic botany collections actually dates back to the 16th and 17th centuries, with the establishment of *materia medica* cabinets that focused on plants for medicinal purposes (Peck, 1953; Richards, 2012). Economic botany collections emphasize the commercial and industrial importance of plants and their components, highlighting their economic value in agriculture, pharmaceuticals, and other industries. In contrast, ethnobotanical collections primarily focus on traditional knowledge and uses of plants by different cultures, including their medicinal, culinary, and ceremonial applications. While economic botany collections centre on the economic impact and commercial use of plants, ethnobotanical collections detail their cultural and traditional uses. Despite their distinct focuses, both types of collections overlap in their exploration of the human-plant relationship (Davis, 1995; Cornish & Nesbitt, 2014; Nesbitt & Cornish, 2016).

Economic botany collections differ from herbarium collections in their broader content of specimen types, and more applied scientific focus. These collections include not only dried specimens but also plant-derived materials and sometimes cultural artifacts and have been gathered to document plant biodiversity in relation to their economic and industrial importance.

Herbarium collections are often complementary to these collections and both collections share synergies in studying the diverse roles and significance of plants in human societies and ecosystems.

In the 19th century, economic botany and ethnobotanical collections were distinctly recognized by curators and users as unique types of collections (Cornish & Nesbitt, 2014). Today, however, these collections — except for a few — are more neglected or less well known compared to herbarium collections. Locating and linking these collections in institutions worldwide is challenging. Unlike *Index Herbariorum* (https://sweetgum.nybg.org/science/ih/), which offers a searchable list of herbarium collections globally, or the Global Registry of Scientific Collections (https://scientific-collections.gbif.org/), which aims to provide a worldwide catalogue of scientific collections, there is no comprehensive global overview of economic botany and ethnobotanical collections. Cornish & Nesbitt (2014) provided an overview table of twenty-nine economic botany and ethnobotanical collections, some of which no longer exist. This list is supplemented here by ten additional collections, including information on the nature of the collections and studies performed on them (tab. 1).

Table 1

Selection of economic botany collections in European institutions, including information on the nature of the collections and studies performed on them. The list complements the overview of twenty-nine economic botany and ethnobotanical collections published by Cornish & Nesbitt (2014)

Institutions	Collections with date and estimated number of specimens, and notes	References
Botanischer Garten Berlin	Spezialsammlungen, 1819-, unknown number of specimens	Botanischer Garten Berlin (2024)
Université de Reims	Droguier Menier, 1816-1838, c. 755 specimens	Demouy (2010, 2011)
Faculdade de Farmácia da Universidade de Lisboa	*Materia medica* via Gehe & Co, 1910-1920, c. 400 specimens	Perdigão (2014)
Faculté de pharmacie de Montpellier	Droguier de la Faculté de médecine, 1633-, c. 15,000 specimens	Motte-Florac (2012)
Faculté de pharmacie de Paris, Université Paris Cité	Droguier du Musée de matière médicale de la Faculté de pharmacie, 1763-, c. 8,000 specimens, plus c. 1,300 specimens from the Guibourt collection	Paris *et al*. (1975)
Faculté de pharmacie, Nantes Université	Droguier de la Faculté de pharmacie, 19th century, unknown number of specimens	Thibon (1993)
Friedrich-Alexander-Universität Erlangen-Nürnberg	Pharmakognostisches Kabinet von Theodor Martius, 1841, c. 2,400 specimens. Smaller duplicate of the collection present in Meise Botanic Garden	Thoma (2004)
Maison de Melle-lez-Gand	Musée commercial, 1847-1889, number of specimens unknown. Collection in decay	Planchon (1873a)
Queens' College, Cambridge	Vigani's Cabinet, 1703-1704, c. 700 specimens	Wagner (2007), Steigenberger (2013)
Universität Wien	Pharmakognostische und Pharmaziehistorische Sammlung der Uni, 1854-, c. 18,000 specimens of which 2,812 from Theodor Martius	Kletter (2012)

The Economic Botany Collection at Meise Botanic Garden

The economic botany collection at Meise Botanic Garden predominantly dates back to the 19th century and early 20th century and includes approximately twenty-five thousand specimens of a very diverse nature, with specimens preserved in the original glass jars (fig. 1) or in cardboard boxes. Although some parts of the collection may initially appear to hold primarily taxonomical interest due to their close connection with the herbarium, it is important to recognize that every species within it has a use relevant to humans — whether obsolete, current or potential. Consequently, the entire collection was and still is considered to have economic value. Specimens include wood samples, fibres, dyes and tanning agents, exudates (such as gums, resins, waxes, latex and manna), fats and oils, essential oils, and *materia medica* (*i.e.* substances derived from plants, animals, and minerals used for medicinal purposes). Surprisingly, it also houses specimens of animal and mineral origin (tab. 2), making the collection highly unusual compared to other collections within the Meise Botanic Garden herbarium.

Fig. 1. — Variety within glass jars preserving palm specimens.

Table 2

Selection of specimens in the economic botany collection of Meise Botanic Garden, indicating common and scientific taxon names (and nature of the material if not plant-based), their economic use, and specimen barcode number(s). Specimen data are available on the herbarium collection portal of Meise Botanic Garden (www.botanicalcollections.be)

Common names	Scientific names	Economic use	Specimens
Acaroid resin/black boy 'gum'	*Xanthorrhoea arborea*	Exudate	AWH10027158
Advogado/avocado	*Persea gratissima*	Food	BR4010005693462
African rosewood	*Guibourtia demeusei*	Wood	AWH10095782
Agave fibres	*Agave vivipara var. deweyana* (syn. *A. deweyana*), *Agave vera-cruz* (syn. *A. mexicana*)	Leaf fibre	BR4010004633391, BR4010004634428
Angélique	*Dicorynia paraensis*	Wood	BRW14100338, BRW14100345
Bagasse	*Bagassa guianensis*	Wood	BRW14100369, BRW14100352
Bakau/red mangrove	*Rhizophora mucronata*	Wood	BRW14115622
Banana fibre/plantain fibre	*Musa* × *paradisiaca*, *Musa* sp.	Leaf fibre	BR4010004560307, BR4010002728549
Barkcloth from fig tree	*Ficus* spp.	Bark fibre	BR4010002742385, BR4010002743412
Baropa/apple mangrove	*Sonneratia alba*	Wood	BRW14115646
Batata de purga	*Operculina macrocarpa* (syn. *Ipomoea operculata*)	*Materia medica*	BR4010005508490, BR4010004108363
Bay leaves	*Laurus nobilis*	Essential oil	AWH10021590
Bitter orange	*Citrus aurantium* (syn. *C. bigaradia*)	Essential oil	AWH10004821, AWH10004838, AWH10004845, AWH10004852, AWH10004869
Bitumen mumiai	Dead sea bitumen (seep petroleum)	*Materia medica*	AWH10031636
Bloodflower	*Asclepias curassavica*	Seed hair fibre	BR4010005516440
Brant's oak manna	*Quercus brantii* (syn. *Q. persica*)	Exudate	AWH10023914, AWH10023907
Brazilian orchil	*Spiloma roseum* (lichen)	Dye	BR4010002272264
Camelthorn manna	*Alhagi maurorum*	Exudate	AWH100008003
Canary orchil	*Roccella tinctoria* (lichen)	Dye	AWH10029206, AWH10029213
Caneelapfel/custard apple	*Annona squamosa*	Food	BR4010000153220
Cape jasmine	*Gardenia jasminoides* (syn. *G. grandiflora*)	Dye	AWH10015667
Carnauba wax	*Copernicia prunifera* (syn. *C. cerifera*)	Exudate	BR4010003192264
Carrageen moss/Irish moss	*Chondrus crispus* (red algae)	*Materia medica*	AWH10029411, AWH10029428
Cashew tree gum	*Anacardium occidentale* (syn. *Cassuvium pomiferum*)	Exudate	AWH10006900
Cassava	*Manihot esculenta*	Starch	BR4010004834484
Cèdre noir	*Laurus surinamensis*	Wood	BRW14100765, BRW14100758, BRW14100772

Chagual gum	*Puya coarctata*	Exudate	AWH10026670
Cinnamon-leaf yam	*Dioscorea cinnamomifolia* (syn. *D. tuberosa*)	Starch	BR4010005503341
Cobalt	Co (mineral)	*Materia medica*	AWH10031209
Cochineal	*Dactylopius coccus* (scale insect)	Dye	BR4010002245329, BR4010002246357
Cocoa	*Theobroma cacao*	*Materia medica*/ stimulant	Several accessions, including BR4010001143220
Cod liver oil	*Gadus morhua* (fish)	Oil	AWH10029848, AWH10029855, AWH10029862, AWH10029879, AWH10029886, AWH10029893, AWH10029929
Coffee/caffeine	*Coffea* spp.	*Materia medica*/ stimulant	AWH10013946, AWH10013953
Common adder	*Vipera berus* (syn. *Pelias berus*) (snake)	*Materia medica*	AWH10029824
Conditura cadaverum/mummy	*Homo sapiens*	*Materia medica*	AWH10029442
Congo jute	*Urena lobata*	Bast fibre	BR4010000822379
Corozo	*Phytelephas macrocarpa*	Vegetable ivory	BR4010003557490
Cotton	*Gossypium* spp.	Seed hair fibre	BR4010002330193
Courbaril, South American copal resin	*Hymenaea courbaril*	Wood, exudate	BRW14100567, AWH10009192
Date	*Phoenix dactylifera*	Food	BR4010003142214, BR4010003143242, BR4010003144270, BR4010003145307
Devil's cotton	*Abroma augusta*	Bast fibre	BR4010001109363
Djave nut butter	*Baillonella toxisperma*	Fat, food, medicinal	AWH10017494
Epsom salt/ magnesium sulphate	$MgSO_4$ (mineral)	*Materia medica*	AWH10030769
Fever tree	*Cinchona* spp.	*Materia medica*	AWH10015544
Flax	*Linum usitatissimum*	Bast fibre	BR4010001243258
Floss silk tree	*Ceiba speciosa* (syn. *Chorisia speciosa*)	Seed hair fibre	BR4010001030094
Garou	*Daphne gnidium*	*Materia medica*	BR4010005354363
Ginger	*Zingiber officinale*	Essential oil	AWH10025802
Goat's rue	*Galega officinalis*	*Materia medica*	BR4010002082214
Grignon	*Bucida buceras*	Wood	BRW14100819, BRW14100826, BRW14100833
Gum arabic	*Acacia nilotica*	Exudate	BR4010003950406
Herba Tayuyae	*Cayaponia tayuya*	*Materia medica*	BR4010002296406
Incense cedar	*Calocedrus decurrens* (syn. *Libocedrus decurrens*)	Wood	AWH10094389
Ipecac/ipecacuanha	*Carapichea ipecacuanha* (syn. *Cephaelis ipecacuanha*)	*Materia medica*	AWH10013434, AWH10013441, AWH10013465, AWH10013489
Japanese boxwood	*Buxus japonica*	Wood	BRW14109751, BR4010004801363 (glass painting)

Japanese isinglass	*Gelidium* spp. (red algae)	Food	BR4010002920363, BR4010002921391
Japanese pagoda tree	*Styphnolobium japonicum* (syn. *Sophora japonica*)	Wood	BRW14109713, BR4010004798632 (glass painting)
Japanese umbrella pine/kooyamaki	*Sciadopitys verticillata*	Wood	BRW14109782, BR4010004803428 (glass painting), BR4010005623391 (jar with liquid)
Kaki/Japanese persimmon	*Diospyros kaki*	Wood	BRW14109522, BR4010004781412 (glass painting)
Kaolin/China clay	Al-compound (mineral)	*Materia medica*	AWH10031032
Keaki/Japanese elm	*Zelkova serrata* (syn. *Z. keaki*, *Z. acuminata*)	Wood	BRW14109829, BRW14109874, BR4010004809604 (glass painting)
Kenaf	*Hibiscus cannabinus*	Bast fibre	BR4010000833412
Kino (tannic) gum	*Eucalyptus citriodora*	Exudate	AWH10011508
Kwepie	Couepia guianensis	Wood for pottery firing	BRW14103773, BRW14103780
Lapis judaicus	*Balanocidaris glandifera* (sea urchin)	*Materia medica*	AWH10031674
Lemon grass	*Cymbopogon citratus*	Essential oil	AWH10028704
Liane de bœuf	*Danais fragrans*	*Materia medica*	BR4010004994577
Lion claws	*Panthera leo* (syn. *Felis leo*) (cat)	*Materia medica*	AWH10029459
Mabondo nut	*Osmorhiza aristata* (syn. *Sclerosperma mannii*)	Vegetable ivory	BR4010002843440
Macassar ebony	*Diospyros* sp.	Wood	AWH10090213
Manga/mango	*Mangifera indica*	Food	BR4010005692434
Manilla hemp/koffo/abaca	*Musa textilis*	Leaf fibre	BR4010004573406
Mate	*Ilex paraguariensis*	*Materia medica*/stimulant	BR4010001606428
Milkweed	*Asclepias sp.*	Seed fibre	BR4010004229440
Munj sweetcane	*Tripidium bengalense (*syn. *Saccharum bengalense*, *S. munja*)	Bast fibre	BR4010004744462
Myrrh	*Commiphora gileadensis* (syn. *Balsamodendrum ehrenbergianum*)	Essential oil	AWH10007068
N'kosa	*Manniophyton fulvum*	Bast fibre	BR4010002720307, BR4010005474412
Oil palm	*Elaeis guineensis*	Oil	BR4010003449511, BR4010003434357
Opium	*Papaver somniferum*	Medicinal	AWH10002445
Ox gall extract	*Bos taurus* (bovine)	*Materia medica*	AWH10029695
Pappus from Apocynaceae	*Stipecoma peltigera, Echites* sp., *Prestonia denticulata* (syn. *Echitis suberosus*), *Araujia sericifera* (syn. *Physianthus albens*)	Seed hair fibre	BR4010004759626, BR4010004761391, BR4010004762428, BR4010004764484
Pearls	*Pinctada margaritifera* (syn. *Avicula margaritifera*) (pearl oyster)	*Materia medica*	AWH10030189

Pekrehoe/pegrekoe	*Xylopia frutescens*	Wood, medicinal, spice	BRW14104077
Pineapple	*Ananas sativus*	Leaf fibre	BR4010002748561, BR4010002749599
Pisang Radja sereh/ plantain	*Musa* x *paradisiaca* L. (AAB Group) 'Latundan' (syn. *Musa sapientum* var.)	Food	BR4010005269490
Queensland hemp	*Sida rhombifolia*	Bast fibre	BR4010005475440
Quince manna	*Pyrus glabra*	Exudate	AWH10010956, AWH10010969
Ramie	*Boehmeria nivea*	Bast fibre	BR4010004538511, BR4010004539549, BR4010004540286, BR4010004541313, BR4010004542341, BR4010004543379, BR4010004544406
Red coral	*Isis nobilis* (polyp)	*Materia medica*	AWH10030202
Rosary pea	*Abrus precatorius*	Jewellery	BR4010004226357
Rye	*Secale cereale*	Food	BR4010005340236
Safflower	*Carthamus tinctorius*	Dye	BR4010004854505
Saint Ignatius bean	*Strychnos ignatii*	*Materia medica*	AWH10018484, AWH10018491
Salangane/glossy swiftlet	*Collocalia esculenta* (syn. *Hirundo esculenta*) (swift)	*Materia medica*	AWH10029787, AWH10029794
Sandalwood/Indian sandalwood	*Santalum album*	Essential oil, wood	AWH10022115, BRW14115639
Sandfish skink	*Scincus scincus* (syn. *S. officinalis*) (lizard)	*Materia medica*	AWH10029817
Sassafras	*Licaria guianensis*	Wood	BRW14101366, BRW14101342, BRW14101359
Sel sédatif de Homberg/boric acid	$B(OH)_3$ (mineral)	*Materia medica*	AWH10030943
Silk-cotton tree	*Bombax* spp.	Seed hair fibre	BR4010000960385
Sorghum	*Sorghum bicolor*	Food	BR4010004246379
Soude de varech/ sodium carbonate	Burnt brown algae (*Fucus* spp.)	Various	AWH10030493
Spanish fly	*Lytta vesicatoria* (syn. *Cantharis vesicatoria*) (blister beetle)	*Materia medica*	AWH10030011
Sturgeon glue/ sturgeon isinglass	*Huso huso* (syn. *Acipenser huso*) (fish)	Glue	AWH10029930
Sugi/Japanese cedar	*Cryptomeria japonica*	Wood	BRW14109799, BRW14109461, BRW14109836, BR4010004775527 (glass painting)
Switiboontje	*Inga* sp.	Food	BR4010005365406
Tandjang/black mangrove	*Bruguiera gymnorhiza*	Wood	BRW14115608
Tchitola	*Prioria oxyphylla* (syn. *Oxystigma mortehanii*)	Wood	AWH10095591
Tea	*Camellia sinensis*	*Materia medica*	BR4010000694440-BR4010000744428
Tingi/spurred mangrove	*Ceriops tagal* (syn. *C. candolleana* Arn.)	Wood	BRW14115615

Tobacco	*Nicotiana tabacum*	*Materia medica*	BR4010003759610, BR4010003760357, BR4010003761385, BR4010003762412, BR4010003763440, BR4010003764478
Tomalayota	*Cucurbita sp.*	Food	BR4010002444357
Tremolite	Ca-compound (mineral)	*Materia medica*	AWH10030622
Unicorn horn/narwhal ivory	*Monodon monoceros* (whale)	*Materia medica*	AWH10029770
Uranium	U (mineral)	*Materia medica*	AWH10031223
Vegetable wool of pine needles	*Pinus sylvestris*	Leaf fibre/*Materia medica*	BR4010004691391
Venetian theriac	Natural concoction	*Materia medica*	AWH10031599
Verdigris/copper acetate	$Cu(CH_3COO)_2$ (mineral)	*Materia medica*	AWH10031407
Wacapou	*Vouacapoua americana*	Wood	BRW14101441, BRW14101434
Water chestnut	*Pachira aquatica* (syn. *Carolinea princeps*)	Food	BR4010000931385
Wild cinnamon	*Cinnamomum malabathrum*	Essential oil	AWH10021293
Wintergreen	*Gaultheria procumbens*	Essential oil	AWH10017180
Yellow mangrove	*Ceriops decandra* (syn. *C. roxburghiana*)	Dye	BR4010005046329
Ylang-ylang	*Cananga odorata*	Essential oil	AWH10001943

Materia medica has had an important impact on the economic botany collection of Meise Botanic Garden. In his 1554 herbal, *Cruydeboeck*, which was initially largely derived from the herbal of Leonhart Fuchs, Rembert Dodoens, a physician and botanist, was one of the first to disseminate knowledge about useful plants in Dutch, referring to them as "profijtelicke cruyden" or profitable herbs (Anon. n.d. a). The use of plants by humans, whether for medicinal, dietary, textile, or other technical purposes, has since led to significant commercial and industrial activities.

Botany and pharmacology are intricately connected. *Materia medica*, encompassing both crude drugs (also called "simples") and compound substances, plays a substantial role in economic botany collections (Leyman, 2023). It is noteworthy that the words "drug" and "drogue" are derived from the Dutch terms "droge vaten, droge waren, droge kruiden, drogen, drogerijen" initially referring to substances stored in dry barrels or containers with dry substances (Philippa, Debrabandere, Quak, Schoonheim & van der Sijs, 2003-2009).

Druggists and pharmacists collaborated closely in the 19th and early 20th centuries. Crude drugs and excipients, available at the druggist's, were processed by pharmacists into medicines. They monitored the authenticity of the raw materials and detected counterfeits, recognizing that falsifying any ingredient could impair therapeutic efficacy. Consequently, they continually augmented their *materia medica* collections ("drogerijen" in Dutch, "droguiers" in French) with the latest substances on the market, whether of vegetable, animal or mineral origin. Excipients (inactive substances used as a carrier for the active ingredients of a medication, aiding in the drug's formulation and stability) were equally important and particularly diverse. Rather exceptionally, old naturalia emerge in collections, serving as silent witnesses to earlier cabinets of curiosities. Amber, oyster pearls, so-called "unicorn horn" (fig. 2), red coral and *Lapis judaicus*, for example, appear unexpectedly in the economic botany collections of Meise Botanic Garden.

Fig. 2. — Fragments of “unicorn horn” also called narwhal ivory, AWH10029770.

The economic botany collection of Meise Botanic Garden comprises three subcollections: the collection of the former State Botanic Garden of Brussels (ca. 70 %), which is subdivided into the von Martius’ collection, spanning 1821 to 1868, and the post-von Martius’ collection from 1856 to 1958 (hereafter referred to as the State Botanic Garden collection), and the Henri van Heurck’s collection of the former Antwerp Herbarium (ca. 30 %) dating from the early 1800s to 1876. Ethnographic artifacts only comprise a small portion of the collection.

The State Botanic Garden (the predecessor of Meise Botanic Garden) was founded in 1870 and this went hand in hand with the purchase of the *Herbarium Martii*, a pivotal move that positioned the garden alongside other renowned botanic gardens such as the Royal Botanic Gardens, Kew (Bommer, 1871). Carl von Martius’ extensive herbarium of three hundred thousand specimens represented the first, largest and most important acquisition. Besides the classic herbarium of pressed and dried plant specimens, the *Herbarium Martii* also contains all kinds of plant parts (including woods) and plant-derived products. Towards the end of the 19th cen-

tury, the garden was tasked with identifying all dried plant materials collected across the Congo Free State — and later in Belgian Congo — which soon resulted in the first important publications on the flora of Congo (Arzel, 2018). Most of this newly-discovered material, such as wood, fruits, fibre and rubber, found its place within the economic botany collection. The expansion of this collection continued in the State Botanic Garden until the 1960s. Following the Garden's relocation from Brussels to Meise, which took place from 1939 to the 1970s, and its renaming as the National Botanic Garden in 1958 (Diagre-Vanderpelen, 2012), the economic botany collection was temporarily stored and neglected until its recent rediscovery in 2013.

Another 19th century collection, which has enriched the Garden, is the Henri van Heurck's collection from Antwerp, and some post-van Heurck's collections, originally housed in the Antwerp Herbarium. In 2006, the collection was lent to the National Botanic Garden. This collection contains, besides herbarium specimens, a substantial economic botany collection, which evolved from *materia medica* as its foundation and expanded into a botanical museum including industrial and commercial products. Several seed collections, exotic fruits, chemical products, two *materia medica* cabinets, a mycological collection and numerous, microscopic preparations of plants, animals and rocks also add to the whole. In 2014 this extensive and highly valuable collection became a permanent loan to Meise Botanic Garden.

Moreover, the economic botany collection was and is currently still occasionally supplemented through acquisitions made by botanists, private individuals and institutes.

The restoration of the economic botany collection at Meise Botanic Garden commenced in 2013. The vast majority of the specimens were well preserved after more than one hundred years thanks to the right choice of receptacles that are still visually very attractive today. The specimens as such were limitedly documented but combining the data from the library and archives of Meise Botanic Garden, encompassing original publications, inventories, letters, and an array of on-line resources, led to the tracing of many series. One of the oldest series dates back to 1835 and consists of Brazilian wood samples collected by Samuel Blanchet, the Swiss consul of Bahia. Even older specimens can be traced to the Rigouts-Verbert collection from the early 1800s, in addition to a Venetian theriac* sample from 1603, a fragment of a wreath from an Egyptian coffin of the Greek-Roman period, and last but not least Jurassic remains of fossilised sea-urchin radiolas of *Balanocidaris glandifera* Goldfuss, known as *Lapis judaicus* (fig. 3).

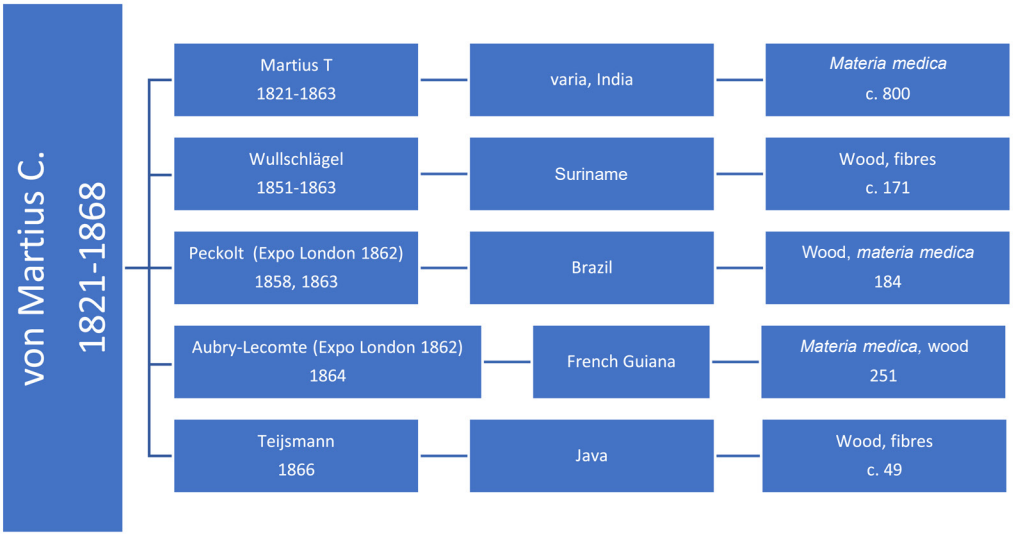
The chronological arrangement of these specimens acts as a material illustration of the history of Meise Botanic Garden, while also endowing the specimens themselves with enhanced context. The process of rehabilitation and restoration is still going on at present.

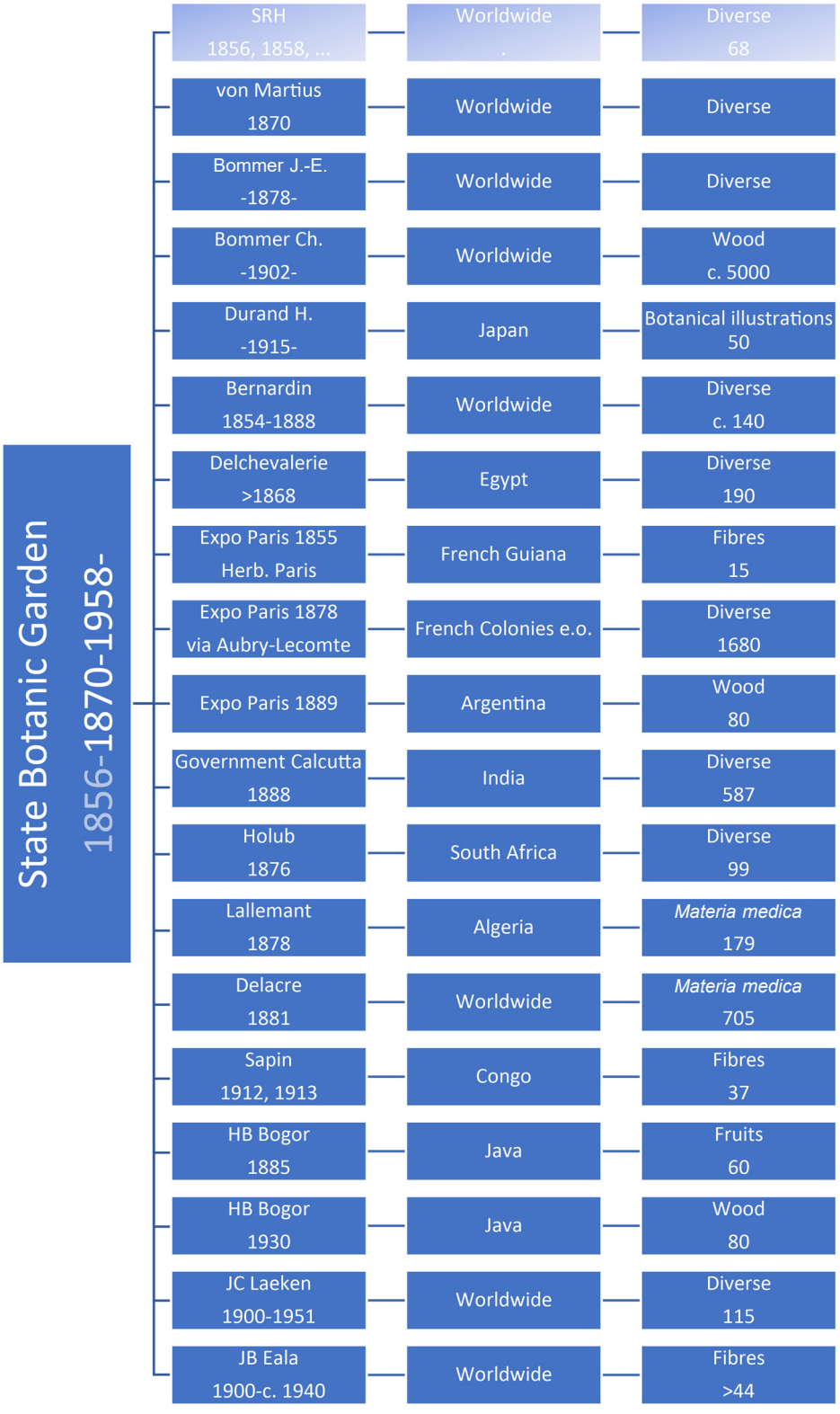
Within this publication, we delve into the economic botany collections of von Martius, the State Botanic Garden, and van Heurck, offering an overview of their most important contributors. Figure 4 summarizes the acquisition periods, main countries of origin, the economic use, and the known or estimated number of the specimens per contributor. Table 2 shows a selection of specimens discussed in this publication and their economic use.

The main aim of this paper is to offer an overview of the economic botany collection housed at Meise Botanic Garden. It focuses on the collection's history and development, highlights the individuals and organizations that have contributed to its development, as well as significant events such as world exhibitions that have shaped its history.

* Theriac is a historical medicinal concoction, originally formulated as an antidote to poisons and later used as a universal remedy for various ailments.

Fig. 3. — *Lapis judaicus*: fossilised radiolas of a sea urchin depicted on a black-and-white photo, AWH10031674.




State Botanic Garden
1856-1870-1958-
SRH
1856, 1858, ...
Worldwide
.
Diverse
68
von Martius
1870
Worldwide
Diverse
Bommer J.-E.
-1878-
Worldwide
Diverse
Bommer Ch.
-1902-
Worldwide
Wood
c. 5000
Durand H.
-1915-
Japan
Botanical illustrations
50
Bernardin
1854-1888
Worldwide
Diverse
c. 140
Delchevalerie
>1868
Egypt
Diverse
190
Expo Paris 1855
Herb. Paris
French Guiana
Fibres
15
Expo Paris 1878
via Aubry-Lecomte
French Colonies e.o.
Diverse
1680
Expo Paris 1889
Argentina
Wood
80
Government Calcutta
1888
India
Diverse
587
Holub
1876
South Africa
Diverse
99
Lallemant
1878
Algeria
Materia medica
179
Delacre
1881
Worldwide
Materia medica
705
Sapin
1912, 1913
Congo
Fibres
37
HB Bogor
1885
Java
Fruits
60
HB Bogor
1930
Java
Wood
80
JC Laeken
1900-1951
Worldwide
Diverse
115
JB Eala
1900-c. 1940
Worldwide
Fibres
>44

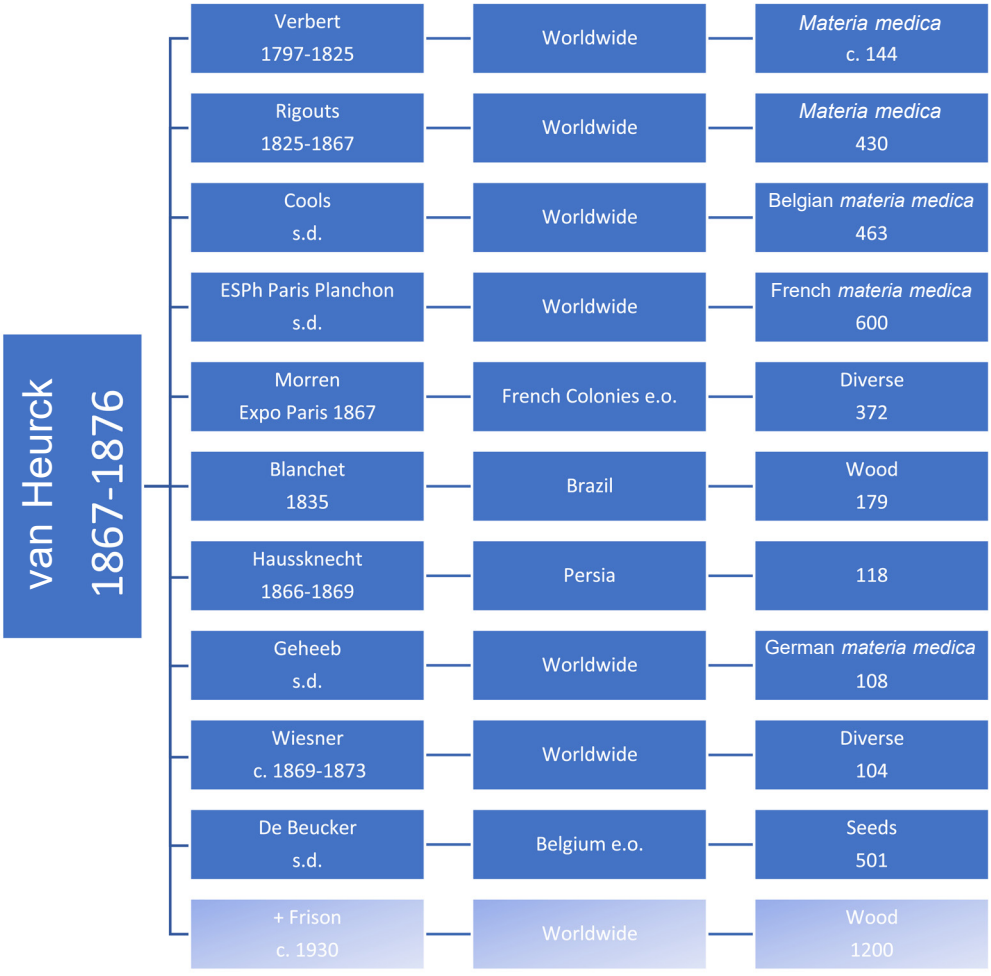


Fig. 4. — Summary of the period — collecting period or arrival of material in the contributor's collection —, the main countries of origin, the economic use and the known or presumed number of specimens per contributor and collection subset. SRH: Société royale d'Horticulture de Belgique; ESPh Paris Planchon: École supérieure de Pharmacie de Paris, Planchon.

Overview of the Collection

von Martius' Collection

Carl Friedrich Philipp von Martius (Erlangen, 1794 – München, 1868)

Carl von Martius was a trained pharmacist, physician and botanist. Together with Johann Spix, a physician and zoologist, he embarked on an extensive exploration journey in Brazil from 1817 to 1820, covering a distance of c. 10,000 km (Helbig, 1994). Their expedition extended beyond botany and zoology, delving into geology, anthropology, and linguistics. The plant specimens, objects and products they collected during this expedition found their destination in the Botanic State Collection in Munich.

Subsequently, von Martius assumed the position of director of the Munich botanic garden and a professorship at the University of Munich. He focused on the *Herbarium Martii*, his

private collection, which he continued to expand until just two months before his death. In addition to his *Herbarium Martii*, he published two monumental works: the *Historia naturalis palmarum* and the *Flora Brasiliensis*. Both of these became enduring reference works in the fields of taxonomy and biodiversity.

In 1869, the Belgian State acquired the *Herbarium Martii*, just one year after the passing of von Martius (Diagre, 2006). The collection of von Martius consists of five subsets: his fruit and seed collection, wood collection, plant product and drug collection and part of his palm collection, which currently form an integral part of the economic botany collection. The fifth subcollection is von Martius' herbarium (Eichler, 1869).

Special mention should be made of von Martius' collection of palms, which is unique in the world. Von Martius is acclaimed as the 'father of palms' (fig. 5), and apart from the great significance of his palm collection for taxonomy, it also contains material with economic importance, including palm seeds, fibres and exudates (Leyman, De Smedt & Stoffelen, 2016). For example, one of the palms that von Martius renamed and pictured in the *Historia naturalis palmarum* is *Copernicia prunifera* (Mill.) H.E.Moore, which yields the valuable carnauba wax (*Copernicia prunifera*) (fig. 6). Marcos Antonio de Macedo — Brazilian governor of Piauí — not only provided von Martius with wax in different forms (from powder to processed candles), but also complemented the product with a detailed study in order to propose it for analysis to the Sorbonne in Paris (de Macedo, 1867). At that time, he had already mentioned its quality as polish for parquet floors and introduced the wax at the Paris World Exhibition in 1867 (Seemann, 2008). This highest quality natural wax, now also used as a glazing agent for fruits, illustrates how historical economic botany collections may still have economic potential today.

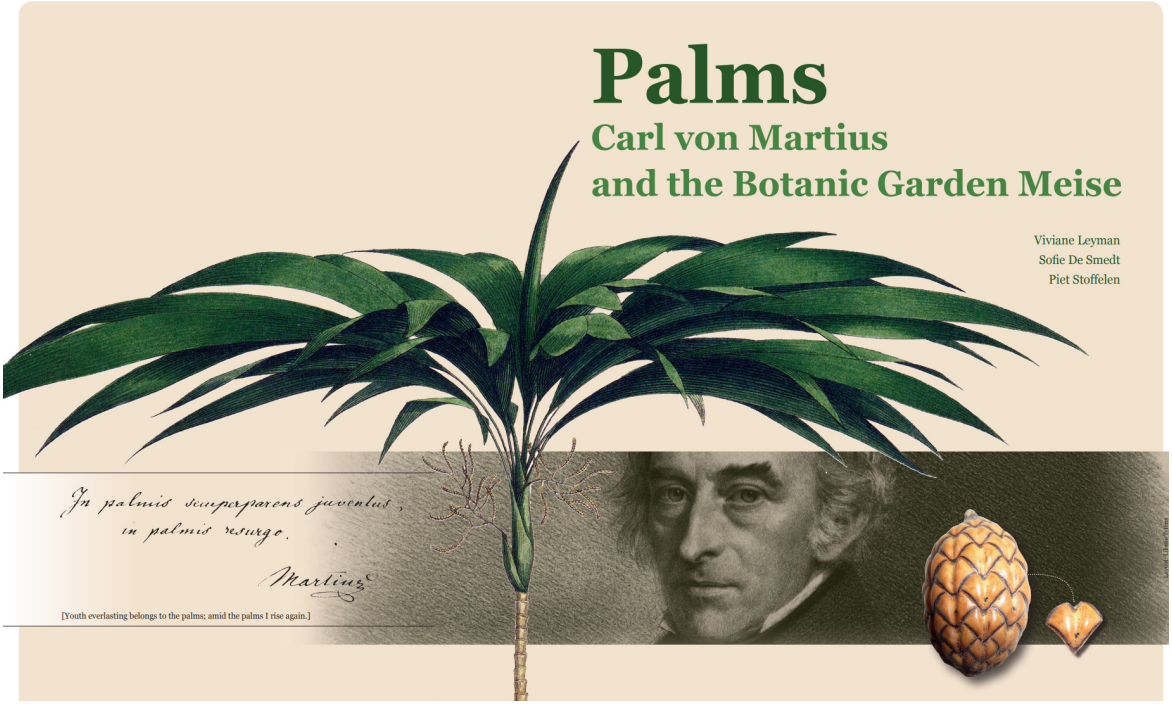


Fig. 5. — Carl von Martius, father of palms: detail from a — winning — poster (Berlin, 2016, SPNHC congress).

Fig. 6. — Carnauba wax specimens from Marcos Antonio de Macedo, BR4010003192264.

Carl von Martius built a worldwide network of more than three hundred contacts (von Martius, 1868). Among these, five emerged as principal contributors to the economic botany collection and are discussed below.

Theodor Wilhelm Christian Martius (Erlangen, 1796 – Erlangen, 1863)

Carl von Martius' brother, Theodor, followed in the footsteps of his father Ernst, court pharmacist in Erlangen. He became a pharmacologist and taught pharmacognosy at the University of Erlangen-Nürnberg. He meticulously assembled a collection of medicinal substances, consisting of six sets, designed to serve as didactic material for his students, who included aspiring doctors, pharmacists and chemists (Martius, 1832). Duplicates of these collections were made in order to sell and expand the collection. In a transaction in March 1863, C. von Martius acquired one of these duplicates from T. Martius for his *Herbarium Martii* (von Martius, 1868). These drugs, now in Meise Botanic Garden, are stored in glass jars with characteristic, recognizable labels and can be traced in a ten-part, handwritten manuscript by Theodor in 1857, and housed in the archives of Meise Botanic Garden.

As reflected in his drug collection and in his publication on pharmacognosy of the plant kingdom (Martius, 1853), T. Martius maintained a classification based on the relevant plant part ("Radices, Cortices, Gemmae, Folia, Herbae, Flores, Fructus, Semina"). Technical products ("von Pflanzenauswüchse, Pflanzensatzmehle, Pflanzenpigmente, eingedickten Säfte, zuckerartigen Producte, Gummata, Resina, Gummi-Resina, Fetten und ätherischen Oelen, und von Web-, Faser- und Seilerstoffe") (plant exudates, starches, pigments, concentrates, sugary substances, gums, resins, fats and essential oils, and weaving, fibre and rope materials) complete the classification. His drug collection also contains Brazilian medicines, collected by his brother during the expedition with Spix. Notable among these is "Herba Tayuyae" (*Cayaponia tayuya*), named after the indigenous Caiapó tribe by António Luis Patrício da Silva Manso in 1836.

An especially remarkable series originates from the Great Exhibition of the Works of Industry of All Nations, the first international exhibition, held in London in 1851. The East Indian collection of raw materials from this exhibition was entrusted to T. Martius at the University of Erlangen-Nürnberg. T. Martius described the collection in great detail for the visitors (Martius, 1853). Today, interested parties can view specimens of cotton fibre (fig. 7), both seed cotton and ginned

cotton (“ungereinigte and gereinigte Baumwolle”), along with the beautiful, old handwritten manuscript for his publication. This manuscript is rendered comprehensible by consulting T. Martius’ printed and corresponding numbered catalogue. His extensive tea collection is also well documented with data on provenance, denominations and prices in the associated manuscript.

Fig. 7. — Cotton seed fibre specimens from the collection of Theodor Martius.

In addition to T. Martius’ drug collection at Meise Botanic Garden, the main and most complete collection is housed at the Friedrich-Alexander-Universität (FAU) in Erlangen-Nürnberg, bought by the university in 1862 (Thoma, 2004), and a duplicate collection is present at the University of Vienna, bought in 1854 (https://pharmakognosie.univie.ac.at/division/historic-collections/). Of the ones in the universities of Berlin, Edinburgh and Halle little or nothing seems to remain.

Heinrich Rudolf Wilhelm Wullschlägel (Sarepta, 1805 – Berthelsdorf, 1865)

Heinrich Wullschlägel, a member of the Moravian Brotherhood, renowned for its international missionary work, embarked on a life of service. He was first dispatched to Antigua and later to Jamaica. Between 1849 and 1855 he resided in Suriname as head of the Evangelical Brotherhood in the capital, Paramaribo. He travelled along the east coast of Nicaragua before returning to Europe and being appointed as a bishop (Haarnack, 2015).

Wullschlägel worked closely with von Martius between 1851 and 1863, collecting material in the districts of Paramaribo and Para (von Martius, 1849-1851-1854). He provided von Martius with plants, wood and bark samples, fibres, fruits and seeds in exchange for books.

Wullschlägel documented the plant material with detailed information on his labels and manuscripts in his own, distinctive handwriting. He mentioned the common names of the plants in several languages, including German, *lingua franca* ("Neger-Englisch"), Arawakan and languages of the Caribbean. Furthermore, he detailed the properties and uses of the plants or plant parts. For example, he noted that the wood ashes of "kwepie" (*Couepia guianensis*) are used in firing pottery. A number of his wood samples refer to the tree plantation "Onverwacht" along the Para creek, including "pekrehoe/pegrekoe" (*Xylopia frutescens*), prized for its fine and elastic wood and the multifaceted use of its fruit as a spice and medicine.

Fig. 8. — Remarkable labelling of a "switiboontje" by Heinrich Wullschlägel showing the number 51, BR4010005365406.

He also described a unique numbering system for collection numbers via incised label edges (fig. 8). Various specimens with these labels can be supplemented by the manuscript data. He recorded fascinating facts, such as the collection of germinating seeds of the water chestnut (*Pachira aquatica*) along the Marowijne River, the consumption of the "switiboontje" (*Inga* spp.) pod when green, and the popularity of "Caneelapfel" or custard apple (*Annona squamosa*) in Suriname due to its sweetness.

Theodor Peckolt (Pechern, 1822 – Rio de Janeiro, 1912)

Theodor Peckolt is considered today as the father of Brazilian ethnopharmacology (Paraense dos Santos, 2005). He studied pharmacy and practised his profession in several German cities. On the recommendation of Heinrich Gustav Reichenbach, he found employment at the Hamburg Botanic Garden. There he came into contact with von Martius — at the time director of the botanic garden in Munich — who was diligently working on the *Flora Brasiliensis*. In 1847, von Martius contracted Peckolt to study the tropical flora in Brazil and to furnish herbarium material.

Between 1848 and 1851, Peckolt crossed several states of Brazil. During his travels he dedicated substantial attention to the plants used in folk medicine and examined their therapeutic effects. In Cantagalo he established a pharmacy equipped with a laboratory, where he complemented the morphological research on herbaria with the results of his chemical analyses.

He emerged as a pioneering figure in the field of phytochemistry, analysing more than six thousand useful Brazilian plant species. His correspondence and the dispatch of plant material to von Martius were facilitated through the imperial court of Pedro II and the German consular service in Rio de Janeiro. Between 1858 and 1867 he regularly sent wood samples, herbarium material, larger fruits preserved in liquid and plant products. The wood samples present in Peckolt's collection can be retraced through the manuscript of von Martius (1858).

At the first Brazilian National Exhibition of 1861 held in Rio de Janeiro, Peckolt presented a collection featuring one hundred and forty-six products extracted from native plants. Subsequently, at the International Exhibition of 1862 (World Fair) in London, he exhibited two hundred and twenty-five products including plants, roots and seeds, starches, resins, gums, ethers, oils and dyes. Von Martius acquired part of these products in 1863 for his *Herbarium Martii* through his son Carl Alexander (von Martius, 1863). The list of Brazilian products exhibited in 1862 by Peckolt (Anon. 1862) can be compared with von Martius' aforementioned manuscript (von Martius, 1863) and the existing material. More details can be found in Peckolt's publication (Peckolt, 1861) about his products exhibited in Rio de Janeiro in 1861. Among the noteworthy items are "orceilha do Brasil" or Brazilian orchil (*Spiloma roseum*), a red lichen dye. Amongst the starches is the purgative "batata de purga" (*Operculina macrocarpa*) and the edible cinnamon-leaf yam (*Dioscorea cinnamomifolia*). Some of the seed hair fibres represented (fig. 9) are from the floss silk tree (*Ceiba speciosa*), silk-cotton tree (*Bombax ceiba*) and bloodflower (*Asclepias curassavica*) which are used as stuffing material.

Fig. 9. — *Pappus* or seed hair from various Apocynaceae specimens from Theodor Peckolt's collection, BR4010004759626, BR4010004761391, BR4010004762428, BR4010004764484.

Charles Eugène Aubry-Lecomte (Paris, 1821-1898)

A number of French economic botany products exhibited during the International Exhibition of 1862 in London, in addition to those discussed earlier of Peckolt, reached von Martius in 1864 via Charles Aubry-Lecomte. These consist of two series originating from the French colonies: medicinal drugs from Réunion, French Guiana, Martinique, India, Senegal, Tahiti,

Fig. 10. — Specimens obtained via Charles Aubry-Lecomte including “angélique”, mentioning the wood plantation St. Louis, BRW14100338, BRW14100345.

New Caledonia, Gabon and Cochinchina (von Martius, 1864), and wood samples from French Guiana (von Martius 1854-1868). Notable items include the root of “liane de bœuf” (*Danais fragrans*), listed as *materia medica* of Réunion and used to treat herpes. The wood samples of French Guiana (fig. 10), including “angélique, bagasse, cèdre noir, courbaril, grignon, sassafras and wacapou” (tab. 2), are registered as timber for naval construction. They are part of the *Herbarium Martii* and the economic botany collection.

Von Martius’ manuscripts also make reference to Chasseloup-Laubat. Justin Napoléon Samuel Prosper de Chasseloup-Laubat, a marquis, was the French Minister of Navy and Colonies between 1860 and 1867. It was on his orders that this series of products reached von Martius via Aubry-Lecomte.

Aubry-Lecomte, initially a marine officer stationed in Senegal, was a passionate collector of ethnographic objects. His journeys took him to Gabon, Oceania and the Indian Pondichéry territory. Upon returning to Paris in 1859, he looked after the collections and the influx of economic products from the colonies. He was appointed as the first curator of the “Exposition permanente des Colonies”, which later became the “Musée des Colonies françaises”. Even after his retirement in 1879, he continued going on missions and teaching in the museum. His keen interest is also reflected in his publications (1865-1866) on the cultivation of tea, cocoa, coffee, cotton, tobacco, textile fibres and sugar cane in the French colonies (Piralla-Heng Vong, 2012). In one of his publications, Aubry-Lecomte (1875) dealt with the World Fair in Vienna in 1873, where the Belgian reporters Monsieur Bernardin and Gustave Delchevalerie were also present. Their contributions are discussed further in this paper.

Johannes Elias Teijsmann (Arnhem, 1808 – Buitenzorg (Bogor), 1882)

Johannes Teijsmann travelled to Java in 1829 as the gardener of the governor-general resident in Buitenzorg. Adjacent to the palace garden, a botanic garden had been established, and named “‘s Lands Plantentuin” (National Botanic Garden). Teijsmann’s craftsmanship and special interest in botany quickly earned him the position of head gardener of the botanic garden, a role he assumed in 1830 and held until 1869. He doubled the area of the garden and enriched it with more than nine thousand species. ‘s Lands Plantentuin gained renown for its research on botany and acclimatization. The garden became a hub for the distribution of new crops. Teijsmann worked on the cultivation of vanilla, especially focusing on pollination techniques, and the ‘fever’ tree (*Cinchona* spp.). In the Dutch East Indies, he introduced important crops

like cotton, camphor and Chinese cinnamon (Doornbos, 2021). Even after his retirement, he continued travelling in the region, collecting a vast number of plants for the garden, and describing hundreds of species (Teijsmann & Binnendijk, 1863).

Teijsmann established a connection with von Martius, providing him with plant material from Java in 1866 (von Martius, 1866). This included, apart from herbarium specimens, woods, (fig. 11a), fibres and paper samples. One sample of Manilla hemp fibre (*Musa textilis*) (fig. 11b) mentions “koffo” on the label, which appears to be the common name in Minahasa (northern region of Sulawesi), while “abaca” is its name in the Philippines (Wigman, 1901). A beautiful series of Javanese wood samples includes the fever tree or quinine producing cinchona (*Cinchona* spp.), originating from the Andes and cultivated in the “Bergtuin” (mountain garden) of Tjibodas, founded by Teijsmann in 1825.

Not only von Martius but also the State Botanic Garden in Brussels was in contact, in 1885 and 1930, with the Buitenzorg Botanic Garden, as well as Edward Frison, the Antwerp micrographer, also around 1930.

Fig. 11. — Representative specimens from the collection of Johannes Teijsmann: (a) wood specimens; (b) koffo fibres also called “abaca” on the right side, BR4010004573406.

State Botanic Garden Brussels Collection – Post-von Martius

Royal Horticultural Society of Belgium

The economic botany collection of the State Botanic Garden in Brussels still includes a number of specimens from its predecessor, the "Société royale d'Horticulture de Belgique" (Royal Horticultural Society of Belgium). Archived letters from 1854 attest the intention to set up a botanical museum.

Fig. 12. — Authentic labels on specimens — goat's rue and tomalayota — from the Royal Horticultural Society of Belgium; seeds from Vilmorin on the left, BR4010002082214, BR4010002444357.

Some Algerian products, which were exhibited at the first "Exposition universelle" in Paris in 1855, came to the Society. In an archived letter of 1856, Edmond Bouvy, a French attaché of the Ministry of War for the commercial affairs of Algeria and in charge of the museum of Algeria (Piralla-Heng Vong, 2012), pointed out that economic products, lacking in the Society's horticultural museum, could be provided. As a result, several economic products such as processed flax, cochineal, safflower and seeds of rye were donated to the Society (see tab. 2). Bouvy also maintained contact with Carl von Martius.

Already before 1870, the Society also established connections with Vilmorin (later known as Vilmorin-Andrieux) (fig. 12), a Parisian seed company which was internationally renowned for its selection work (Diagre, 2003), and obtained seed samples, including those from the bean family.

Monsieur Bernardin (discussed later in the paper) too exchanged specimens with the Society. A letter from 1858 attests this along with specimens of Turkish gum arabic, 'vegetable wool' of pine needles, mate leaves and finely woven ramie fabrics (see tab. 2).

Jean-Édouard Bommer (Brussels, 1829 – Brussels, 1895)

Jean-Édouard Bommer (fig. 13), a key figure in the history of the Botanic Garden, joined the "Société royale d'Horticulture de Belgique" in 1855. During that year, the concept of establishing a botanical museum was first proposed. At the time of the sale of the Society to the State Botanic Garden in 1870 J.-E. Bommer was director of collections. In his work titled *Notice sur le Jardin botanique de Bruxelles*, he described the complications of the transition and the purchase of the *Herbarium Martii* (Bommer, 1871). Within the newly-established botanic garden, Bommer was the driving force in the development of the scientific collections as curator of both the herbarium and the living plant collections. His desiderata for the botanical museum are

flagged in the successive catalogues of world's fairs. He held his position in the Botanic Garden from 1871 to 1895 (Lawalrée, 2001).

J.-E. Bommer laid the foundations for the economic botany collection and highlighted the substantive and logistical facets inherent to such a collection in *Remarques sur l'arrangement et la conservation des collections de produits végétaux* (Bommer, 1880). Remarkably, many of these aspects remain integral to the economic botany collection today, more than one hundred and forty years later, as described in the subsequent text. Plant products were to be stored in glass jars whose rims and those of the stopper are ground with emery to make them waterproof. J.-E. Bommer listed twenty-five sizes, the most common of which ranged in size from 11 cm in height and 3 cm in width to 33 cm in height and 18 cm in width. The monolingual, pre-printed labels of the garden were to be written with indelible "blue black" ink of the English brand Stephens. Preference was given to specimens representative of the species and the preferred species were economic crops. The amount of material held was related to the research potential; research on medicinal plants, for instance, required considerable supplies. Even detailed sizes for wood, bark and textile samples were specified. J.-E. Bommer proposed two possible classification systems: the scientific and the practical, expressing a preference for the latter, although it was not ultimately adopted, as evidenced by the current organization of the collection. Starting from 1888, the economic botany collection and the herbarium were rearranged according to Théophile Alexis Durand's *Index generum phanerogamorum* (fig. 14) which listed eight thousand three hundred and forty-nine genera of seed plants (Durand, 1888).

Fig. 13. — Portrait and signature of Jean-Édouard Bommer.

Fig. 14. — Label showing the corresponding number (5454) of the genus *Pithecoctenium* in Théophile Durand's *Index Generum Phanerogamorum*, BR4010005563406.

Charles Bommer (Brussels, 1866 – Brussels, 1939)

J.-E. Bommer's son, Charles, had the same dynamism and became the founder of the Forest Museum at the State Botanic Garden in Brussels and of the Arboretum of Tervuren, both inaugurated in 1902 (Galoux, 1969). They were both arranged according to the geographical distribution of the plant species.

Charles Bommer's great interests in mycology, dendrology, photography and botanical drawings are reflected in the economic botany collection.

At the Forest Museum, he established the very first Belgian wood collection, a considerable portion of which had been previously acquired by his father. He presented these wood samples both free-standing and in display cases and tables. The whole was completed with leafy branches, fruits, specimens showing plant diseases, pictures and botanical drawings, all essential in research. The xylarium of Meise Botanic Garden now includes the specimens of the former Forest Museum. Among these specimens is a section of a three hundred and twenty-four-year-old silver fir from the Carpathian Mountains. The original numbers are stamped into the samples (fig. 15) and refer to a card classification in use at that time. A selection of these specimens is currently displayed in the WOODlab of Meise Botanic Garden.

Fig. 15. — Classification system of Charles Bommer's wood collection using stamped numbers.

Hélène-Émilie Durand (Watermael-Boitsfort, 1883 – Uccle, 1934)

Hélène-Émilie Durand was a distinguished expert in botanical drawings and watercolours, as evidenced on the glass plates at the Forest Museum and in several books published by Charles Bommer and stored as valuables in the library of Meise Botanic Garden. Recognizing the crucial value of botanical illustrations in herbaria, Bommer emphasized that the botanical drawing adds undeniable value to the herbarium and stated: “Qui mieux qu’un artiste, en effet, peut alors — et encore — rendre les délicats coloris et détails des plantes, que la conservation en herbier tend à rendre moins lisibles?” (Van Biervliet, 2020).

For the Forest Museum, besides drawings and watercolours, Durand made exceptional glass paintings to accompany a series of Japanese wood samples dating from the third world’s fair in Paris in 1878 (fig. 16a). The number on the back of the glass paintings by chance revealed the link with the wood samples. Among her delicate works were depictions of kaki or Japanese persimmon, Japanese pagoda tree, Japanese boxwood, keaki or Japanese elm and sugi or Japanese cedar (see tab. 2). A two-volume publication describes conifers and cycads cultivated in the Arboretum of Tervuren and the State Botanic Garden in Brussels (Bommer, 1919-1930). Each species featured in the publication was accompanied by a full-page watercolour drawing (fig. 16c). The plant part she was inspired by is in some cases still in the collection. For instance, a branch of the Japanese umbrella pine or kooyamaki (*Sciadopitys verticillata*), grown in the Arboretum and stored in liquid in a remarkable quadrangular jar (fig. 16b).

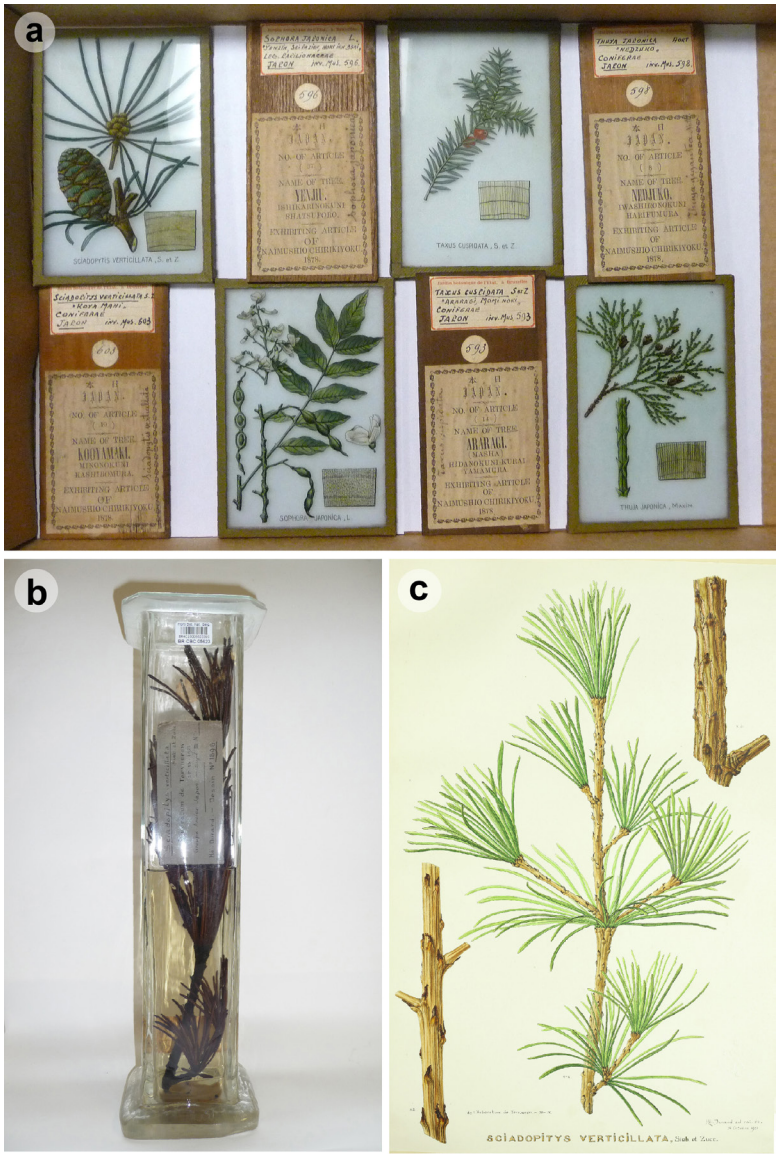


Fig. 16. — Representative specimens of Japanese umbrella tree drawn by Hélène Durand: (a) glass painting, BR4010004803428, and corresponding wood sample, BRW14109782, on the left; (b) branch preserved in liquid, BR4010005623391, which was depicted; (c) watercolour drawing.

Monsieur Bernardin – Joannes Jacobus (Jean) de Waele (Bruges, 1817 – Melle, 1889)

In 1838 Joannes de Waele joined the Congregation of the Josephites in the "Maison de Melle-lez-Gand", and changed his name to Monsieur Bernardin. In 1847 he started teaching in this private boarding school, focusing on literature, languages, mathematics, sciences, law, trade and industry. He took charge of the course on commerce and natural sciences. For his practical classes, he established and curated the Commercial-Industrial Museum, among other museums within the college. Through a series of annual reports titled "Notice sur les collections scientifiques et sur le Musée commercial-industriel", Bernardin created publicity for the internationally-renowned college. The museum continued to exhibit new materials and equipment in use by industry at that time. By 1866, his collection included over thirteen thousand specimens from the various continents. He also published several booklets in multiple languages — French, English, German, Dutch, and Spanish — about the classification of vegetable oils, fibres (fig. 17a), tanning agents, rubber and gutta-perchas, animal oils, soaps, and starches, as well as studies on the commercial products of Central Africa, and the natural resources of the globe. The diverse products of Bernardin, now in the economic botany collection at Meise Botanic Garden, hold invaluable contextual information (Leyman, 2022). For example, seeds of "lucrabau" (*Gynocardia odorata*) from Thailand, known from the extracted chaulmoogra oil which is efficient against leprosy, is linked to the journey of the frigate Novara from 1857 to 1859 which was the first German travel around the world by boat. Bernardin referred to the travel report of Karl von Scherrer who described these seeds collected in Siam. Bernardin, in the meantime, translated the preparation and use of the oil which can be read on the label of the specimen.

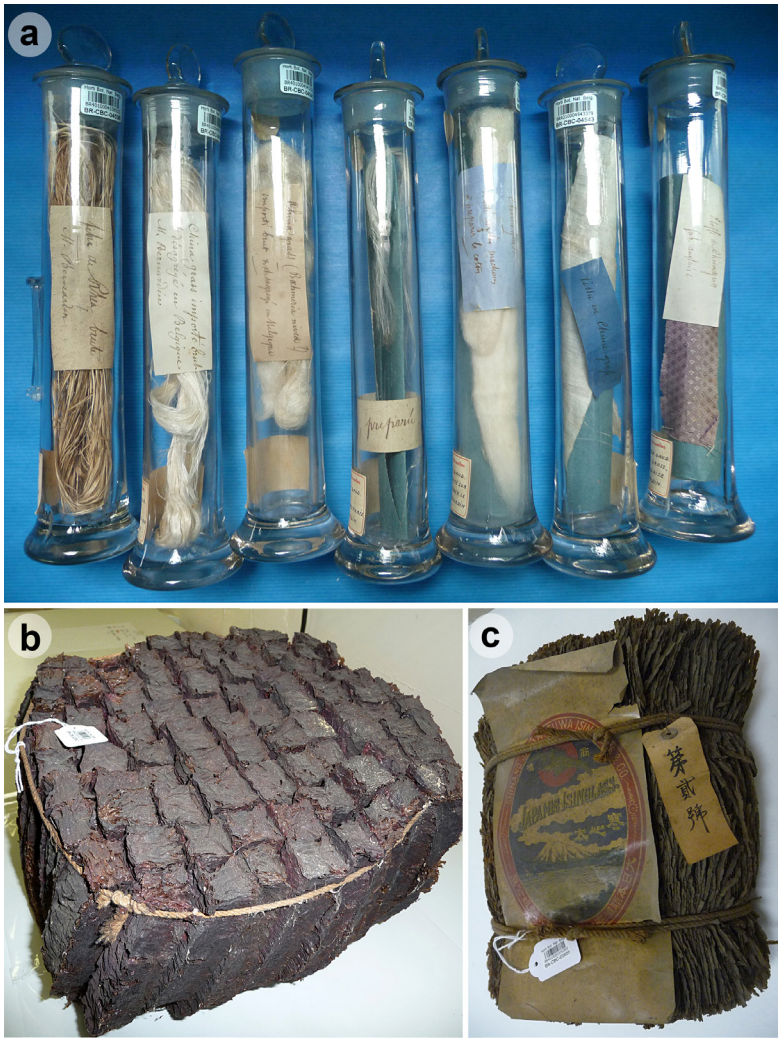


Fig. 17. — Representative specimens from the collection of Monsieur Bernardin: (a) specimens of ramie fibre, BR4010004538511, BR4010004539549, BR4010004540286, BR4010004541313, BR4010004542341, BR4010004543379, BR4010004544406; (b) square Japanese isinglass, BR4010002921391; (c) lined Japanese isinglass, BR4010002920363.

Bernardin visited the Vienna World Fair in 1873, with a particular interest in economic plants, and wrote down his findings in a publication, providing detailed insight into dozens of natural products (Bernardin, 1874). He gathered some of them from the oversupply of scattered novelties on display. This information is still valuable one hundred and fifty years later in understanding the economic botany collection in Meise. For instance, he described the two forms of Japanese isinglass (*Gelidium* spp.) or agar-agar (fig. 17b,c), exactly as they appeared in the collection in 2015. His information confirms the result of the recent search on the non-documented specimens. The publication is full of innovative ideas. A noteworthy novelty for the paper industry in 1873 was the "sausage skin made of vegetable parchment" manufactured in Wurtemberg (species not mentioned). Bernardin concluded with a foresightful statement about the untapped potential of numerous products scattered across the globe, possibly leading to new industrial applications — a statement that remains pertinent even today.

Teaching for four decades, Bernardin gained international acclaim. His museums of ethnography and geography in particular are still famous today in what is now known as the College of Melle.

Gustave Delchevalerie (Vedrin, 1841 – Chaumes-en-Brie, 1899)

Gustave Delchevalerie, a Belgian horticulturist, initially gained recognition for his expertise in the parks and gardens of Paris before embarking on a journey to Egypt in 1868 (Wilkinson, 2010). He entered the service of the Khedive of Egypt and Sudan, Isma'il Pasha, who modernized his country based on the European model. Delchevalerie provided his expertise in the start-up of an agricultural school and nurseries and reformed the acclimatization garden.

Delchevalerie published mainly on garden architecture and horticulture. He collected and described agricultural and horticultural products and sent specimens to the State Botanic Garden in Brussels. These included wood samples from the banks of the Nile and different samples of dates, cotton (fig. 18) and tobacco, all listed in his unpublished manuscript and still present in the collection today.

Fig. 18. — Old, more explicit label of a cotton specimen from the Egyptian collection of Gustave Delchevalerie, BR4010002330193.

At the World's Fair in Vienna in 1873, he was a member of the Egyptian Commission and international jury member. His report from the fair emphasized ornamental plants in particular (Delchevalerie, 1873b).

"Expositions universelles" in Paris (1855, 1878, 1889)

The third world's fair in Paris, held in 1878, was of significant importance for the development of the economic botany collection of the State Botanic Garden in Brussels, which received an extensive collection of useful plants and products from the French colonies. This acquisition was made possible through the "Exposition permanente des Colonies" and its curator, Charles Aubry-Lecomte, who is discussed above.

The French overseas territories, which were widely dispersed geographically, comprised Cochinchina, Gabon, Guadeloupe, Guinea, French Guiana, India, Madagascar (île Sainte-Marie), Martinique, Mayotte and Comoros, New Caledonia, Tahiti, Réunion, Saint-Pierre-et-Miquelon, and Senegal.

The collection obtained was vast, covering a wide array of categories including wood, textiles (fig. 19a), tanning and dyeing agents, gums and resins, rubbers, perfumes, fats and oil products, waxes, spices and condiments, stimulants and narcotics, medicinal plants, fruits and seeds, cereals, starches, sugars and saponins. The uncovering of the collection is still ongoing. The handwritten, original lists of these acquisitions are subdivided by country and by category and include scientific and common names.

In the publication *Catalogue des produits des colonies françaises* at the "Exposition universelle" of 1878 (Anon. 1878b), many species appearing in the economic botany collection were marked with a red pencil, most likely by J.-E. Bommer. These include, for example, around a hundred selected wood species of Sainte-Marie de Madagascar.

In addition to the products from the French colonies, there are acquisitions from other countries including Japan, the United States, Haiti, Peru, Egypt, Australia, Argentina and El Salvador. The Salvadoran products are ticked off, this time in blue, in the *Catalogue des objets exposés par la République du Salvador* (Guzman, 1878).

A limited number of specimens in the collection originate from the first (1855) and fourth (1889) world's fairs of Paris. From the 1855 Exhibition, there are fibre specimens from British Guiana obtained via the *Museo Herbario Parisiensis* (fig. 19b), and from the 1889 World Exhibition, there are Argentine wood specimens originally intended for the former Forest Museum in Brussels.

Products of the second world's fair in Paris in 1867 only appear in the Henri van Heurck's collection, described later.

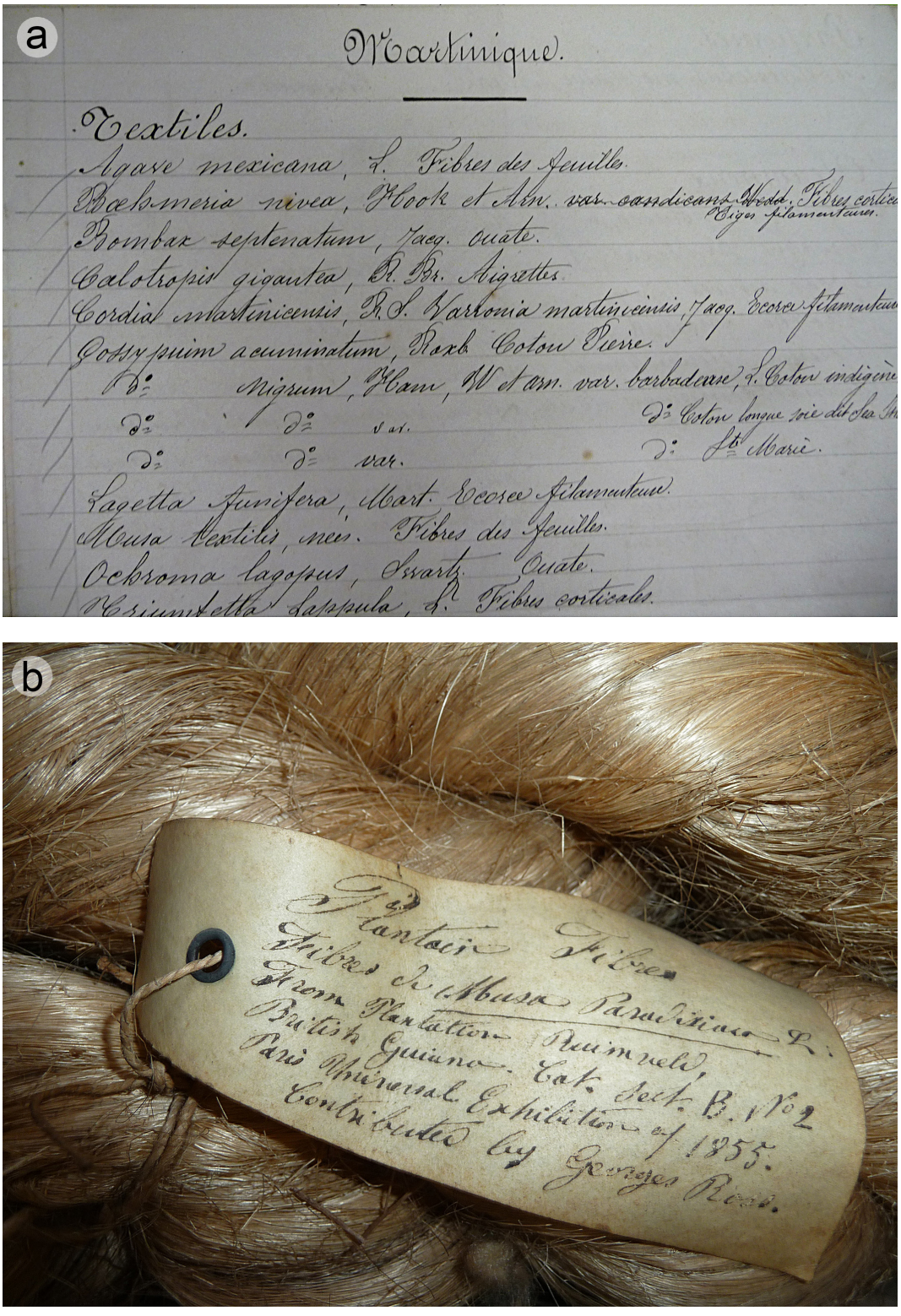


Fig. 19. — Items regarding the third and the first world exhibitions of Paris: (a) manuscript list from 1878 matching with the fibre specimens of Martinique; (b) specimen of banana — plantain — leaf fibre from 1855 originating from British Guiana, BR4010004560307.

Government of Calcutta (1887-1888)

In 1888, the Revenue and Agricultural Department of the Government of India supplied a collection of Indian economic products to the Government of Belgium (Mukharji, 1887). The corresponding printed archive list mentions four hundred and twenty plant species including plant parts and products, and some minerals and silk. Among the examples are four specimens of munj sweetcane (*Tripidium bengalense*) represented by flower tops, straw, fibre and rope (fig. 20). Another example is bark of the yellow mangrove (*Ceriops decandra*), the sap of which yields a black, tannin rich dye used in the ‘batik’ industry and in preserving fishing nets.

Although the original labels of the specimens do not specify their provenance, their unique characteristics trace them back to Calcutta (now Kolkata). Some labels are printed, listing various Indian common names, while others are handwritten in elegant script on linen-coated paper, with details that correspond perfectly with the previously mentioned archive list.

Fig. 20. — Specimen from the Indian economic product collection: fibres and rope of munj sweetcane, BR4010004744462.

Emil Holub (Bohemia, 1847 – Vienna, 1902)

Emil Holub studied medicine at the Charles-Ferdinand University of Prague. He became a physician but his interest in natural sciences and archaeology led him to South Africa in 1872 where he started his practice in Kimberley. He undertook three expeditions but eventually succumbed to malaria.

Holub's collections, housed in various institutions, including the *Naturhistorisches Museum Wien* (Mauthe, 1997) and the National Museum (Prague) are among the earliest holdings from South Africa (Mauthe, 1997; Jirouškouvá *et al.*, 2011).

In 1876, the State Botanic Garden acquired Holub's herbaria and about a hundred economic botany specimens. He documented the latter thoroughly (with description, local use, location and common names) in a handwritten catalogue (fig. 21a). One of these specimens was a giant sorghum species "mobele" (*Sorghum bicolor*), commonly cultivated in South and South-central Africa for its use as a cereal and production of "butschuala" beer and the stronger "mo-timbo". Holub's material is stored in very distinctive glassware and some species are meticulously mounted on thin glass slides (fig. 21b).

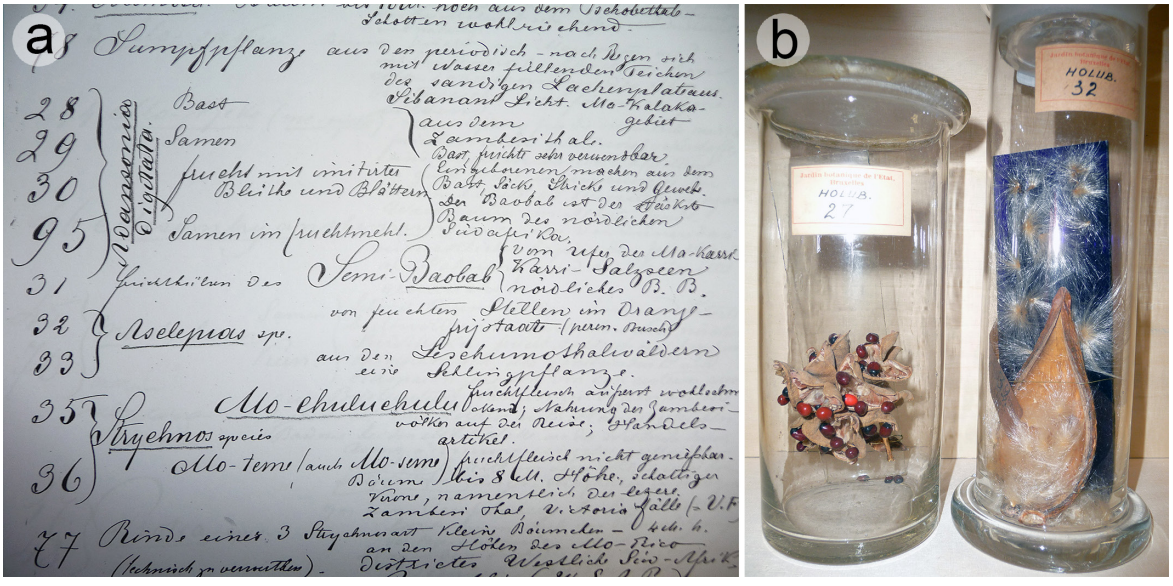


Fig. 21. — Representative items from the collection of Emil Holub: (a) detail of manuscript; (b) specimens of rosary pea and milkweed mounted on glass slides, BR4010004226357, BR4010004229440.

Charles Lallemant (France, 1878 – ?)

Charles Lallemant was a pharmacist. He moved to Algeria and opened a drugstore in L'Arba (later called Larbaâ) near Algiers. Lallemant studied native flora and fauna (including vesicating beetles, molluscs and leeches) which provided an arsenal of therapeutic products (Bonnemain, 2009).

Lallemant's collection, consisting of medicinal and industrial products of Algeria and accompanied by a handwritten list (fig. 22a), eventually found its way to the State Botanic Garden in Brussels. An example is medicinal "garou" bark (*Daphne gnidium*) (fig. 22b). This list dates from around 1878. Lallemant is also mentioned in the accompanying catalogue of the Algerian

colony at the world's fair in Paris (Anon. 1878a), which lists agricultural and industrial products. He was one of the exhibitors in group 5 (extractive industries, raw and manufactured products), class 47 (chemical and pharmaceutical products).

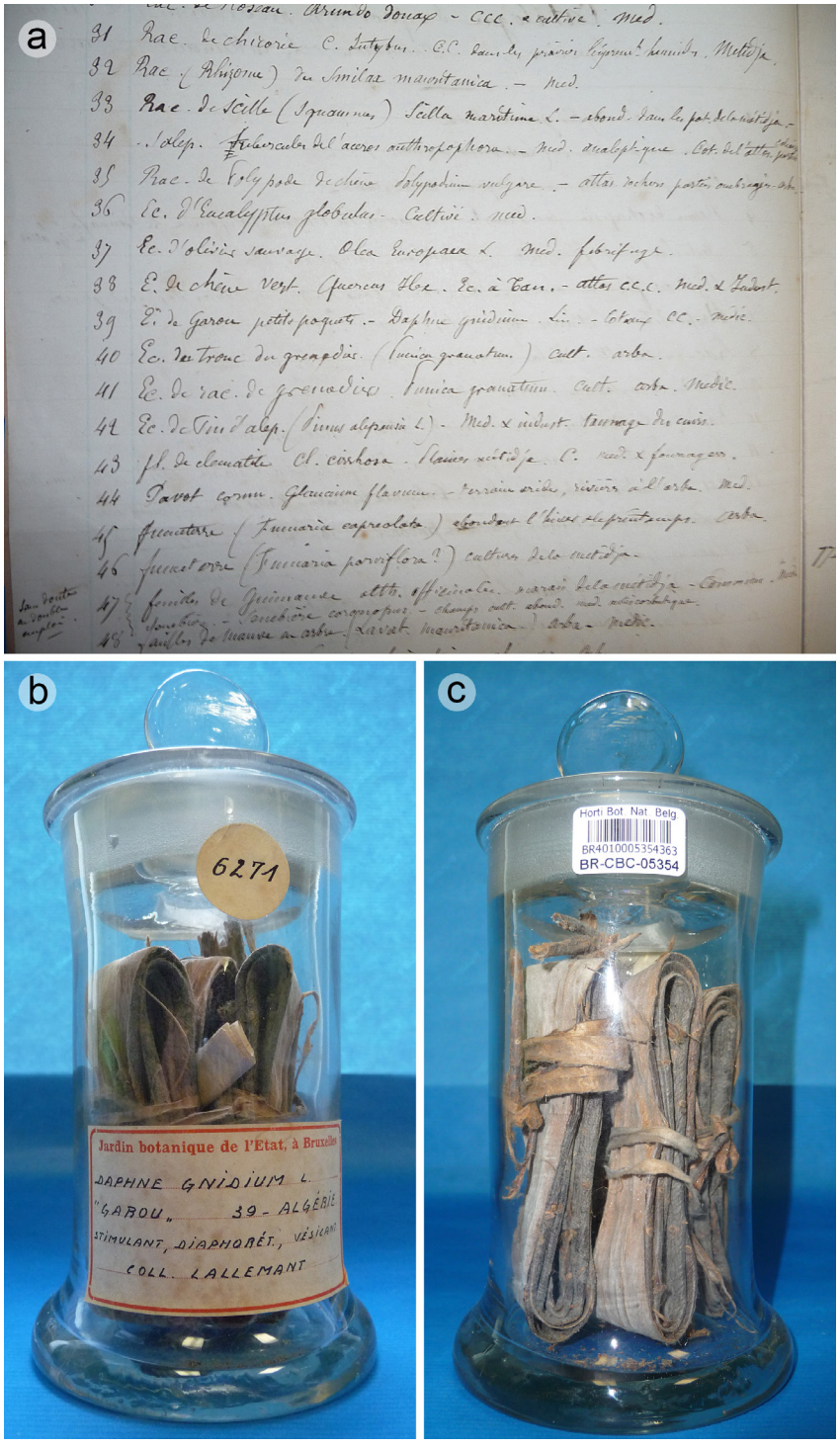


Fig. 22. — Representative specimens (a.o. nr 39) from the collection of Charles Lallemant: (a) detail of manuscript; (b) & (c) medicinal "garou" bark, BR4010005354363.

Ambroise Delacre (Brussels, 1859 – Brussels, 1926)

Ambroise Delacre was the firstborn son of Charles Delacre, who opened a pharmacy ("Pharmacie anglaise") in Brussels in 1853. Charles Delacre also sold chemical specialties, Chinese tea and cocoa, which led him to the manufacturing of chocolate and later the famous Belgian Delacre biscuits in Vilvoorde. Ambroise Delacre also studied pharmacy and in 1884 took over the business of his father situated at the "Coudenberg", previously known as rue Montagne de la Cour (Lausberg, 1999). Notable among his listed specialties were products like quinine toothpaste, tincture of myrrh and borax, castor oil pomatum and genuine American bay rum (Anon. n.d. b).

In 1881 and subsequent years, the State Botanic Garden in Brussels obtained his private "Collection Ambroise Delacre", encompassing medicinal products, bark, and wood samples from various parts of the world. One document in the Meise archives lists an exchange of specimens with the *Herbarium Martii*. Other specimens originate from the collections of Bernardin. Ambroise also ordered products from various companies such as Fougera (Brooklyn), Gehe & Co. (Dresden), Evans, Lescher & Webb (London), and Delvaille et Attias (Paris). Of the latter company, a revealing delivery receipt illustrates a series of cocoa bean cultivars, shipped by high speed from Paris to Vilvoorde, and still part of the collection today. The cocoa bean jars of Delacre (fig. 23a) are distinctive for their stoppers containing a dehydrating powder (fig. 23b).

The second, stylish pharmacy of Delacre, also located at the "Coudenberg" in Brussels, is now a listed building. The inscription "Pharmacie anglaise – Ch. Delacre" can still be seen on the façade.

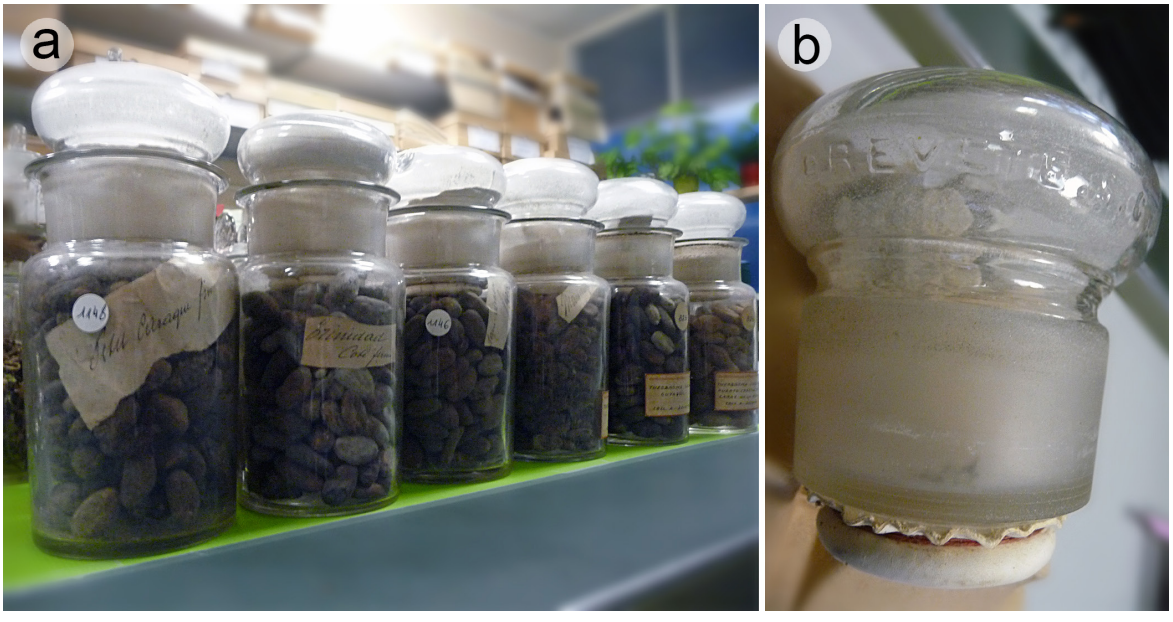


Fig. 23. — Representative specimens from the collection of Ambroise Delacre: (a) cocoa bean specimens; (b) distinctive jar stopper.

Albert-Louis Sapin (Charleroi, 1869-1914)

Albert Sapin graduated as a pharmacist from Ghent University in 1891 where he then started to work as a "preparationist" (laboratory assistant). By 1894 he became head of the laboratory at the A. Delacre pharmacy in Brussels. Three years later, in 1897, he set up his own pharmacy

in the capital. In 1902, he joined the Congo Free State as attaché to the medical service in Boma. He collected many documents and data of a botanical, cultural and economic nature. He obtained his doctorate in 1905 and was sent on scientific and economic missions (Coosemans, 1958). Labels from various herbaria mention, for example, “Mission scientifique de la Compagnie du Kasaï”. It was from this last mission in Ubangi, in 1912 and 1913, that his economic botany specimens originated. Some of these include excellent plant fibres, and labels detailing the processing method: raw, processed and manufactured banana (*Musa* sp.) and pineapple (*Ananas sativus*) leaves (fig. 24), alongside n’kosa bast fibre (*Manniophyton fulvum*) and barkcloth (*Ficus* spp.). In 1914 he returned to Belgium for a brief stay but unfortunately died in 1914 after a trivial accident.

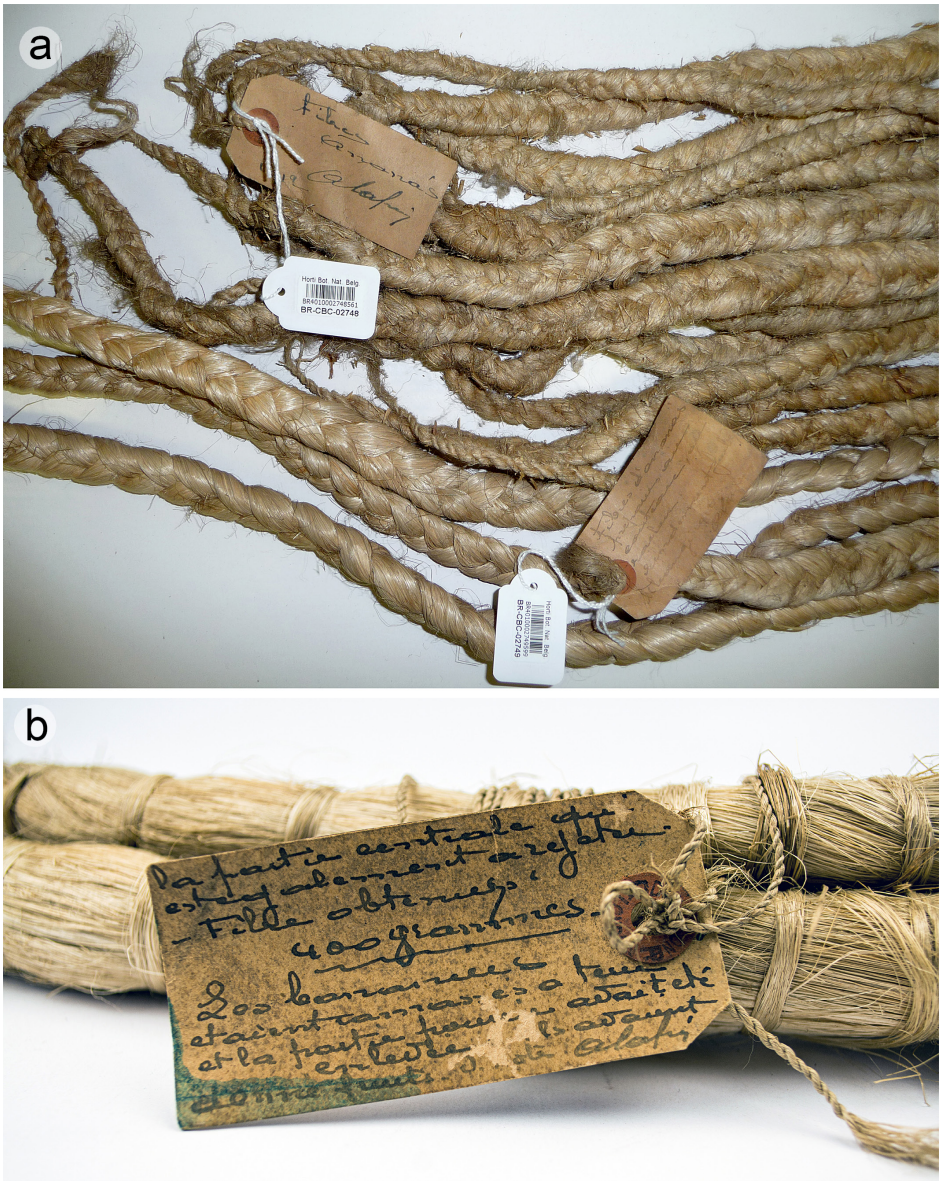


Fig. 24. — Representative specimens with well-documented labels from the collection of Albert-Louis Sapin: (a) braided pineapple fibres, BR4010002748561, BR4010002749599; (b) pooled banana fibres, BR4010002728549.

Museum Botanicum Horti Bogoriensis (1885, 1930)

A letter dated February 1885 from Melchior Treub (director of "'s Lands Plantentuin" in Buitenzorg from 1880 to 1910) to François Crépin (director of the State Botanic Garden from 1876 to 1901) emphasizes the collaboration between the two botanical gardens and describes a shipment of Javanese plant objects packed in four boxes. These objects included herbarium specimens of economic plants, coffees and economic fruits preserved in liquid. Treub expressed the wish to exhibit some of these objects at the world's fair in Antwerp that same year. The labelling of the jars containing fruits from the *Museum Botanicum Horti Bogoriensis* (fig. 25a) is house-styled and also mentions the Javanese popular name, *e.g.* "pisang, manga, advogado" (see tab. 2).

Later, in 1930, another shipment from "'s Lands Plantentuin" in Buitenzorg reached the State Botanic Garden in Brussels. This time, it consisted of a large series of well-documented Javanese wood samples from the forestry research station "Boschbouwproefstation" that were shipped from Java to Amsterdam with the M.S. Christiaan Huygens. The information provided by the labels consists of scientific and common names, durability rating and use. For example, the label of Indian sandalwood (*Santalum album*) specifies its various applications for medicinal purposes, carving and its fragrant heartwood. Also four, less obvious mangrove wood samples — tandjang or black mangrove (*Bruguiera gymnorhiza*), tingi or spurred mangrove (*Ceriops tagal*), bakau or red mangrove (*Rhizophora mucronata*) and baropa or apple mangrove (*Sonneratia alba*) — are included (fig. 25b).

Fig. 25. — Representative items from the collection of Bogor Botanical Garden: (a) label of the garden's museum on plantain specimen, BR4010005269490; (b) mangrove wood samples, BRW14115608, BRW14115622, BRW14115615, BRW14115646.

"Jardin colonial de Laeken" (J.C.L.) (Brussels, 1900-1951) and "Jardin botanique et Jardin d'Essai à Eala" (near Mbandaka, formerly Coquilhatville, 1900 – to this day)

A decree from 3 February 1900 by Leopold II found in the library of Meise Botanic Garden stipulates the creation of a botanical and a trial garden in Congo, and a colonial garden in Belgium. The latter was to provide the former with plants, chosen by the state, to be introduced as new crops in Congo (Anon. 1900)

The colonial garden in Laeken, near Brussels, was dedicated to gathering suitable and economically important plant species aimed at developing agriculture in Central Africa. René Kinds, appointed director of the colonial garden, oversaw the cultivation of these plants and prepared them for shipment to Congo by boat. At the port of Antwerp, he provided final instructions for their successful transport (Comeliau, 1952). Kinds published a list of these plants, cultivated in 1911 (Kinds, 1912).

In addition to his horticultural skills, Kinds excelled in applied agricultural research. For example, Kinds explored the "mabondo" nut (*Osmorhiza aristata*) as a potential African equivalent of the American palm nut, corozo (*Phytelephas macrocarpa*), the well-known vegetable ivory (Kinds, 1924). Kinds had these nuts processed into buttons in the Brussels Gauthier factory. He arranged nuts and buttons in glass-fronted cases, still in the economic botany collection in Meise (fig. 26a). Some products, such as cassava flour (*Manihot esculenta*) and seeds of oil palm (*Elaeis guineensis*), were stored in decorative glass jars, all with distinctive labels, elegantly handwritten and with the letters 'J.C.L.'. Other examples include palm and palm kernel oil from the oil palm (fig. 26b) and an ample range of coffee bean samples.

Fig. 26. — Representative specimens from the collection of the Colonial Garden in Laeken: (a) vegetable ivory from mabondo nuts manufactured into buttons, BR4010002843440; (b) oil palm nuts, BR4010003449511, and palm oil, BR4010003434357 (two jars at the left).

The Eala Botanical Garden grew tropical economic crops, including foods, feeds, fibres, oils, pharmaceutical, ornamental, and industrial crops. Seeds and plants from the propagation nurseries were exchanged with similar institutions or bought by companies and individuals. The first list of cultivated plants published in 1908 includes around eight hundred and twenty species, varieties and cultivars. It mentions whether seeds or plants were available in addition to information about common names, use and origin (Anon. 1908).

From the Eala Botanical Garden, mostly plant fibres appeared in the economic botany collection, apart from some fruit and seed specimens. A valuable report from around 1940 listed thirty-six fibre plant species, detailing crucial information such as the weight of the crude fibre material, the retting period, the weight of the fibre output and the fibre percentage (fig. 27) (Dehon, [1940]). The Eala fibre samples still in the collection almost completely match those on this list. Species that provide the highest fibre yields appear to be Queensland hemp, kenaf, devil's cotton and Congo jute (see tab. 2).

Fig. 27. — Agave fibres from the Eala Botanical Garden with yield data per plant species, BR4010004633391, BR4010004634428.

Fig. 28. — Portrait and signature of Henri van Heurck.

van Heurck's Collection

Henri-Ferdinand van Heurck (Antwerp, 1838 – Antwerp, 1909)

Henri van Heurck's father and grandfather had been manufacturers of paints, oils, varnishes and saccharin (of which they were the only manufacturers in Belgium and the Netherlands) since 1787 (van Heurck, 2008). Van Heurck (fig. 28) initially taught natural sciences, chemistry and physics. He eventually directed his expertise towards horticulture, botany, plant anatomy and microscopy. His dedication and contributions to the field of microscopy and diatoms established him as an authoritative figure.

In 1877 he was appointed as director-professor of the Botanic Garden in Antwerp. Under his guidance, the garden was thoroughly renovated and a museum was added, known as the "Musée botanique du Dr Henri van Heurck". In this way van Heurck could offer a comprehensive educational package covering systematic, anatomical and medico-commercial botany to trainee pharmacists, teachers and professors, army officers, and enthusiasts. It was in the Botanic Garden of Antwerp — in 1893 and 1895, before the foundation of the colonial garden in Laeken — that van Heurck took care of the plants which were to be shipped to Congo. He invested a fortune in enriching his museum, expanding significantly his herbarium, library and drug collection (Van Camp, Dorikens, Dorikens-Van Praet & Haustraete, 2004). In his drug collection, which includes crude drugs, derivatives, excipients and forgeries, the famous *materia medica* collection of Verbert-Rigouts is the basis. This collection goes back to 1763, which means that the drogarium contains unique products that were no longer available in 1876 (Verleyen, 1942). He classified the specimens according to A.P. de Candolle's *Prodromus Systematis Naturalis Regni Vegetabilis* (van Heurck, 1876).

Separate specimens of larger, exotic fruits and products, in addition to the old collection of wood samples collected by Blanchet in Bahia in 1835, are also represented. A large seed collection from the company of Frans De Beucker is embellished with a range of decorative glass jars. It also features two *materia medica* cabinets (fig. 29a) and many microscopic preparations of plants, animals and stones.

The van Heurck's economic botany collection also incorporates a representative number of products of animal and mineral origin, which illustrates natural history in a fuller scope.

An important publication by van Heurck for this collection is *Notions succinctes sur l'origine et l'emploi des drogues simples de toutes les régions du globe* (van Heurck, 1876), being a "Catalogue systématique de la collection de matière médicale, commerciale et industrielle faisant partie du Musée botanique de l'auteur". This catalogue provides a wealth of information in addition to that found on specimen labels.

Van Heurck also knew how to supplement his drug collection with exceptional specimens. For example, a Venetian theriac sample from 1603 in a small metal container — catalogued as pharmaceutical curiosity — with the inscription "Teriaca fina alla Testa d'Oro in Venet" (fig. 29b), is one of the oldest specimens in the economic botany collection of Meise Botanic Garden. Theriac is the legendary antidote to a broad spectrum of poisons.

Fig. 29. — Representative specimens from the *materia medica* collection of Henri van Heurck: (a) cabinet drawer with vials; (b) Venetian theriac sample, AWH10031599.

Below are some of the important individuals and institutions which contributed to van Heurck's economic botany collection. Pharmacy again plays an important role, as can be seen hereafter starting with three successive generations of pharmacologists-naturalists.

François Mathieu Verbert (Sint-Katelijne Waver, 1769 – Antwerp, 1854)

Mathieu Verbert commenced his professional career as an apprentice pharmacist before transitioning to manage a chemical product factory. Verbert opened his pharmacy office in Antwerp in 1797. In 1812, he obtained the exceptional title of first-class pharmacist after an exam in Paris (Frison, 1962). From the end of the 18th century, he started his collection of drugs — some from 1763 —, which would continuously serve as demonstration material for the medico-botanical classes in Antwerp between 1819 and 1908, utilized in his own classes and later by F. Rigouts and van Heurck (Aernouts & Frison, 1959).

Verbert's distinct and authentic jars at Meise Botanic Garden are easily recognizable, characterized by teal-edged and handwritten labels and jars that are sealed with paper and string. His specimens represent the earliest economic botany collection of significant size of Meise Botanic Garden.

One of the ancient drugs, allegedly blood-purifying, is red coral (fig. 30a). Its classification as zoophyte was controversial and made it a luxury collectable in naturalia cabinets in the 17th century. Red coral was then shipped in Antwerp to trade for diamonds in India (Rijks, 2019). *Conditura cadaverum* or Egyptian mummy powder is a rather unexpected specimen. Kaolin, "soude de varech" or sodium carbonate from burnt marine algae (mainly *Fucus* spp.) and "Succinum album, S. citrinum, S. rubrum, S. nigrum" being different coloured forms of amber from the Baltic sea, are some of Verbert's mineral products. Three varieties of ipecac or ipecacuanha (*Carapichea ipecacuanha*) from Brazil — a strong emetic used since ancient times — are especially worth mentioning since they originate from the collection of François Victor Mérat de Vaumartoise, who described them extensively in his pharmacopeia (Mérat & de Lens, 1837). South American copal resin from the Antilles piled up in gourd halves and tied with vegetable rope (fig. 30b), moreover illustrates the storage and transport method of this product.

Fig. 30. — Representative specimens from the collection of Mathieu Verbert: (a) red coral, AWH10030202; (b) South American copal resin, AWH10009192.

François Joseph (Frans Jozef) Rigouts (Lier, 1796 – Antwerp, 1867)

François Rigouts (also known as Rigouts-Verbert) first went into training at the pharmacy of J. Van Eeckhoven in Lier. In 1821 he moved to Antwerp. In 1825 he married Verbert's daughter

and took over her father's pharmacy, where he further expanded the *materia medica* collection. Rigouts became professor of botany, medical natural history and theoretical and practical pharmacy in 1829 (Broeckx, 1868) and was appointed director of the Botanic Garden in Antwerp in 1856. This resulted in the creation of a botanical cabinet in which exotic and indigenous wood species were also included. Meanwhile, the young van Heurck lived adjacent to the botanic garden; his father regularly consulted F. Rigouts, awakening the enthusiasm of van Heurck (Aernouts & Frison, 1959).

With regard to plants, F. Rigouts organized his *materia medica* collection, unlike T. Martius, according to Guibourt's new classification in his *Histoire naturelle des drogues simples* (Guibourt, 1876). This implied that related plant genera and species (and no longer plant parts) went together.

F. Rigouts also collected every new drug on the market, as well as forgeries, bizarre and rare samples. The Rigouts-Verbert drug collection was a valuable completion of van Heurck's collection.

The collection contains various vegetable samples, including chunks of opium (*Papaver somniferum*) as well as opium forged with clay, wax and starch. Nest pieces of the "salangane" or glossy swiftlet from Java and African lion claws are representative of animal products (see tab. 2). Compounds of uranium and cobalt and tremolite — a form of asbestos — (fig. 31) are part of the mineral material.

F. Rigouts passed on his pharmacy and collection to his son Charles.

Fig. 31. — Tremolite or "lin fossile" from François Rigout's mineral collection, AWH10030622.

Charles Rigouts (Antwerp, 1828 – Antwerp, 1892)

Charles Rigouts, also a pharmacist, was passionate about botany, research into forgeries of medicines and foodstuffs and in the history of pharmacy. He sold his drug collection, commenced by his grandfather Verbert, to van Heurck, laying the foundations for the "Musée botanique du Dr Henri van Heurck" (Aernouts & Frison, 1959).

François Cools (Antwerp)

François Cools studied under the guidance of F. Rigouts and gained years of theoretical and practical knowledge in his pharmacy. Cools' expertise was also often called upon in van Heurck's botanical museum.

At the time, the type collection of the Cools' drugstore represented the Belgian *materia medica* and comprised more than one thousand products. Today, the van Heurck collection still contains a surprising number of specimens of plant, animal and mineral origin from this collection. The following specimens are an illustration of the diversity of this collection.

Carrageen moss or Irish moss (actually a red alga, *Chondrus crispus*), which contains a lot of polysaccharides, is currently known as food additive E407. Petitgrain, bergamot, curaçao and neroli oils are all essential oils from bitter orange (*Citrus aurantium*). Spanish flies, ox gall extract and cod liver oil (see tab. 2) are animal remedies. Alkaloids like the stimulant caffeine (fig. 32a) — from coffee beans — and the toxic strychnine and brucine — from Saint Ignatius beans (*Strychnos ignatii*) — are chemical derivatives, and verdigris, "sel sédatif de Homberg" and epsom salt are among the mineral compounds (fig. 32b) in Cools' collection.

Fig. 32. — Representative specimens from the collection of François Cools: (a) caffeine specimens, AWH10013946, AWH10013953; (b) mineral compounds, AWH10030981, AWH10031407, AWH10030943.

"École supérieure de Pharmacie de Paris" (Paris, 1876) and François Gustave Planchon

Van Heurck received a considerable collection of rare and interesting products from the "École de Pharmacie de Paris" by Planchon. About half of the specimens were from Guibourt's collection, some of them bearing his handwritten labels.

Gustave Planchon (1833-1900) was director of this college. He supplemented the legacy of his predecessor, Guibourt. Nicolas Jean-Baptiste Gaston Guibourt (1790-1867) gained renown for his *Histoire naturelle des drogues simples*, of which five editions were published between 1820 and 1851. Planchon complemented the sixth and seventh editions between 1869 and 1876, introducing a new classification system of the mineral, plant and animal kingdoms. For mineralogy, Guibourt adapted the basic elements of Ampère; for botany he followed the *Prodromus Systematis Naturalis Regni Vegetabilis* of A.P. de Candolle and for zoology the classification of Cuvier (Guibourt, 1876).

The series of specimens of Guibourt is among the oldest in the economic botany collection in Meise Botanic Garden, though slightly younger than the Verbert collection.

It contains a hundred wood samples and a high number of Guibourt's cinchona (also known as fever trees) bark samples (fig. 33) — yielding quinine — which are extensively described on eighty-two pages in Guibourt's *Histoire naturelle des drogues simples* (Guibourt, 1876). Guibourt referred to the initial research of Hipólito Ruiz (Ruiz, 1792) and Hugh Algernon Weddell (Weddell, 1849) from whom bark material is represented in the *Herbarium Martii*.

Fig. 33. — Part of Guibourt's fever tree bark specimens from the collection of the "École de Pharmacie" in Paris, AWH10015544.

Fig. 34. — Australian acaroid resin from the collection of Charles Morren, AWH10027158.

Charles Jacques Édouard Morren (Ghent, 1833 – Liège, 1886) and the 1867 Paris World's Fair

Édouard Morren was a Belgian botanist with a special interest in bromeliads and horticulture. He became a professor at the University of Liège following in the footsteps of his father Charles Morren. He soon enriched the collections of the "Musée botanique" of the university with products of vegetable origin, diligently following international exhibitions, such as those in Paris in 1855 and 1867 (Morren, 1856). In this way he offered van Heurck a large number of valuable products from the second Paris World Fair in 1867 (van Heurck, 1876). These offerings encompassed not only novelties from the French colonies but also from diverse regions such as Cape Verde, Egypt, Syria, Niger, Angola, South Africa, Turkey, Iran, Timor, Thailand, Mauritius, Australia, Canada, Puerto Rico, the Antilles, Colombia, Brazil, Chile, Russia, Finland and Norway. Some examples of these products include Cape Verdean Canary orchil (*Roccella tinctoria*) used as dye, Australian acaroid resin or black boy 'gum' (*Xanthorrhoea arborea*) (fig. 34) — used as varnish and fragrance —, cashew tree gum (*Anacardium occidentale*) — used by bookbinders to repel insects — and Gabonese djave nut butter (*Baillonella toxisperma*) — used in the kitchen, in cosmetics, in traditional medicine and soap making.

Morren also maintained contacts with the State Botanic Garden as was shown in the archive inventory of April 1881, mentioning a series of mostly plant fibres.

Jacques Samuel Blanchet (Moudon, 1807 – Vevey, 1875)

Samuel Blanchet was a Swiss trader stationed in San Salvador de Bahia as consul of Switzerland from 1826 to 1856. Being an enthusiastic naturalist, he was one of the first to collect plant material (and terrestrial and freshwater molluscs) in Brazil's eastern states. The material was sent to Stéfano Moricand in Geneva for identification (Breure & Tardy, 2020).

Dating from 1835, Blanchet's outstanding wood collection from Bahia became part of van Heurck's Botanic Museum. It consists of uniform samples of branches, all c. 9 cm long and up to 7 cm diameter, each with a cut-out piece used for micrography (fig. 35).

Fig. 35. — Selection of Brazilian wood samples from Samuel Blanchet (the entire collection AWH10034590-AWH10036372 includes corresponding herbarium specimens).

Heinrich Carl Haussknecht (Bennungen, 1838 – Weimar, 1903)

Carl Haussknecht was a pharmacist who collected and studied alpine plants in his spare time. This passion introduced him to the Swiss botanist, Pierre Edmond Boissier, who was working on the *Flora orientalis*. Boissier invited Haussknecht to collect plants to complete his herbarium and flora. Haussknecht's first trip in 1865 was to Turkey and Syria, the second trip from 1866 to 1869 stretched from Lebanon to Persia. On site, he was also officially entrusted with tasks in his capacity as a pharmacist. As a result, he obtained a lot of information on medicinal plants from the local population who also led him to mountainous regions untrodden by botanists. He became a respected expert on oriental plants. His extensive travel diaries and collections were studied in-depth in Germany (Kämpfer & Victor, 2020).

In his *Notions succinctes sur l'origine et l'emploi des drogues simples de toutes les régions du globe* van Heurck (1876) mentioned the acquisition of Haussknecht's rare and interesting Persian products. One of these pharmaceutical curiosities was a sample of Persian bitumen mumiai (fig. 36, tab. 2), a mineral pitch which is called "momiai" in Persian and which was once confused with powdered mummies. Outstanding too is a series of mannas, exuded by, for example, camelthorn, quince and Brant's oak (see tab. 2).

Fig. 36. — Bitumen mumiai from the Persian collection of Carl Haussknecht, AWH10031636.

Adalbert Geheeb (Geisa, 1842 – Königsfelden, 1909)

Adalbert Geheeb was a pharmacist and carried on his father's pharmacy in Geisa. In addition, he was a botanist-bryologist. In his *Notions succinctes…* van Heurck mentioned that Geheeb had sent him the almost complete collection of medicines in use in Germany at that time. Some of them are of animal origin and are real curiosities in the collection, such as the following: sturgeon glue or sturgeon isinglass prepared from the dried swim bladder, cut in different ways, was complemented with its forgeries; sandfish skink (fig. 37), preserved in

lavender flowers, was listed as an aphrodisiac in pharmacopeia of the mid-19th century. Another noteworthy specimen of Geheeb is a defiant, dried common adder, once used in Venetian theriac or Venice treacle, an ancient broad-spectrum antidote. It contained sixty-four ingredients, including opium and agarics.

Part of Geheeb's pharmacy in Geisa has been transformed into a small museum dedicated to Geheeb, which can still be visited today (Anon n.d. c).

Fig. 37. — Sandfish skink in lavender flowers from the *materia medica* collection of Adalbert Geheeb, AWH10029817.

Julius von Wiesner (Tschechau, 1838 – Wien, 1916)

Julius Wiesner studied botany at the University of Vienna. His study trips focussed primarily on physiological aspects and took him to Java (Buitenzorg), Egypt, North America and Spitzbergen.

Van Heurck received some key products from Wiesner and stressed their value because they were the type products from two of Wiesner's publications, one about gums, resins and balms (Wiesner, 1869), the other one about raw materials of plant origin (Wiesner, 1927-1928). Among the examples in the economic botany collections are Chilean chagual gum and Australian kino, both used in folk medicine, and fruit of Cape jasmine, known as traditional, Chinese dye (see tab. 2). Of particular significance within these collections are Wiesner's essential oils (fig. 38) distilled from a variety of sources, including bay leaves, ylang-ylang, sandalwood, myrrh, ginger, wild cinnamon, wintergreen and lemon grass (tab. 2), to name but a few.

Fig. 38. — Essential oil specimens — ylang-ylang and ginger — from the collection of Julius von Wiesner, AWH10001943, AWH10025802.

Other Renowned Contacts of Henri van Heurck

H. van Heurck also was in contact with Bernardin, whom he described as a distinguished naturalist and philologist. He also obtained (though only a very limited number) products from von Martius' collection. These included bark of *Esenbeckia febrifuga*, acting as quinine, and roots of *Smilax* species, known as "salsaparilla".

Post-van Heurck Era

Following van Heurck's passing in 1909, his extensive collection was transferred to the city of Antwerp for the mere sum of one hundred and twenty-five thousand Belgian francs (Aernouts & Frison, 1959). Over the course of more than fifty years, these collections found temporary homes in various locations in Antwerp, sometimes being utilized and at other times remaining idle. Edward Frison greatly admired van Heurck and comprehended the immense value of his collections. He dedicated decades of effort to ensure their conservation. After much wandering the city council gave the collections on long-term loan to the "Koninklijke Maatschappij voor Dierkunde van Antwerpen" (KMDA).

In 1985, the association for "Antwerps Wetenschappelijk en Industrieel Erfgoed (AWIE)" was founded under the chairmanship of Karel Van Camp with the aim of repurposing the patrimony of van Heurck and Frison, among others. In 2004, transfers of books, microscopes and other equipment and microscopic wood preparations to the Central Library of Antwerp and the Museum of History of Sciences of Ghent University were arranged.

The important transfer of van Heurck's herbarium, diatom collection and botanical museum, and of Frison's wood collection (all material from the Antwerp Herbarium, AWH) to the former National Botanic Garden in Meise was regulated in the 1990s. In 2014, this AWH material became a permanent loan to the newly-structured Meise Botanic Garden. Subsequently, Frison's wood collection and microscopic sections were transferred from Antwerp to Meise in 2020, 2022 and 2025.

Karel Edward Frison (Meerhout, 1888 – Antwerp, 1973)

Despite his limited acquaintance with van Heurck, Edward Frison held him in high esteem. He valued, studied and took care of his collections. He was particularly fascinated by microscopic research, first on algae, foodstuffs, drugs (from the van Heurck collection), paper, fibres, and later wood (Frison, 1944). He became an expert in microscopy and microphotography, essential to the identification of commercial wood species. His personal collection reached up to about thirty thousand microscopic specimens, mostly wood sections, about one thousand eight hundred wood samples, various microscopes and a library. It was sold to the city of Antwerp for six hundred thousand Belgian francs in 1977 (Van Camp *et al.*, 2004).

Frison's wood collections are housed in Meise Botanic Garden. Some of these have a corner removed that served for micrographic research. Frison's wood samples with "Terv" numbers are among the earliest "TW"-numbers in the xylarium of the Africa Museum in Tervuren. Examples include African rosewood (*Guibourtia demeusei*) (Terv31 = Tw31) and tchitola (*Prioria oxyphylla*) (Terv47 = Tw47) from expeditions in Congo dating back to 1910 and 1912.

Apart from the collections of 1866 and 1930, discussed earlier, Frison's collection also contains wood samples from Bogor. The wooden case is now labelled with: "Collectie van houtmonsters uit Ned. Oost- en West-Indië. Afdeeling Handelsmuseum van het Koloniaal Instituut" and contains wood samples with the original (and informative) label and stamp of the "Boschbouwproefstation Buitenzorg". The Macassar ebony (*Diospyros* sp.) stands out as the darkest-coloured specimen in this series (fig. 39).

The provenances of Frison's wood samples also outline the collectors, institutions, companies and societies at that time. For instance, incense cedar (*Calocedrus decurrens*) is a sample from the only Belgian and no longer existing pencil factory "Crayons Gilbert" in Hastière.

Fig. 39. — Macassar ebony and other wood samples from the collection of Edward Frison, AWH10090213.

Epilogue

In 1873, the "Société botanique de France" planned an extraordinary session with several excursions in Belgium. The members visited botanical gardens, museums and nurseries. Planchon reported enthusiastically and was full of praise for the visit to the State Botanic Garden in Brussels and to the Commercial-Industrial Museum in Melle as well as to the Botanical Museum of van Heurck in Antwerp (Planchon, 1873b). Overviewing the three collections in Meise Botanic Garden one hundred and fifty years later, we find ourselves sharing the same opinion. The combined knowledge and dedicated efforts of all the contributors have led to a

collection that testifies to every possible use of (mainly) plants at the time. Interestingly, the search for resources then runs a parallel with today's technologies and ongoing searches for diverse applications, while historical collections like the Meise Botanic Garden economic botany collection still serve as a source of innovation (Stauffer & Roguet, 2012; Decq *et al.*, 2019, 2021; De Paepe, Genbrugge & Stoffelen, 2023).

The economic botany collection at Meise Botanic Garden remains largely hidden from public view, with the exception of a selection of wood specimens displayed in the WOODlab (including touch screens with background information on the specimens), and a number of specimens in jars on display in a permanent exhibition on the history of Meise Botanic Garden in Bouchout Castle. Additional portions of the collection can be seen in the herbarium rooms, but only through guided tours. As part of the planned renovations of the collection building, scheduled for 2028-2030, a permanent exhibit will be created to showcase the rich collections from the herbarium, library, and archives, and to highlight the related research activities. This exhibit will guide visitors along the paths of historical botanists during their explorations of remote regions around the world, unveiling the rich history, current endeavours, and future directions of research and collections at the Botanic Garden.

Understanding the content, as well as the historical, political and cultural context of the economic botany collection at Meise Botanic Garden is a crucial first step. Specimen data from this collection are already present in the collection management system of Meise Botanic Garden, and basic information can be accessed through our institutional portal (https://www.botanicalcollections.be) and the Global Biodiversity Information Facility (GBIF) (Meise Botanic Garden, 2024). The next step will be to include high-resolution images of the specimens, include data on their uses, conduct provenance research for specimens that have not yet been re-examined, and recognize traditional knowledge wherever possible.

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Challenges during Treatment of Microbial Infections: Sanctuary Niches, Persistence and Relapse*

by

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Keywords. — Infection; Treatment Failure; *Leishmania*; Leishmaniasis; Tissue Niches; Dormancy.

Summary. — Many infectious diseases suffer from post-treatment clinical reactivation. The ontogeny of such treatment failure may relate to features of the pathogen, host and drug. Besides drug resistance, tissue or cellular niches that escape drug activity have gained increasing awareness for the last couple of years. Evidence has also emerged for pathogen dormancy and persistence in combination with hiding in such sanctuary niches. Protozoans such as *Trypanosoma*, *Toxoplasma* and *Plasmodium* are liable to treatment failure resulting from infection of tissues such as the adipose, central nervous system and liver respectively. Several bacteria, most notably *Mycobacterium*, *Staphylococcus* and *Salmonella*, are known to form persisters that are drug tolerant and that can reside in multiple sanctuary niches. This review will focus on the tissues and host cells reported to provide sanctuary underlying treatment failure and subsequent relapse, whereby visceral leishmaniasis will be elaborated as a disease that is prone to relapse of multifactorial origin.

Trefwoorden. — Infectie; Behandelingsfalen; *Leishmania*; Leishmaniase; Weefselniches; Dormantie.

Samenvatting. — *Uitdagingen bij de behandeling van microbiële infecties: sanctuaire niches, persistentie en recidief*. — Meerdere infectieziekten vertonen klinische reactivatie na behandeling. De oorsprong van dergelijk behandelingsfalen kan samenhangen met eigenschappen van het pathogeen, de gastheer en het gebruikte geneesmiddel. Naast geneesmiddelresistentie is er de afgelopen jaren toenemende aandacht voor weefsel- of cellulaire niches die aan de werking van geneesmiddelen ontsnappen. Bovendien is er toenemend bewijs dat ziekteverwekkers in een dormante toestand kunnen overleven, vaak in combinatie met het zich verschuilen in bepaalde niches. Protozoa zoals *Trypanosoma*, *Toxoplasma* en *Plasmodium* zijn gevoelig voor behandelingsfalen doordat zij respectievelijk vetweefsel, het centrale zenuwstelsel en de lever kunnen infecteren. Van verschillende bacteriën, meer bepaald *Mycobacterium*, *Staphylococcus* en *Salmonella*, is bekend dat zij persistercellen vormen die tolerant zijn voor geneesmiddelen en kunnen overleven in meerdere beschermende niches. Deze review richt zich op de weefsels en gastheercellen waarvan is aangetoond dat zij een bescherming bieden aan het pathogeen. Viscerale leishmaniase wordt daarbij uitgelicht als een ziekte die bijzonder vatbaar is voor behandelingsfalen en herval.

Highlights

- Post-treatment clinical reactivation is increasing in both epidemiological occurrence and in scientific awareness, with a clear link to tissue niches and pathogen persistence/quiescence.

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- Largely overlooked niches such as stem cells in the bone marrow have been shown to constitute a hospitable reservoir for pathogens ranging from bacteria to parasites.
- Our research has uncovered that visceral leishmaniasis persists after treatment whereby parasites find sanctuary in a hematopoietic stem cell niche and by transitioning through a quiescent state.
- Important arguments are provided for innovation in the drug discovery and R&D pipeline to incorporate sanctuary niches and pathogen quiescence to overcome the risk of relapse.

Introduction: The Ontogeny of Treatment Failure

A notorious challenge for a plethora of major microbial diseases is the establishment of an effective curative treatment. Challenges are even more prominent in tropical settings where access to proper health care and logistics for drug availability are more limited. Over the past decade, an important impact of environmental changes has also been noted, where global warming has resulted in the expansion of especially vector-transmitted diseases to new geographical areas (Rocklöv & Dubrow, 2020). For many infectious organisms an alarming rate of drug resistance (Allué-Guardia, García & Torrelles, 2021; Menard & Dondorp, 2017; Ponte-Sucre *et al.*, 2017; Radha, Murugesan & Rupali, 2020), treatment failure and disease relapse are being reported (Nascimento *et al.*, 2019; Shao *et al.*, 2021; Naylor-Leyland *et al.*, 2022). Although drug resistance and treatment failure can be related, these concepts cannot be interchanged. Drug resistance can be acquired by the pathogen due to a variety of mechanisms, involving the emergence of genetic and/or metabolic alterations, which give rise to an attenuated response to the drug (Ghosh, Saran & Saha, 2020; Hendrickx *et al.*, 2014). In fact, in broad and general terms, drug resistance is a decrease of compound efficacy against a pathogen population that was previously susceptible, consequently leading to the need for higher drug exposure or even complete clinical drug ineffectiveness at the maximal safe or tolerated drug dose (Capela, Moreira & Lopes, 2019; Hazlehurst & Hacker, 2009). Treatment failure, on the other hand, can be the result of numerous factors, situated at the level of the drug itself, the host or the pathogen. Drug-associated factors include subtherapeutic exposure due to pharmacokinetic properties or poor pharmaceutical quality of the medication. Particularly important pharmacokinetic properties in the context of treatment failure are tissue distribution and the elimination half-life of the compounds (Rijal *et al.*, 2013; Dorlo *et al.*, 2014; Castro *et al.*, 2017; Dorlo, Huitema, Beijnen & de Vries, 2012; Kip *et al.*, 2021). For example, the plasma half-life for the antileishmanial drugs miltefosine (MIL) and AmBisome both exceed five days (Sundar & Chakravarty, 2010; Sundar, Jha, Thakur, Sinha & Bhattacharya, 2007), causing them to linger on in the body at subtherapeutic concentrations for weeks after treatment which may, apart from treatment failure, trigger the emergence of resistance. Besides pharmacokinetics, drug quality is another major contributor to treatment failure. The shelf life of many drugs depends on proper storage, which may require a cold supply chain to the patient, which may not be straightforward in tropical countries (Sunyoto *et al.*, 2019; Pambudi, Sarifudin, Gandidi & Romadhon, 2022). In some regions, drugs requiring a cold chain are therefore substituted by drugs with less optimal profiles (Sundar *et al.*, 2011). Moreover, due to both cost and limited drug availability, patients in developing countries are more likely to be treated with coun-

terfeit medications that fail in terms of efficacy and may favour resistance development (Glass, 2014; Akpobolokemi, Martínez-Núñez & Raimi-Abraham, 2022).

Host factors include *e.g.* immunity, nutritional status or compliance. An effective immune response is often required to support treatment; therefore patients with immunodeficiencies can be particularly hard to cure. A notoriously challenging co-infection is leishmaniasis with human immunodeficiency virus (HIV). In general, HIV co-infection is associated with higher initial treatment failure and relapse rates due to immune exhaustion and chronic immune stimulation (Nissapatorn & Sawangjaroen, 2011; Zheng *et al.*, 2020; Shikanai-Yasuda *et al.*, 2021). Natural heterogeneity in host immune responses can also influence the potency of a drug (Aruleba, Carter, Brombacher & Hurdayal, 2020). For example, MIL has been used successfully to treat leishmaniasis in India, whereas its efficacy in Africa is lower (Ritmeijer *et al.*, 2006) and failed during a clinical trial in Brazil. Besides host genetic factors, pathogen genetics in different geographical areas are implicated as well, as the 40 % relapse rate in Brazil was associated with the absence of the "MIL sensitivity locus" (Carnielli *et al.*, 2018). Other pathogen factors influencing treatment failure include the intrinsic virulence, which can affect the induced host immune response and can result in elevated pathogen burdens that require higher drug doses (Porco, Lloyd-Smith, Gross & Galvani, 2005). Microorganisms can also reside in tissues inaccessible to drugs, or within cells exhibiting unique properties aiding in the escape from drug exposure or the immune response (Barrett, Kyle, Sibley, Radke & Tarleton, 2019; Silva Pereira, Trindade, De Niz & Figueiredo, 2019). The adaptive characteristics of pathogens also allow them to transform from a metabolically active state into a quiescent or persistent form that is more impervious to treatment (Khlebodarova & Likhoshvai, 2018).

Sanctuary Sites and Persisters

For many infectious diseases, the ontogeny of treatment failure is not straightforward and is most likely multifactorial. Without the need of genetic or phenotypic changes, pathogens can exploit particular tissue or cellular tropism to survive and escape treatment or immunity (Sánchez-Váldez, Padilla, Wang, Orr & Tarleton, 2018; Zhang, 2014). The body comprises several potential niches ranging from specialized tissues (fig. 1) to specific cells or cellular compartments that differ in accessibility for immune responses and therapeutic agents. Host cells and tissues can as a result underlie (re)colonization of the host and relapse (Dirkx *et al.*, 2022; Sarathy & Dartois, 2020; Silva-Filho *et al.*, 2020). This phenomenon of sanctuary sites or niches has been described for a range of pathogens across the microbiological spectrum (Barrett *et al.*, 2019).

The advantage for a pathogen to exhibit a certain tissue tropism can relate to the characteristics of the tissue, the constituting cells or the subcellular compartment. In addition, tissue or cellular tropism can change over the course of infection, *e.g.* differing between the acute and chronic stage of the disease. For example, acute *Toxoplasma gondii* infections are associated with infection of a broad range of nucleated cells, while chronic infections persist in tissue cysts that establish in skeletal/smooth muscle cells and long-lived cells (neurons) of the central nervous system, known to be poorly accessible for many pharmaceutical agents (Dogga *et al.*, 2022).

It has been understood that treatment failure can also derive from pathogens that survive treatment without selection of inheritable genetic alterations. Such organisms exhibit pheno-

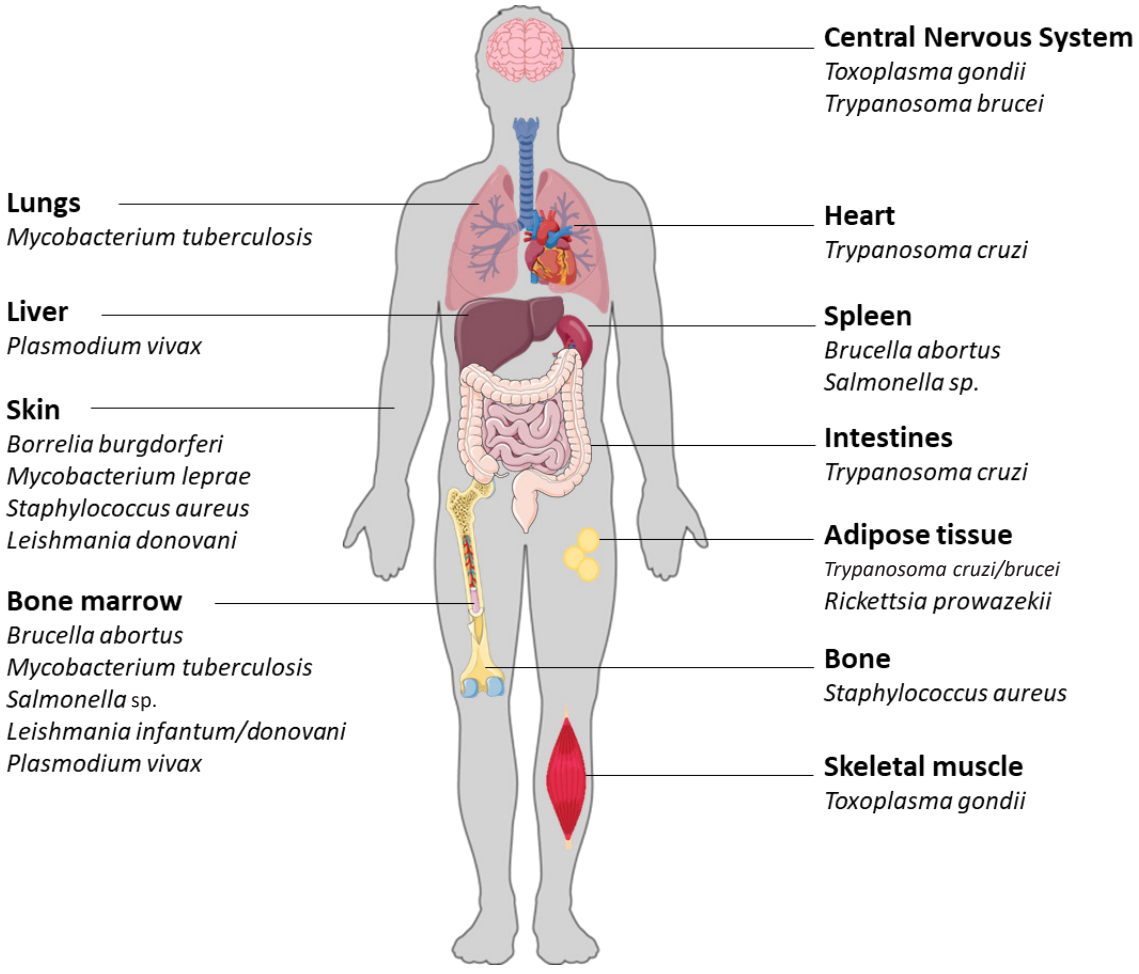

Fig. 1. — Tissue niches of specific pathogens linked to treatment failure. Neuronal and skeletal muscle cells are niches for *Toxoplasma gondii* (Remington & Cavanaugh, 1965; Li, Severance, Viscidi, Yolken & Xiao, 2019; Swierzy *et al.*, 2014; Dunay, Gajurel, Dhakal, Liesenfeld & Montoya, 2018). African trypanosomes invade the central nervous system, which represents a challenge for effective drug treatment across the blood-brain barrier (Mogk *et al.*, 2017; Jennings, Whitelaw, Holmes, Chizyuka & Urquhart, 1979). In the adipose tissues, *Trypanosoma cruzi*/*brucei* (Combs *et al.*, 2005; Ferreira *et al.*, 2011; Trindade *et al.*, 2022, 2016) and *Rickettsia prowazekii* (Bechah, Paddock, Capo, Mege & Raoult, 2010) can persist. *Brucella abortus* and *Salmonella typhimurium* use the spleen as a reservoir (Goenka, Guirnalda, Black & Baldwin, 2012; Castro-Eguiluz *et al.*, 2009; Souwer *et al.*, 2012). *Plasmodium vivax* resides in the hepatocytes of the liver and causes recrudescence of malaria (Shanks & White, 2013; Markus, 2012; Mikolajczak *et al.*, 2015). Persistent skin infections with the Lyme spirochete, *Borrelia burgdorferi*, have been linked to relapse (Rudenko, Golovchenko, Kybicova & Vancova, 2019; Cabello, Godfrey, Bugrysheva & Newman, 2017; Middelveen *et al.*, 2018; Sapi *et al.*, 2019). *Mycobacterium leprae* is known for persisting in the skin (Hartanto *et al.*, 2022), as is *Staphylococcus aureus* (Yee *et al.*, 2019). *Leishmania donovani* parasites can persist in the skin and cause post-kala-azar dermal leishmaniasis (Zijlstra, 2019). The lungs are a notorious niche for *Mycobacterium tuberculosis* persistence (Pandey & Sassetti, 2008). The bone marrow is a niche for many pathogens, including monocytes for *Brucella abortus* (Gutiérrez-Jiménez *et al.*, 2018; Pappas, Akritidis, Bosilkovski & Tsianos, 2005), stem cells for *Mycobacterium tuberculosis* (Das *et al.*, 2013; Tornack *et al.*, 2017; Delgobo *et al.*, 2019; Belay *et al.*, 2021), *Leishmania infantum*/*donovani* (Dirkx *et al.*, 2022), and *Plasmodium vivax* (Obaldia III *et al.*, 2018), and possibly macrophages for *Salmonella typhimurium* (Gasem *et al.*, 2003; Nix, Altschuler, Henson & Detweiler, 2007; Ahmad, Khan, Roshan & Bhutta, 2011). The figure was created using SmartServier.

typic diversity, *e.g.* encompassing quiescent or dormant forms that can persist after treatment (Barrett *et al.*, 2019). These pathogens are mostly metabolically inactive, slow growing or have other specific changes that differ from the active pathogen. These changes are also reversible.

Properties of Sanctuary Tissues and Cellular Niches

Some biological tissue properties related to treatment are, for instance, the low perfusion rate of adipose tissue (Silva Pereira *et al.*, 2019) and bone marrow (Mu *et al.*, 2018). Likewise, certain tissues are largely privileged from the systemic circulation as they are governed by barriers such as the blood-brain (Krasemann *et al.*, 2022), the blood-cerebrospinal fluid (CSF) (Zheng, Song, & Zhang, 2011) or the blood-testis barrier (Cheng & Mruk, 2012). Some other tissues provide an immune-privileged niche, such as the eyes (Benhar, London & Schwartz, 2012) and hair follicles (Gueirard *et al.*, 2010). Characteristics of compounds themselves can also determine success or failure depending on the targeted tissue, *e.g.* hydrophilic drugs do not effectively permeate adipose tissue (Souto *et al.*, 2022).

Intrinsic properties of stem cells may also provide opportunities for the pathogen to evade immune responses and drug action. For example, mesenchymal stem cells do not normally express major histocompatibility complex (MHC) class II on their cell surface and their MHC class I molecules are functionally inactive, *i.e.* these molecules do not trigger effector functions of cytotoxic T lymphocytes (Lopes, Daifalla, Das, Dias da Silva & Campos-Neto, 2016). Furthermore, stem cells have been described to express high levels of drug efflux pumps that could contribute to low drug exposure (Ng & Alexander, 2017). During visceral leishmaniasis (VL) infection, substantially-decreased levels of *Nos2* gene expression and of both nitric oxide (NO) and reactive oxygen species (ROS) were demonstrated in infected long-term haematopoietic stem cells (LT-HSC), creating a more hospitable environment for parasite multiplication and survival (Dirkx *et al.*, 2022). Other cells withdraw from cell cycle progression and trigger differentiation of the pathogen to a quiescent stage, such as the skeletal muscle cells during *T. gondii* infection (Swierzy & Lüder, 2015). Adipocytes are an excellent niche and well-known reservoir for *Trypanosoma cruzi*, the causative agent of Chagas disease, as these cells are rich in nutrients and secrete the anti-inflammatory adipokine adiponectin (Rajala & Scherer, 2003; Chandran, Phillips, Ciaraldi & Henry, 2003; Nagajyothi & Weiss, 2019). During *Mycobacterium tuberculosis* (*Mtb*) infection, monocytes are differentiated to longer-lived foamy macrophages characterized by the presence of lipid-containing bodies, which afford dormant *Mtb* bacilli access to host cholesterol, required for persistence (Pandey & Sassetti, 2008; Mayito *et al.*, 2019).

Some pathogens adopt intracellular invasion strategies in non-phagocytic cellular niches to persist. For example, *T. cruzi* is able to invade various host cells by fusion of lysosomes at the site of invasion (Andrews, 1993; Batista, Nájera, Meneghelli & Bahia, 2020; Fernandes & Andrews, 2012). Hereby, the parasite takes advantage of the parasite-induced membrane damage to enter the cells, stimulating lysosomal exocytosis pathways to repair the membrane (Batista *et al.*, 2020; Fernandes *et al.*, 2011). *T. cruzi* is known to escape rapidly from the vacuole into the cytoplasm as a favourable environment to differentiate and replicate (Ferri & Edreira, 2021).

Adipose Tissue

The adipose tissue has been infamous to serve as a site of refuge, as it is less accessible to chemical compounds due to the low perfusion rate. For example, Combs *et al.* (2005) demonstrated significant numbers of *T. cruzi* in the adipocytes of mice during a chronic infection. Further research also revealed persistence of this parasite in adipose tissue of chronic Chagas disease patients (Ferreira *et al.*, 2011). Benznidazole and nifurtimox are the current first-line drugs for acute *T. cruzi* infection, but have been ineffective during the chronic stage (Zaki *et al.*, 2020; Morillo *et al.*, 2015; Santos *et al.*, 2016), which may in part result from a decreased efficacy in adipose tissue. In fact, both drugs need to reach the parasite and undergo enzyme-mediated activation to have cytotoxic effects (Wilkinson, Taylor, Horn, Kelly, & Cheeseman, 2008). Currently an effort is undertaken to develop nanocarriers for effective delivery, such as lipid nanovesicles for better permeability of certain tissues (Arrúa, Seremeta, Bedogni, Okulik, & Salomon, 2019). *T. brucei*, an extracellular parasite causing sleeping sickness, has a transcriptionally distinct "adipose tissue form" (ATF) that is described as slow-growing and quiescent, therefore possibly responsible for recrudescence of the disease (Trindade *et al.*, 2016, 2022).

In addition to trypanosomes, it has been documented that *Rickettsia prowazekii*, a bacterium transmitted by body lice that causes epidemic typhus, can reside in this tissue after treatment. This suggests that adipose and adipocytes play important roles in the occurrence of Brill-Zinsser disease, the recrudescent manifestation of epidemic typhus (Bechah *et al.*, 2010).

Skin

Persistent infections with the Lyme spirochete, *Borrelia burgdorferi*, have been demonstrated in patients who have been treated with the proper antibiotics, yet regain symptoms after alleviating drug pressure (Rudenko *et al.*, 2019; Cabello *et al.*, 2017; Middelveen *et al.*, 2018; Sapi *et al.*, 2019). *Mycobacterium leprae* is notorious for persisting in the skin. As such, multiple relapses after multidrug treatment have been reported (Hartanto *et al.*, 2022). Other bacterial persisters in the skin include *Staphylococcus aureus*, where it was shown that persisters have an increased infectivity, causing more severe lesions (Yee *et al.*, 2019) and a tolerance to antibiotic treatment, linking the persister phenotype to chronic and relapsing *S. aureus* infections (Conlon, 2014). A specific dermal complication that can develop after the protozoan *Leishmania donovani* infection is known as post-kala-azar dermal leishmaniasis (PKDL), in which the parasites persist in the skin after treatment, causing a highly transmissible condition with self-healing lesions that usually disappear within a year (Zijlstra, 2019).

Liver

The liver can be colonized by dormant or hypnozoite stages of *Plasmodium vivax*, a causative agent of malaria. These are less susceptible to antimalarial therapies and can be reactivated (Shanks & White, 2013). Hypnozoites appear responsible for relapse of *P. vivax*-mediated malaria even years after initial infection (Markus, 2012), although studies in human liver chimeric mice suggest that hypnozoites may actually not be fully metabolically inactive (Mikolajczak *et al.*, 2015). Studies on treatment efficacy of chloroquine and primaquine have documented *P. vivax* relapse rates varying from 8 % (Rajgor *et al.*, 2014) to 38 % (Kim *et al.*, 2012). To prevent relapse of vivax malaria, an additional fourteen-day primaquine (0.5-0.75 mg/

kg per day) cure is recommended, targeting the hypnozoite stages (Galappaththy, Tharyan & Kirubakaran, 2013; Rishikesh & Saravu, 2016). However, individuals with specific CYP2D6 polymorphic alleles fail to metabolize primaquine and experience treatment failure (de Pina-Costa *et al.*, 2021). Likewise, primaquine can cause hemolysis in individuals with a genetic enzyme deficiency (G6PD), requiring downward adjustment of the treatment dosage (Rishikesh & Saravu, 2016).

Central Nervous System

There has long been evidence that the cyst form of *T. gondii* can reside and persist in neuronal cells (Remington & Cavanaugh, 1965). *T. gondii* cysts reside in the brain for extensive periods and this process requires a continuous immune response to prevent the parasite's reactivation (Li *et al.*, 2019). Especially in HIV-infected patients cerebral toxoplasmosis is a life-threatening condition that requires prompt diagnosis and treatment (Dian, Ganiem & Ekawardhani, 2023).

African trypanosomes are notorious for crossing the blood-brain and blood-CSF barriers, causing typical deregulation of the sleep-wake cycles (Mogk *et al.*, 2017). This reservoir in the central nervous system has been described as a source of relapse for decades (Jennings *et al.*, 1979), requiring drugs that can cross the blood-brain barrier such as fexinidazole and eflornithine (Bernhard, Kaiser, Burri & Mäser, 2022; Kuemmerle *et al.*, 2021).

Skeletal Muscle

Infection of skeletal muscle by *T. gondii* triggers differentiation from the highly replicative tachyzoites to dormant bradyzoites and tissue cyst formation, both being crucial for parasite persistence in muscle tissue (Swierzy *et al.*, 2014). A current limitation is that therapies are effective against tachyzoites but not against bradyzoites, due to its dormant phenotype (Dunay *et al.*, 2018).

Spleen

In the spleen, the presence of *Brucella abortus* was detected in splenic B lymphocytes which protect the bacteria against bactericidal agents. Especially the marginal zone B cells seems to be the preferred target (Goenka *et al.*, 2012). Similar conclusions could be drawn for *Salmonella typhimurium* where the presence of the bacteria was confirmed in splenic B cells. Data demonstrated that all precursors as well as plasma cells were infected with the bacterium (Castro-Eguiluz *et al.*, 2009). Additionally, *Salmonella*-specific B cells were shown to act both as a survival niche and a reservoir for reinfection (Souwer *et al.*, 2012).

Lungs

One of the most notorious persistent diseases of the lung is tuberculosis. A hallmark of tuberculosis is the ability of the causative agent, *Mtb*, to persist for decades despite a vigorous host immune response. Although the immune response effectively controls the replication of bacteria, they are able to resist eradication, resulting in chronic tuberculosis, characterized by slowly-replicating bacteria and progressive immunopathology (Pandey & Sassetti, 2008). These slow or sometimes non-replicating bacteria exhibit extreme tolerance to many first- and second-line *Mtb* drugs (Sarathy *et al.*, 2018).

Heart

Chagas cardiomyopathy is the most common infectious cause of heart failure, whereby a cardiac parasite burden is a hallmark of chronic infection (Venturini *et al.*, 2023). Dormancy in the mammalian infection cycle of *T. cruzi* is key to the failure of current drug treatments. Although other factors, including the differential tissue tropism of parasite strains and tissue distribution of potential drugs, certainly also impact treatment outcomes, only dormancy has been definitively linked (Sánchez-Váldez *et al.*, 2018).

Gastrointestinal Tract

A study by Lewis *et al.* (2014) identified the gastrointestinal tract as the primary site of parasite persistence for long-term *T. cruzi* infection, associated with conditions such as megaesophagus and megacolon.

Bone and Bone Marrow

Long-term intracellular infection of bone cells, *i.e.* osteoblasts, osteoclasts and osteocytes, by *S. aureus* has been described as a mechanism for infection persistence and recurrence following long periods of dormancy (Libraty, Patkar & Torres, 2012; Masters *et al.*, 2022). The bone marrow has also been increasingly understood as a pivotal sanctuary niche. For instance, it was observed by Gutiérrez-Jiménez *et al.* (2018) that *B. abortus* persists in the bone marrow and particularly resides in monocytes which are most likely the source of relapse in approximately 10 % of brucellosis patients (Pappas *et al.*, 2005). There is also evidence of persistence of *Salmonella* in the bone marrow (Gasem *et al.*, 2003), presumably inside haemophagocytic macrophages (Nix *et al.*, 2007), responsible for relapse rates of 5 to 20 % (Ahmad *et al.*, 2011).

A lot of effort has been done in describing the role of the bone marrow during tuberculosis. In fact, the bone marrow was identified as an antibiotic-protective niche where *Mtb* can infect CD271+CD45-mesenchymal stem cells (MSC) and long-term haematopoietic stem cells (LT-HSC) (Das *et al.*,2013; Tornack *et al.*, 2017; Delgobo *et al.*, 2019; Belay *et al.*, 2021). Importantly, it was demonstrated that even after prolonged treatment, the bacterium remained present in CD271+MSC, linking these observations with the occurrence of relapse (Beamer, Major, Das & Campos-Neto, 2014; Berry *et al.*, 2010). Unexpectedly, the haematopoietic niche of the bone marrow has also been discovered as a reservoir for *P. vivax*. Here, proliferation of malaria parasites occurs as well as gametocyte development (Obaldia *et al.*, 2018).

Properties of Persisters

The largest body of evidence and mechanistic information for persistence has been obtained for bacterial pathogens. Actually, bacterial persistence was first reported eighty years ago for staphylococcal infections treated with penicillin (Bigger, 1944). Nevertheless, the underlying mechanisms of persistence in general remain an enigma. Classically accepted features of persisters are that they comprise only a subpopulation, with a dormant phenotype that endows the pathogen a multidrug tolerance that is non-inheritable and reversible (Jung, Ryu & Kim, 2019).

The central dogma entails that bacteria can alternate between planktonic growth and formation of persisters that often reside in biofilms. Persisters refer to genetically drug susceptible,

quiescent (non-growing or slow-growing) organisms that survive exposure to a given cidal drug and have the capacity to regrow under highly specific conditions (Zhang, 2014). The term 'persisters' refers to a heterogeneous group, whereby some types are formed in response to external triggers, while others switch phenotype in the absence thereof (Balaban, Merrin, Chait, Kowalik & Leibler, 2004). External triggers include drugs, starvation, heat, acidic pH and oxidative stress (Leung & Lévesque, 2012; Wu, Vulić, Keren & Lewis, 2012). Several complex mechanisms have been proposed to lay at the basis of bacterial persistence. Toxin/antitoxin (TA) systems are often mutated in high-persistence genetic screens and overexpression of these toxins often increases the frequency of persisters in a population (Ronneau & Helaine, 2019; Moyed & Bertrand, 1983). The TA system has been observed to contribute to persister formation for *Mtb* (Keren, Minami, Rubin & Lewis, 2011) and *S. typhimurium* (Helaine *et al.*, 2014). Others include reduced metabolism, energy production, protein and nucleic acid synthesis, DNA repair and protection, protein degradation, transporters/efflux systems, and transcriptional regulators (reviewed in Cui, Xu, Zhang & Zhang, 2016; Harms, Maisonneuve & Gerdes, 2016). Several studies have been conducted, for instance in *S. aureus*, to elucidate the transcriptional alterations associated with persisters, where several stress responses were activated, including the stringent response, cell wall stress, SOS response (a complex response to DNA damage) and heat shock response (Peyrusson *et al.*, 2020). Recent evidence also suggests a major role of epigenetic regulations, such as DNA methylation, which stably alter gene expression without modifying genomic sequences (Riber & Hansen, 2021).

For parasites, information about mechanisms of persistence is very scarce, due to its relatively recent discovery. The main limitation hindering the study of persister cells in any disease is the very low frequency of occurrence (Khlebodarova & Likhoshvai, 2018). A recurrent feature of protozoan persisters is the decrease in metabolic activity. Studies have shown that DNA replication, general transcription and protein synthesis are decreased in *Plasmodium* spp. and *T. gondii* persisters (Barrett *et al.*, 2019).

Visceral Leishmaniasis: An Example of the Multifactorial Origin of Treatment Failure

For VL, post-treatment relapse rates are described for all currently used drugs. Relapse rates of up to 7 % for AmBisome (Salih *et al.*, 2014), 20 % for MIL (Rijal *et al.*, 2013) and 38 % for antimonials (Berbert *et al.*, 2018) have been reported over the past decade. Even combination therapy, *e.g.* with antimonials and paromomycin, showed a relapse rate of 6 % (Atia *et al.*, 2015). Relapse rates for VL are also increasing considerably. In South Sudan, relapse as a proportion of all VL cases increased by 6.5 % per annum, from 5.2 % during 2001-2003 to 14.4 % during 2016-2018 (Naylor-Leyland *et al.*, 2022). Moreover, VL relapse patients have a high chance of relapsing again, *e.g.* a recent study in Sudan using AmBisome revealed that 10 % of relapse patients underwent new relapse episodes (Salih *et al.*, 2014). Notably, an increased infectivity associated with relapse has already been shown for MIL and antimonial treatment in the Indian subcontinent (Ouakad *et al.*, 2011; Vanaerschot *et al.*, 2010; Rai *et al.*, 2013), suggesting that the selected phenotype may pose an additional threat to leishmaniasis control programmes.

The current VL treatments do not accomplish sterile cure and display severe limitations such as toxicity, high production cost, decreased efficacy, difficulty in administration, and most importantly the emergence of resistance (Alves *et al.*, 2018; Hirve *et al.*, 2017; Monge-Maillo, Norman, Cruz, Alvar & López-Vélez, 2014; Singh, Singh, Chakravarty & Sundar, 2016;

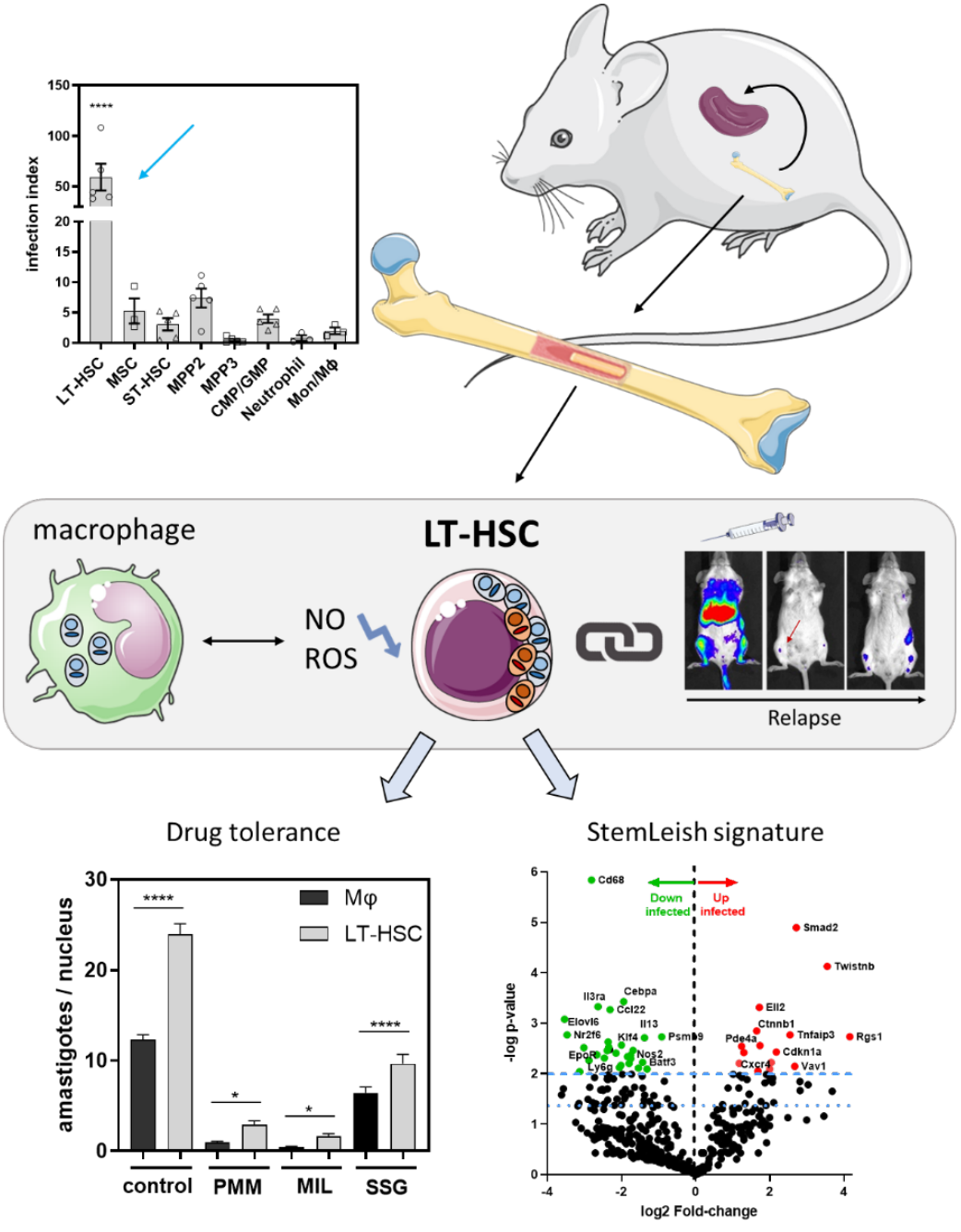

Fig. 2. — Discovery of the stem cell niche linked to relapse during visceral leishmaniasis (Dirkx *et al*., 2022). In the bone marrow relapse niche of VL-infected animals, stem cells harbour very high numbers of parasites and display decreased oxidative stress levels, which makes them more tolerant to antileishmanial drugs. These infected stem cells express a unique transcriptional signature, defined as StemLeish. Long-term haematopoietic stem cells (LT-HSC), mesenchymal stem cells (MSC), short-term haematopoietic stem cells (ST-HSC), multipotent progenitors (MPP), common myeloid progenitor (CMP), granulocyte-monocyte progenitor (GMP), monocyte (Mon), macrophage (Mφ), nitrogen oxide (NO), reactive oxygen species (ROS).

Frézard, Demicheli & Ribeiro, 2009; Reveiz, Maia-Elkhoury, Nicholls, Romero & Yadon, 2013). The acquisition of such resistance mechanisms can be associated with either (*i*) decreased drug uptake, (*ii*) increased drug efflux, (*iii*) enzymatic drug inactivation, (*iv*) improved cellular mechanisms to deal with drug-induced stress of cell damage, and/or (*v*) changes in the expression, abundance or drug-binding affinity of the primary therapeutic target (Ponte-Sucre *et al.*, 2017). For MIL it has been shown that MIL-resistant *Leishmania* strains show reduced fitness; however, exposing this phenotype to MIL treatment restores their infectivity, proving that their fitness is drug dependent, which emphasizes the risk of MIL treatment in sustaining infections with resistant parasites (Bulté *et al.*, 2021; Eberhardt *et al.*, 2019).

We recently demonstrated the importance of the bone marrow as a sanctuary niche for a persistent VL infection and post-treatment relapse. In fact, the bone marrow was identified as a sanctuary site from which the host can be recolonized (fig. 2). In this tissue, LT-HSC (Lin- Sca1+ cKit+ CD48- CD150+) were found to be a hospitable cellular niche (fig. 2, top left) with low oxidative stress levels and harbouring enormous parasite burdens, which make them more tolerant to antileishmanial drug action (fig. 2, bottom left). Infected LT-HSC express a unique transcriptional signature, termed 'StemLeish', defined by upregulated TNF/NF-kB and RGS1/ TGF-β/SMAD/SKIL signaling, and a downregulated oxidative burst (fig. 2, bottom right). Cross-species analyses demonstrated significant overlap with human VL and HIV co-infected blood transcriptomes (Dirkx *et al.*, 2022).

For LT-HSC, a decreased treatment response could not be linked to drug efflux and is likely related to the observed extreme high parasite burdens. Other mechanisms of the LT-HSC niche can play a role such as drug distribution to the bone marrow (Mu *et al.*, 2018). In general, the bone marrow contains at least two different types of niche based on location, *e.g.* periosteal or perivascular. The former provides a hypoxic environment with differential sensitivity to therapy (Pajonk & Vlashi, 2013). Zhao *et al.* (2019) showed that HSCs can be functionally distinguished into reserve HSCs and primed HSCs based on their response to chemotherapy, and which is linked to their different position in the bone marrow niche and distance to the blood vessel. The LT-HSC are specifically in close proximity of capillary fenestrations, enabling drugs that pass through these fenestrations to directly encounter LT-HSC (Mu *et al.*, 2018). Drugs with favourable pharmacokinetic properties to target the bone marrow would potentially be more effective in targeting the LT-HSC burdens and preventing persistence and post-treatment relapse. Artificial culture systems have suggested the occurrence of *Leishmania* quiescence after treatment with antimonials or upon exposure to experimental stress conditions (Jara *et al.*, 2019, 2022), associated with a downregulated synthesis of ATP, ribosomal components, proteins and alterations in membrane lipids (Jara *et al.*, 2017, 2019). Recently, we discovered *in situ* acquisition of quiescence in parasites infecting LT-HSC and described its downstream effects on parasite biology: increased survival under drug pressure, increased infectivity and high transmissibility (Dirkx *et al.*, 2024). The occurrence of resistance, sanctuary niches and quiescence underscores the multifactorial origin of treatment failure during leishmaniasis.

Conclusion

Significant gaps remain in our understanding of host-pathogen interactions, pathophysiology, and the implications for treatment and establishment of appropriate tests-of-cure (Silva-Filho *et al.*, 2020). The functional consequences of tissue or cellular tropism as well as pathogen

quiescence or persistence remain poorly studied, despite the association with important aspects of the disease, including transmission, treatment failure, relapse and clinical outcome. In fact, it is reasonable to suspect that slowly-replicating or transiently-arrested microbial pathogens have a selective advantage under immune and drug pressure and play a role in sustaining chronic infections in asymptomatic individuals and pre-relapse patients. Innovative detection methods are therefore needed, not only to provide proper treatment and enable accurate post-treatment follow-up, but also to tackle the dissemination of infection. Highly specific biomarkers and new host-directed therapeutic targets may serve these purposes. Besides focusing on the host, there is an unmet need for drugs that act against quiescent pathogens within their cellular niches. For this, transcriptional profiling can uncover potential drivers of quiescence and provide targets for novel combination therapies. Additionally, due to the many links between relapse niches and dormant phenotypes for several pathogens, the currently available genetic toolbox to study host and pathogen genes will offer unprecedented insights in the universal problem of quiescence across the microorganism spectrum.

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APPENDIX

Table 1
Abbreviations in alphabetic order

Written in full	Abbreviation
Adipose tissue form	ATF
Brucella abortus	*B. abortus*
Cerebrospinal fluid	CSF
Cytochrome P450 2D6	CYP2D6
Glucose-6-phosphate dehydrogenase	G6PD
Human Immunodeficiency Virus	HIV
Leishmania donovani	*L. donovani*
Long-term haematopoietic stem cell	LT-HSC
Major histocompatibility complex	MHC
Mesenchymal stem cells	MSC
Miltefosine	MIL
Mycobacterium tuberculosis	*Mtb*
Nifurtimox Eflornithine Combination Therapy	NECT
Nitric oxide	NO
Plasmodium vivax	*P. vivax*
Post-kala-azar dermal leishmaniasis	PKDL
Reactive oxygen species	ROS
Salmonella typhimurium	*S. typhimurium*
Staphylococcus aureus	*S. aureus*
Toxin/antitoxin	TA
Toxoplasma gondii	*T. gondii*
Trypanosoma brucei	*T. brucei*
Trypanosoma cruzi	*T. cruzi*
Visceral leishmaniasis	VL

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Bitter Chocolate: The Difficult Road to a Living Income for West-African Cocoa Farmers*

by

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Keywords. — Ivory Coast; Child Labour; Deforestation; Certification; Organic Production; Living Income.

Summary. — Cocoa (*Theobroma cacao* L.) is a tropical cash crop that provides income to 4.5 million farming families worldwide. In Ivory Coast, the world's largest cocoa producer (38 % of global cocoa supplies), 82 % of cocoa farmers do not earn a living income, which is the net income a household would need to earn to enable all members of the household to afford a decent standard of living. In the present paper, we explore how the cocoa sustainability initiatives of two Belgian cocoa value chain actors (Oxfam Fair Trade Belgium and Galler SA) attempt to close the gap between current cocoa farming income and a living income. They do that through (*i*) cocoa productivity improving initiatives; (*ii*) paying cocoa premium prices; and (*iii*) farm income diversification. We highlight the opportunities as well as risks and challenges of the specific actions undertaken in both cases and conclude that relying on one strategy alone is unlikely to significantly contribute to closing the living income gap.

Trefwoorden. — Ivoorkust; Kinderarbeid; Ontbossing; Certificering; Biologische landbouw; Leefbaar inkomen.

Samenvatting. — *Bittere chocolade: de moeizame weg naar een leefbaar inkomen voor West-Afrikaanse cacaoboeren.* — Cacao (*Theobroma cacao* L.) is een tropisch handelsgewas dat wereldwijd inkomsten biedt aan 4,5 miljoen landbouwgezinnen. In Ivoorkust, dat 38 % van alle cacao op aarde produceert, verdient 82 % van de cacaoboeren geen leefbaar inkomen, wat het netto-inkomen is dat een huishouden nodig heeft om alle leden een fatsoenlijke levensstandaard te kunnen bieden. In dit artikel onderzoeken we hoe de duurzaamheidsinitiatieven van twee Belgische actoren in de cacaowaardeketen (Oxfam Fair Trade Belgium en Galler SA) de kloof tussen het huidige inkomen van cacaoboeren en een leefbaar inkomen trachten te verkleinen. Zij doen dit via (*i*) initiatieven om de productiviteit van cacao te verbeteren; (*ii*) het betalen van cacaopremies; en (*iii*) diversificatie van het landbouwinkomen. We belichten bij beide initiatieven zowel de kansen als de risico's en uitdagingen van de specifieke acties en concluderen dat één strategie op zichzelf waarschijnlijk niet significant zal bijdragen aan het dichten van de kloof naar een leefbaar inkomen.

1. Introduction

Cocoa (*Theobroma cacao* L.) is the tropical cash crop from which chocolate is made. In 2022, global cocoa dry bean production amounted to 5.88 million tonnes that were produced on 11.9 million hectares of land. Around two thirds (63 %) of that volume were produced in West Africa (38 %, 19 %, 5 % and 5 % of global cocoa were produced in Ivory Coast, Ghana,

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Nigeria and Cameroon, respectively). Outside Africa, major cocoa procuring countries include Indonesia (13 % of world production), Ecuador (6 % of world production) and Brazil (5 % of world production) (FAOSTAT, 2024).

Despite the fast emergence of cocoa industry-led efforts such as sustainability or fair trade certification schemes, cocoa production continues to be linked to deforestation and poverty (Higonnet, Bellantonio & Hurowitz, 2017; True Price, 2018). Cocoa is a smallholder crop, particularly in West Africa. In all cocoa production areas, it is produced by around 4.5 million farming families, most of which live in (extreme) poverty. Van Vliet, Slingerland, Waarts & Giller (2021) reported that in Ivory Coast, 40 % of cocoa farmers live in extreme poverty, according to World Bank definitions.

Increasing consumer demand for sustainable chocolate products as well as pressure from some European governments (Krauss & Barrientos, 2021) have triggered the cocoa industry and civil society to take initiatives to improve livelihoods of cocoa growing families. In the present paper, we analyse the historical context of cocoa farmer poverty in Ivory Coast, the world's largest cocoa supplier, and critically and qualitatively assess cocoa sustainability strategies that can be taken by actors in the cocoa supply chain which specifically aims at improving income of cocoa farmers above a living income threshold. We do this using two cocoa cases of Belgian actors in the Ivorian cocoa value chain. The research question is whether the latter strategies have a potential to close the prevailing living income gap in the Ivorian cocoa sector and whether relying on one strategy alone is sufficient. Given the considerable size of the present-day living income gap in the Ivorian cocoa sector, we hypothesize this is not the case.

2. The Origins of Cocoa Smallholder Poverty

For many decades, Ivory Coast was a popular immigration country for foreign non-citizens from ECOWAS countries including Mali, Burkina Faso and Liberia (Pailey, Kandilige, Shilue & Zongo, 2017). As a result, the Ivorian cocoa sector could continuously rely on young workers who were hired from the abundant market of migrant labour (Ruf, 1987). At the same time, cocoa has historically expanded in Ivory Coast by shifting cocoa cultivation to recently deforested or degraded forest areas (Clough, Faust & Tscharntke, 2009), where cocoa tree growth, development and production was initially largely supported by the highly fertile tropical forest soils and shade provided by remaining forest trees. These advantages can be considered as labour (Ruf, Schroth & Doffangui, 2015) and forest rents (Odijie, 2016; Ruf & Lançon, 2004; Ruf & Schroth, 2004), respectively, and allow for cocoa production at a relatively low cost. As a result, cocoa growers could obtain a profit margin (albeit small) at low cocoa sale prices. Apart from soil fertility, forest rent, also defined as the difference in cost between planting cocoa in tropical forests compared to replanting cocoa on existing agricultural fields or fallow land, is also derived from differences in costs or efforts required for maintenance, weeding, soil fertility and disease management, which are linked to microclimatic differences between forests and replanted sites. Also, the prevalence of pests and diseases, which contributes to production costs and yields, differ between forest plantations and replanted sites (Odijie, 2016).

Over the past twenty-five years, the cocoa world market prices (FOB) have been very volatile and fluctuated around US$ 2,500 per tonne of dry cocoa beans. Because of inflation, this implies a *de facto* decreasing price for cocoa growers. Forest and labour rents furthermore did

not encourage agronomic innovations in Ivorian cocoa production. Such innovations (agroforestry, integrated soil fertility management, improved cocoa varieties, integrated pest and disease management strategies) are badly needed to sustain cocoa production levels once the forest rent has been depleted. Low cocoa prices and therefore small cocoa profit margins, prevent cocoa growers from implementing these innovations, leading to cocoa production collapses after twenty years. New forest rents are then obtained by moving cocoa production into newly-deforested areas, a process which Clough *et al*. (2009) described as the cocoa boom-and-bust cycle.

Continuous low cocoa prices are the main driver of cocoa farmer poverty. In Ivory Coast, cocoa is exclusively produced by smallholders, most of them own less than 5 ha of cropland (3 ha on average). For these smallholders and their families, cocoa is the main source of income on which they depend for their livelihood. In Ivory Coast, at the beginning of each cocoa season, the cocoa farmgate price is set by the government through the Coffee and Cocoa Council (*Conseil du Café-Cacao* – CCC). This price is influenced by global market prices, production costs, and negotiations with industry stakeholders. The aim is to ensure a fair income for farmers while maintaining competitiveness in the global market (Gilbert & Varangis, 2003). Nevertheless, 82 % of Ivorian cocoa farmers do not earn a living income (Fountain & Huetz-Adams, 2020), which is the net income a household would need to earn to enable all members of the household to afford a decent standard of living. Elements of a decent standard of living include food, water, housing, education, health care, transport, clothing, and other essential needs including provision for unexpected events (Anker, 2011; Veldhuyzen, 2019). It is estimated that under current average cocoa productivity levels in Ivory Coast (460 kg of dry cocoa beans per ha in 2020) (FAOSTAT, 2024), the cocoa farmgate price should increase to US$ 3,160 per tonne of cocoa for Ivorian cocoa farmers to earn a living income, which is more than double the guaranteed farmgate price of US$ 1,247 per tonne that Ivorian farmers received in the main cocoa crop season of 2021-2022 (Christensen, 2022). In 2024, cocoa prices sharply increased well above this price (up to US$ 10,000 per tonne) because of extreme drought caused by the El Niño weather phenomenon (Tabe-Ojong, Adetumi Guedegbe & Glauber, 2024). However, Ivorian cocoa farmers benefit little from these sharp price increases as the CCC set the cocoa farmgate price at just US$ 2,498 per tonne of cocoa (http://www.conseilcafecacao.ci).

Poverty in cocoa farming communities entails lack of quality education and health care. Poverty, absence of, or low access to good affordable schools and inadequate local infrastructure are the root causes of child labour that, despite cocoa company promises to reduce the worst forms of child labour, remains a major issue in the cocoa sector (Fountain & Huetz Adams, 2020). Nearly one fifth of Ivorian children aged five-seventeen are exposed to multiple forms of hazardous work, such as working with dangerous tools or harmful pesticides (UNICEF, 2018).

The cocoa boom-and-bust cycle is responsible for massive deforestation in Ivory Coast. The Ivorian primary rainforest, covering fifteen million hectares in 1960, has shrunk today to just three million hectares, into the Ivorian rainforest (Verdeaux & Alpha, 2004). According to Riano *et al.* (2016), cocoa is responsible for between 20-23 % of historic deforestation in Ivory Coast. Analysis of spatial data further shows that deforestation in Ivory Coast continues to date. Between 2019 and 2020, sixty-eight thousand hectares of primary forest (*i.e.* 2.2 % of the remaining forest) were lost in Ivory Coast. Around one fifth of the latter deforestation took place in the so-called protected forest areas (*forêts classées*) (Despretz, 2020). Deforestation

leads to loss of biodiversity, habitats and ecosystem services (such as pollination), which together with the depletion of the forest rent, threaten cocoa production in Ivory Coast and therefore will hamper cocoa yield and profit improvements in the future.

Climate change will likely decrease climatic suitability of most cocoa-growing regions, mostly because of reduced or irregular rainfall. Areas most likely to retain high suitability are in the proximity of forest reserves where future precipitation will probably remain sufficiently high (Bunn, Lundy, Läderach & Castro, 2017). This means that deforestation and climate change are mutually reinforcing stressors in cocoa production.

To conclude with, the poor institutional environment in which Ivorian cocoa farmers operate, is an important factor preventing them to escape from poverty. Most Ivorian farmers are members of a cocoa cooperative which usually groups up to several hundreds of cocoa farmers and which aim at empowering cocoa farmers and facilitating their access to extension services and capacity-building initiatives. However, Ivorian cocoa farmers generally distrust their cooperatives. According to Ruf, Uribe Leitz, Gboko & Carimentrand (2019), Ivorian cocoa cooperatives should be considered as private companies that act in the interest of their own administration and that of cocoa traders, rather than that of their members. They lack adherence to cooperative values such as collectivism and participative management, particularly of cooperative revenues and expenditures (Ruf *et al.*, 2019).

3. Reversing the Trend

3.1. Third-Party Certification

Civil society organizations were the first responders to cocoa sustainability problems. Fairtrade-certified cocoa guarantees a minimum cocoa price to cocoa growers and adds a premium price to that. The first fairtrade chocolate was labelled in 1994. Fairtrade cocoa is currently governed by Fairtrade International [1]*. Since 2018, the international sustainability certifiers UTZ and Rainforest Alliance (RA) have merged into one organization (RA). It addresses deforestation, climate change, systemic poverty, and social inequity problems in agricultural commodities, including cocoa [2]. Unlike Fairtrade International, UTZ/RA does not guarantee a minimum cocoa price but pays a premium to cocoa growers who comply with a broad set of sustainability criteria.

Organic agriculture is a century-old agricultural practice attempting at increasing sustainability of agricultural production. The main elements of organic agriculture are the exclusion of chemical fertilizers and pesticides (Shi-ming & Sauerborn, 2006). For a company to market cocoa beans as ‘organic’ on the European market, it must comply with European organic legislation, which includes regulations for production, processing and trade (CBI, 2022). The volume share of organic chocolate sold in Belgium was just 1 % in 2019 but had doubled since 2016 (Vandenhaute, Gellynck, Vanhove & Boeckx, 2020). Roughly twenty thousand tons of organic certified beans were imported in 2018, with Dominican Republic as main country of origin (Timmermans & Van Bellegem, 2019). According to the Netherlands Ministry of Foreign Affairs (CBI, 2022), organic premium prices can be as high as 300 USD$ per ton of organic cocoa.

* Numbers in brackets [ ] refer to the notes, p. 436.

3.2. Voluntary Sustainability Standards

Depleting forest rent, concomitant deforestation and accelerating climate change effects have urged also cocoa companies to act and try to reverse the unsustainability trend in the cocoa sector. Cocoa production collapse in West Africa would drive cocoa growers deeper into poverty and would increase cocoa (consumer) prices because of market shortages, as was illustrated by the sharp cocoa world market price increases in 2024 (see § 4.2.). Since the mid-2000s, cocoa trading and processing companies have therefore taken several voluntary sustainability initiatives in the form of self-regulatory corporate social responsibility (CSR) programmes (Ingram, van Rijn, Waarts & Gilhuis, 2018). Among the main cocoa traders and processors, they include (non-exhaustive list) Cargill Cocoa Promise, ADM's Socially and Environmentally Responsible Agricultural Practices (SERAP), Barry-Callebaut's Cocoa Horizons and OLAM's Grow Cocoa initiatives. Chocolate-producing companies' CSR programmes include Nestlé's Cocoa Plan, Mars' Sustainable Cocoa, Ferrero's Farming Values, Hershey's Cocoa Link, Mondelez' Cocoa Life Initiatives and Tony Chocolonely's Tony's Open Chain of some large chocolate companies. These initiatives mostly offer packages of interventions or services (such as organizing farmers into groups, training, credit, tools and farm inputs such as fertilizers, agrochemicals and cocoa seedlings) to farmers and their organizations to secure supplies of cocoa beans of specific quality, produced in specific, often traceable, environmental and social conditions (Ingram *et al.*, 2018). Apart from an evaluation of the Cocoa Challenge Fund (IDH, financed by Cargill, Barry Callebaut and the Beyond Beans Foundation), which found no impact on cocoa yield or income of the investments in fertilizers, enabled by that fund (IDH, 2021), the impact of these corporate cocoa sustainability programmes has to our knowledge not been scientifically assessed.

In addition to the latter corporate cocoa sustainability initiatives, multi-stakeholder platforms have been set up around cocoa sustainability, which include both companies and civil society organizations. They include the Cocoa and Forest Initiatives (CFI) in Ghana and Ivory Coast, the Cameroonian *Feuille de Route pour un Cacao sans Déforestation* and the International Cocoa Initiative (ICI) [3], founded in 2002 following the Harkin-Engel Protocol, an international agreement aimed at ending the worst forms of child labour in the cocoa supply chain. In 2015, the governments of Denmark, France, Germany, the Netherlands, Norway and the UK signed the Amsterdam Declaration to support private-sector and public initiatives aiming at eliminating deforestation from agricultural commodity chains.

3.3. Sustainable Sourcing Legislation

Over the past few years, actors in the cocoa sector have urged for legislation at the European (EU) level to leverage cocoa sustainability and to create a level playing field within a supportive enabling environment for cocoa supply chain actors. Since 2019, the Cocoa Coalition, an informal group of cocoa and chocolate companies, certification organizations, NGOs and the earlier mentioned International Cocoa Initiative, has been advocating the development of relevant EU policy measures, including human rights due diligence legislation and bilateral agreements between the European Union and cocoa-producing countries (Cocoa Initiative, 2022).

In 2023, the European Parliament and the European Council adopted the "Regulation for Deforestation-free products", whereas on 13 June 2024 they adopted Directive (EU) 2024/1760

on “Corporate Sustainability Due Diligence” (CSDDD). Both were designed to improve corporate governance practices and increase corporate responsibility in relation to human rights and environmental risks and improve access to remedy for those affected by adverse impacts of commodities globally sourced and imported to the EU (EC, 2024). Even though the CSDDD requires member states and the European Commission to develop accompanying measures geared at companies, especially SMEs, and other cocoa supply chain stakeholders (EC, 2024), there is a risk that, instead of addressing sustainability issues within their current supply chains, cocoa companies disengage from their buyers and shift cocoa sourcing to areas where *e.g.* deforestation or child labour are less prevalent. Furthermore, companies may cascade compliance requirements without adequate support for cost and risk management (Hylander, Hyrske-Fischer, Gauttier & Vieira, 2014).

3.4. Sustainable Cocoa Partnerships

Since 2014, in Europe, multi-stakeholder platforms, such as the International Cocoa Initiative (see § 3.2.), have also been set up at national level. Such Initiatives on Sustainable Cocoa (ISCO’s) have been established in Germany (GISCO [4]), Switzerland (SWISSCO [5]), Belgium (Beyond Chocolate, since 2018 [6]), the Netherlands (DISCO, since 2020 [7]) and France (*Initiative française pour un Cacao durable*, since 2021) [8].

Although each platform operates independently, often the same multinational companies and civil society organizations are members of the national platforms. As these platforms share most of their objectives, namely to (*i*) contribute to a living income for cocoa farmers and their families; (*ii*) halt cocoa-related deforestation and promote sustainable reforestation and biodiversity; (*iii*) end child labour and forced labour in the cocoa value chain; and (*iv*) enhance the transparency in the cocoa value chain (Kakaoforum, 2022), in 2021 they signed a MoU to better align and to bundle efforts [9].

4. The Difficult Road to a Living Income

Cocoa sustainability is multifaceted and requires actions to reduce cocoa farmer poverty, improve cocoa labour conditions and halt deforestation and other environmental harm, all of which are mutually influencing one another. In what follows, we will exclusively focus on the strategies cocoa farmers, their associations, companies, civil society organizations and scientists, alone, or in collaboration with each another, can deploy to close the living income gap (*i.e.*, the income differential between their actual income and a living income) of cocoa farming families, as there is a wide acceptance among these actors that extreme poverty is the root cause of sustainability problems in the cocoa sector.

In this assessment, we make the simple assumption that a cocoa farmer income is determined by (*i*) the cocoa price; (*ii*) cocoa farm output (consisting of cocoa yield per ha multiplied by cocoa farm size in ha, which determine cocoa farm turnover); (*iii*) cocoa production costs which need to be subtracted from the latter turnover to obtain cocoa net income; and finally (*iv*) additional on- and off-farm income (fig. 1). We further assume that intervening on cocoa price, cocoa yield and production costs as well as on on- and off-farm income (or on a combination of the latter factors), may significantly contribute to closing the cocoa farmer house-

hold living income gap. Many Ivorian cocoa smallholders operate on a scale of just 2-3 ha. Eighty percent of Ivorian cocoa farms are smaller than 5 ha (Suh & Molua, 2022). Land scarcity, tenure issues, land-use competition and low means for investment severely restrict land-use increase. We will therefore not further consider land size as a factor on which external, non-governmental stakeholders like companies or NGOs have leverage to boost cocoa farm income.

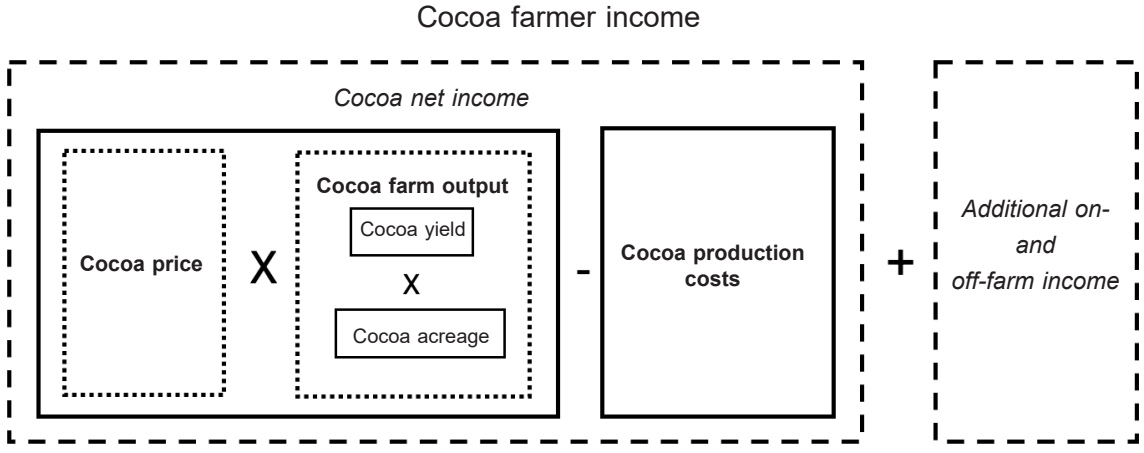

Fig. 1. — Simplified cocoa farmer income model.

We take two Belgian cocoa sustainability initiatives as case studies to show how an NGO (first case) and a private company (second case) take actions on each of the latter three components of cocoa farming income to close the living income gap of a group of Ivorian cocoa farming families.

The first case is the “Bite-to-Fight” project of Oxfam Fair Trade Belgium (hereafter called the Oxfam case), which is performed in collaboration with the cocoa farmer cooperative CPR-Canaan which gathers cocoa farmers from around Daloa (Haut-Sassandra region, Ivory Coast). The second case includes two projects of the Belgian chocolate company Galler SA (*i.e.*, the People, Planet and Cocoa Project, financed by the King Baudouin Foundation, and the Virtuous Beans Project, financed by the Belgian Beyond Chocolate Initiative; see § 3.4.) (hereafter called the Galler case). The latter case is a collaboration between Galler SA, the chocolate SME Zoto, the Trade for Development Centre of the Belgian Development Cooperation Enabel, the Faculty of Gembloux Agro-Bio Tech (University of Liège) and the Yeyasso cocoa farmer cooperative of Man (Tonkpi region, Ivory Coast). Cocoa production in the Tonkpi region started to develop around 1920 (Plas, 2020), whereas in the Haut-Sassandra region cocoa was introduced in 1940 (Oszwald, Bigot & Brou Yao, 2003). However, in the latter region, cocoa production rapidly expanded from the 1960s onwards, whereas in the Tonkpi region, cocoa production has more recently expanded. It is therefore possible that farmers in the Galler project in the Tonki region still benefit from some remaining forest rent, which may result in a higher effect of the project interventions and thus in higher cocoa yields and consequently higher cocoa income compared to farmers in the Oxfam case. Data are lacking to check this hypothesis.

Projects in both cases aim at improving the ecological and socio-economic sustainability of cocoa farming in the intervention areas in Ivory Coast. In both cases similar project activities are performed. However, in their activities, the Oxfam project emphasizes farmer agricultural guidance and organizational capacity building, whereas the Galler projects predominantly focus on transitioning cocoa farming to agroforestry and organic cocoa production systems as well as on farm income diversification. Moreover, the Oxfam project directly intervenes on the cocoa price by paying cocoa farmers a living income premium price on top of the Fairtrade Minimum Price and Fairtrade Premium Price (see further in § 4.2.).

We assess the activities that are performed by one or several case projects. These activities include (*i*) agroforestry, soil management and agricultural practices to boost cocoa productivity; (*ii*) price premiums improving cocoa payments to farmers; and (*iii*) poultry farming, horticulture, staple crop production, apiculture and savings and credit schemes as a strategy to boost non-cocoa income by Ivorian cocoa farmers.

4.1. Cocoa Productivity Enhancing Activities

A study by van Vliet *et al.* (2021) among Ivorian and Ghanian cocoa farmers revealed that when cocoa yields would double (*i.e.* increase from the current 300 to 600 kg of dry cocoa per ha per year), and taking into account the increased production costs to achieve such yields, the share of households that earn a net income below the extreme poverty line would reduce to just 2 and 4 % and those living below the "living income benchmark" to 25 and 32 % in Ghana and Ivory Coast, respectively. In what follows, we will present and discuss the interventions made by the Oxfam and Galler projects aiming at improving yield. We focus on agroforestry, soil management and other agricultural practices.

4.1.1. Agroforestry

Despite earlier efforts of companies and NGOs to promote agroforestry systems in Ivory Coast, most Ivorian cocoa farmers produce cocoa in full sun systems, with some old remaining forest trees (*e.g.*, *Ceiba pentandra* or *Terminalia* spp.) dispersed here and there in the cocoa plots. Agroforestry has numerous agro-ecological benefits to cocoa trees that are produced in low-input agroecosystems such as those in Ivory Coast.

Cocoa agroforestry systems (*i*) reduce air and soil temperatures as well as wind speed (Beer, 1998); (*ii*) reduce fruit abortion, resulting from soil N addition through leguminous shade trees (Bos, Steffan-Dewenter & Tscharntke, 2007); (*iii*) protect cocoa pods and trees against windborne spores of fungal diseases (Rice & Greenberg, 2000); (*iv*) improve buffering of high humidity levels and soil moisture availability (Beer, 1998; Schwendenmann *et al.*, 2010); (*v*) improve light regulation and tree nutritional status (Isaac, Timmer & Quashie-Sam, 2007); (*vi*) reduce excessive vegetative growth (flushing) (Beer, 1998); (*vii*) reduce nutritional imbalances and tree dieback (Beer, 1998; Wessel & Gerritsma, 1997); (*viii*) suppress weed growth (Rice & Greenberg, 2000); (*ix*) increase overall insect biodiversity, which improves yield through natural control of pest populations and increased pollination services (Asare, 2006; Daghela Bisseleua, Missoup & Vidal, 2009; Bos *et al.*, 2007; Sperber, Nakayama, Valverde & de Siqueira Neves, 2004; Zuidema, Leffelaar, Gerritsma, Mommer & Niels, 2005); and (*x*) improve soil fertility, and reduce and prevent soil erosion (Beer, 1998; Duguma, Gockowski & Bakala, 2001; Schroth, Lehmann, do Rosário Lobato Rodrigues, Barros & Macêdo, 2001; Rice & Greenberg, 2000).

Agroforestry enhances soil exploration by the trees' root system and the associated mycorrhizas. It also fosters litter fall and proliferation of soil organisms (fauna and microbes, including pest and disease antagonists) (Vanhove, Vanhoudt & Van Damme, 2016), thus creating a soil with more favourable structure, and adequate organic matter and nutrient availability (Schroth & Krauss, 2006). In addition to the agro-ecological benefits of shade trees, possible lower per yield of cocoa in agroforestry systems can be compensated by additional income from selling fruits from shade trees such as bananas (Musa *sp*.), citrus (Citrus *sp*.), avocado (*Persea americana*), coconut palm (*Cocos nucifera*) (Feintrenie, Ollivier & Enjalric, 2010; Kan Koko, Snoeck, Lekadou & Assiri, 2013; Osei-Bonsu, Opoku-Ameyaw, Amoah & Oppong, 2002) or other, local and often underutilized fruit tree species (Asare, Afari-Sefa, Osei-Owusu & Pabi, 2014; Daghela Bisseleua *et al.*, 2009; Sonwa *et al.*, 2007; Vaast & Somarriba, 2014).

Fig. 2. — Shade tree nurseries in Man (People, Planet and Cocoa Project – Galler case).

Because of these benefits, both the Oxfam and Galler projects have a strong agroforestry component. In 2021, in the Oxfam project five thousand four hundred and forty-two shade tree plants were distributed to fifty-one cocoa farmers. They were raised in nurseries (fig. 2) under guidance of *Foncier Foresterie Agriculture* (FOA), a local forestry partner. Between 2019 and 2021, the Galler People, Planet and Cocoa Project raised and distributed fifty thousand trees to cocoa farmers in the region of Man. Species planted included *Beilschmiedia mannii* (Kplé), *Ricinodendron heudelotii* (Akpi), *Terminalia superba* (Fraké), *Terminalia ivorensis* (Framiré), *Garcinia kola* (Petit cola), *Irvingia gabonensis* and *Citrus* x *sinensis* (Orange), *Cedrela odorata* and *Acacia mangium*. *B. mannii* was exclusively distributed in the Galler case, whereas *C. odorata* and *A. mangium* were only distributed in the Oxfam case. All other species were used in both cases.

Despite the numerous benefits of cocoa agroforestry in Ivorian cocoa systems and despite private and public sector efforts such as those in our case studies, to promote shade tree planting, 90 % of cocoa in Ivory Coast is still produced under light or no shade (Sanial, 2018). Obstacles for agroforestry adoption by Ivorian cocoa smallholders that were identified in the case studies include (*i*) perceived competition between cocoa and shade trees; (*ii*) shade tree planting preferences on the plantation borders; (*iii*) preference of timber tree species (which are cut down after ten to fifteen years); and (*iv*) lack of follow-up on shade tree development after seedling distribution to cocoa farmers.

Given the long period required for agroforestry systems to mature, and the difficulties for shade trees to grow above the cocoa canopy in standing cocoa plantations, it is strongly recommended that shade tree planting projects extend their activities beyond shade tree seedling growing in nurseries and seedling distribution to cocoa farmers. Shade trees require protection

from weeds, drought, pests, and diseases. Furthermore, cocoa trees around shade trees should be pruned for successful shade tree growth and development. In both case studies, agroforestry follow-up activities are adequately performed. In the long run, these projects could consider incentives (*e.g.*, premiums; see § 4.2.) for cocoa farmers not to cut down shade trees. At the same time, as current cocoa genotypes in Ivory Coast have been bred for full-sun systems, it is important to breed new genetic cocoa material that is adapted to shaded agroforestry systems with low light intensities. This is crucial to close the yield gap between monocultures and agroforestry systems, and to further promote the adoption of the latter (Armengot, Picucci, Milz, Hansen & Schneider, 2023).

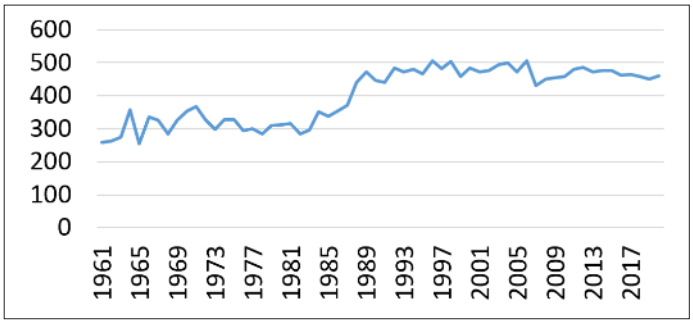

Fig. 3. — West-African cocoa dry bean yield (kg ha^{-1}) (1960-2020) (source: FAOSTAT).

4.1.2. Soil Management

Notwithstanding soils on which cocoa is grown are highly variable in physical and chemical properties, they are generally characterized by poor fertility (particularly lacking phosphorus), acidity and low exchange capacity of clay minerals. It is widely accepted (van Vliet & Giller, 2017) that in addition to ageing cocoa trees and lack of good agricultural practices, poor soil fertility explains to a large extent why current average West-African cocoa yield (460 kg of dry cocoa beans per ha in 2020 [10]) (fig. 3) is far below the theoretical level of three tons of dry cocoa beans per ha that was obtained in controlled, experimental conditions (Goenaga, Guiltinan, Maximova, Seguine & Irizarry, 2015).

Cocoa smallholders have limited options to improve soil fertility. In Cameroon, it was found that just 33 % of cocoa farmers apply mineral fertilizers, whereas compost and manure were applied by even less farmers (16 % and 13 %, respectively). Farmers were mostly restricted by poor access to fertilizers, organic material to produce compost or to manure (Kenfack Essougong *et al.*, 2020). Improving soil fertility in cocoa farms should make long-lasting changes in soil structure and composition, most importantly improving soil organic matter contents as a strategy to improve soil water retention and mineral exchange capacities. The establishment of agroforestry systems is the best strategy to achieve these goals (see § 4.1.1.) (Wartenberg, Blaser, Roshetko, Van Noordwijk & Six, 2020).

Apart from agroforestry, the studied cases have developed other soil fertility improvement alternatives such as (*i*) compost production and application, and (*ii*) poultry farming, aiming at organic fertilizer production (apart from additional income from poultry meat and eggs, see § 4.3.). In the Oxfam case, compost was produced by forty smallholders. Compost heaps were 2 m x 2 m x 1.5 m (height) and consisted of organic material including leaves, hay, rice straw, sawdust, chopped branches and chopped maize stalks (fig. 4). Nitrogen sources such as weeds or plant residues from gardens, fresh or dry manure, or digested sewage sludge were also added. Compost can significantly contribute to improving cocoa farm soils' physicochemical composition. However, the largest bottleneck of compost production for Ivorian cocoa farmers is the limited supply of organic matter. It is unsure whether the small compost quantities

applied (6 m³ per 2 to 3 ha farm) can significantly improve soil fertility. Moreover, if composting is done inappropriately, it might contribute to the rapid spread of black pod disease (*Phytophthora* spp.) (Amponsah-Doku, Daymond, Robinson, Atuah & Sizmur, 2022). Barriers to poultry farming (Galler case) include the investment needed for chicken cage construction, labour and chicken feed that mostly needs to be purchased.

Fig. 4. — Compost heap construction in Cailloux village (Daloa, Ivory Coast) (Oxfam case).

4.1.3. Other Agricultural Practices

Good agricultural practices (GAP) in cocoa cultivation have frequently been reported for more than seventy years (Thirion, 1950; Lery, 1954; Williams, 1975; Lass, 1985; Huijsmans, 2020). These practices, which are expected to obtain optimum cocoa yield, include (*i*) pruning, including tree formation, maintenance pruning (shaping the tree and allowing air flow through the cocoa canopy to optimize photosynthesis and to prevent pests and diseases), and phytosanitary pruning (removal of diseased branches and pods); (*ii*) (integrated) pest and disease management, including the reasonable use of chemical or biological pesticides and aforementioned pruning practices; (*iii*) composting of diseased plant parts (to prevent spore spreading of fungal diseases); (*iv*) weeding; (*v*) soil fertility management, including fertilizer application, composting and re-introduction of crop residues (empty pod shells) or other organic (waste) material to the field (see § 4.1.2.); (*vi*) shade tree planting (see § 4.1.1.); and (*vii*) cocoa (re-) planting, including variety choice and planting density.

Despite decades of training and extension programmes by companies and NGOs, GAP adoption rates, particularly those of pruning (Obeng Adomaa, Vellema, Slingerland & Asare, 2021), are very low in West Africa (Asare, Afari-Sefa, Muilerman & Anim-Kwapong, 2018). The reasons for this remain unclear. It may be that the amount of time and capital that need to be invested in GAP outweigh the expected cocoa yield and thus income improvements. Furthermore, it may be that GAP benefits are acknowledged but that they are perceived only to occur in the long term. Cocoa farmers may prefer to allocate time and money to investments with shorter-term benefits. According to Huijsmans (2020), GAP adoption is significantly improved through training. However, she did not find a positive effect of GAP adoption on cocoa yield, which may be linked to the short evaluation period (three years) or other yield-limiting factors such as low-yielding cocoa genotypes or severe soil infertility that cannot be quickly solved by short-term GAP applications. Obeng Adomaa *et al*. (2021) underscored the need for context-specific diagnoses and adaptations, which are often lacking in NGO and company GAP training sessions.

Training is a core element of the Oxfam and Galler cases. In the Oxfam case, training is organized through four “Farmer Field Schools” (FFS), each providing training to a cooperative subsection of twenty-five farmers. Trainings take place in a plot where the trainer, in a par-

ticipatory way, teaches good agricultural as well as good environmental practices. The training methodology is based on a manual published by the German Development Agency GIZ (Dohmen, Helberg & Asiedu, 2016). FFS sessions are held fortnightly and are provided by a trainer (the same for each subsection) and a coach (one per subsection). Moreover, in each FFS, there is a "farming practices" as well as a "best practices" plot. The "farming practices" plot is managed by a cocoa farmer according to his own choice, whereas in the "best practices" plot, appropriate GAP are implemented by the trainer and the coach. During training, cocoa tree production as well as phytosanitary problems are compared between both plots. Moreover, to encourage cocoa growers to carry out GAP, participating farmers receive an agricultural kit consisting of a machete, a pair of boots, a file and a rack.

In addition to training, the coaches pay monthly visits to the cocoa farmers to discuss their individual cocoa agricultural problems, barriers to adopting the GAP and the possibilities to overcome them. Specific focus has been on guiding farmers in correctly putting compost heaps in place on their plantations as well as providing access to organic fertilizers (based on chicken manure) and biopesticides, based on Neem (*Azadirachta indica*) seed oil. Furthermore, each subsection has self-help teams, which consist of several (mostly young) cocoa growers who step in when certain GAP (particularly weeding) cannot be performed by a farmer (*e.g.*, because the farmer is incapable of doing the laborious tasks due to high age or illness). The idea behind this approach is that cocoa farms have very particular phytosanitary and other agronomic problems that consequently require solutions tailored to these specific situations. The impact of the latter strategy on cocoa yield, environmental sustainability and cocoa farming income remains to be evaluated.

4.2. Cocoa Premiums

Cocoa prices — determined by global future markets — are too low for cocoa farmers to obtain a living income with the current cocoa production levels (see § 1). Cocoa buyers therefore often provide premiums as an incentive for cocoa farmers and traders to improve social, ecological or both sustainability aspects of their cocoa growing and trading activities.

In the Oxfam case, a Fairtrade Minimum Price (FMP) is used that is determined by Fairtrade International for Ivory Coast and Ghana. The FMP is then compared to the reference price for these countries. The difference (called differential) is paid to cocoa farmers (unless the reference price is higher than the FMP) together with a cocoa premium. Before 2019, the reference price was too often higher than the FMP (fig. 5). As a result, in October 2019, Fairtrade International raised its FMP from US$ 2,000 to US$ 2,400 per tonne (FOB), marking a 20 % increase. Since 1 April 2024, Fairtrade International has set the cocoa premium at US$ 240 per tonne (Guimarães, 2024). Since 2023, cocoa prices have significantly increased with spikes exceeding US$ 10,000 per tonne of cocoa, mainly because of global cocoa drought-induced shortages caused by the El Niño weather phenomenon (Tabe-Ojong *et al.*, 2024). For a cocoa farmer to receive the FMP differential and the Fairtrade premium, farmers, workers, traders and other stakeholders in the Fairtrade cocoa value chain must comply with minimum social, economic and environmental requirements (with focus on working conditions) plus progress requirements that encourage continuous improvement of cocoa farmer well-being (Vandenhaute *et al.*, 2020). Moreover, farmers participating in Oxfam's "Bite-to-Fight" project receive an additional Living Income Premium of US$ 1,068 on top of the guaranteed FMP and Fairtrade Premium Price. This means that since April 2024, farmers in the latter project receive a price of US$ 3,708 (US$ 2,400 FMP + US$ 240 Fairtrade Premium + 1,068 US$ Living Income Premium).

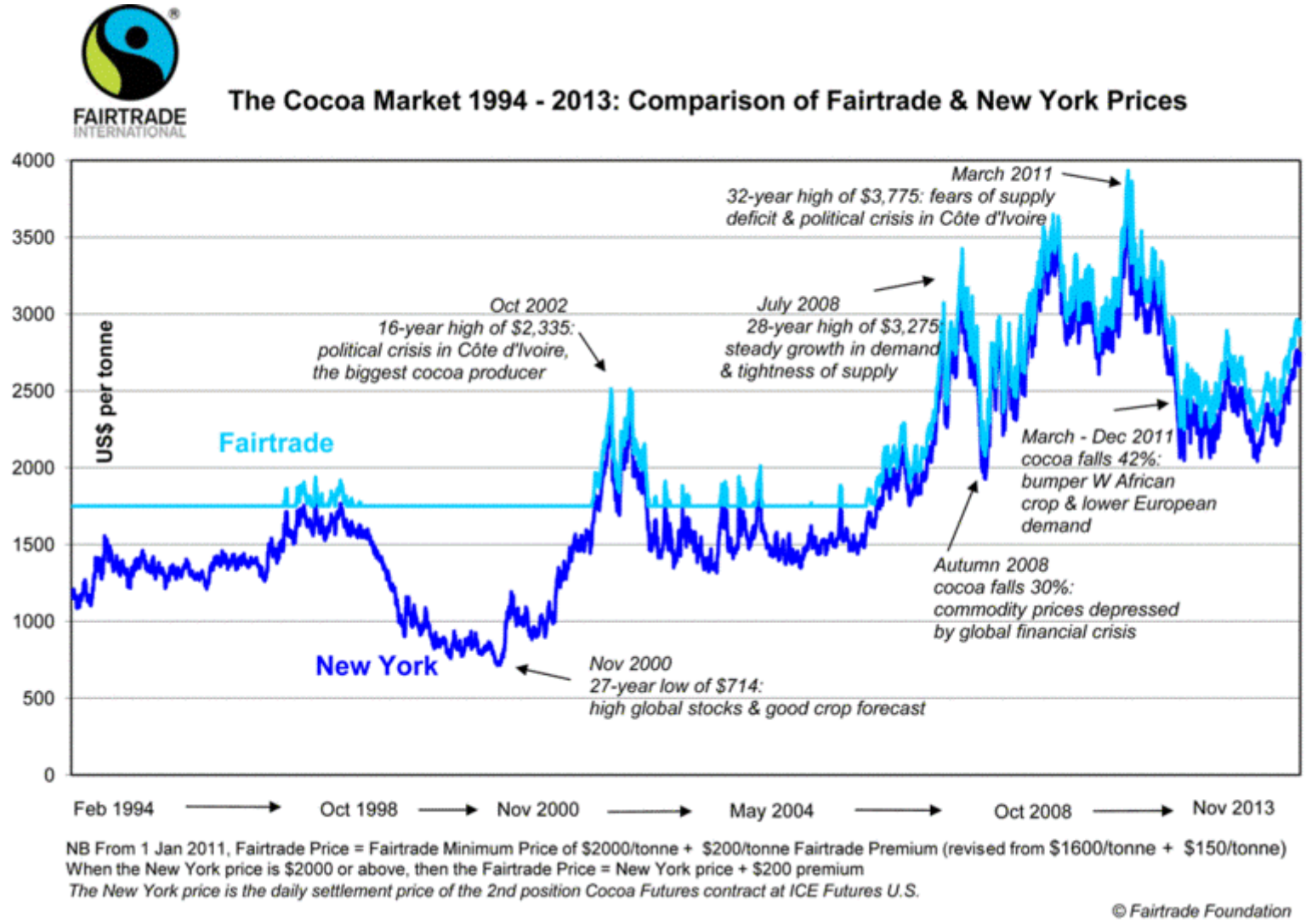

Fig. 5. — Cocoa Reference Price (dark blue line) and Fairtrade Minimum Price (FMP) (light blue line) set by Fairtrade International between 1994 and 2013 (source: Fairtrade International).

While Fairtrade offers cocoa farmers a minimum price and a fixed premium, Rainforest Alliance operates without explicitly protecting farmers from unfortunate market developments and focuses on environmental issues (Vandenhaute *et al.*, 2020).

The Virtuous Beans Project in the Galler case aims at improving cocoa quality as well as cocoa farming income through a transition to organic cocoa. It requires complete elimination of chemical pesticides from cocoa cultivation in the project area and the adoption of organic farming practices, including alternative non-chemical strategies to control pests and diseases. The latter can be done through phytosanitary pruning, composting of diseased plant parts as well as the application of organic pesticides such as neem (*Azadirachta indica*) oil. In areas with high pest and disease incidence, the sudden elimination of chemical pesticides may cause a drop in cocoa production. This is particularly the case for cocoa areas infested by the mirids *Distantiella theobroma* and *Sahlbergella singularis* whose sap-sucking nymphs and adults feed on young cocoa shoots and pods (Babin *et al.*, 2010). Mirids occur more abundantly in so-called "mirid pockets", *i.e.* sunny patches in cocoa plantations, which frequently occur in degraded, unshaded plantations (Anikwe & Otuonye, 2015). Agroforestry practices may reduce mirid populations in West-African cocoa systems (Babin *et al.*, 2010; Gidoin *et al.*, 2014; Daghela Bisseleua, Fotio, Yede, Missoup & Vidal, 2013). In Bolivia, Schneider *et al.* (2017) showed that the cocoa yield gap between organic and conventional systems was 47 %, but that this gap was closed to just 16 % in agroforestry systems. However, transforming a full-sun cocoa plantation to a mature agroforestry system requires several years. A sudden turn towards organic cocoa farming thus entails risks of (temporary) production decreases.

To date, the impact of the transition to organic production on cocoa yield and profit of the cocoa farmers involved in the Galler case has been slightly negative (- 1 %). According to Galler, this is mostly due to inadequate replacement of chemical pesticides by biopesticides. Moreover, the premium price cocoa farmers will receive for organically-labelled cocoa remains to be determined. As is the case in the Oxfam project, all cocoa beans produced in the Galler case are Fairtrade-certified. On top of an organic price premium, the Yeyasso producers will therefore also obtain a Fairtrade price premium. Total organic cocoa output as well as (premium) price will determine the income that farmers in the Galler case will derive from organic cocoa.

Cocoa companies could think of other premium prices or other financial incentives that reward cocoa sustainability activities which are not yet covered by organic or fairtrade standards. They may include premiums paid for cocoa trees that are adequately pruned, where black pod disease (*Phytophthora* sp.) is below certain thresholds or where other GAP have resulted in objectively verifiable sustainability results, or a premium price paid per cocoa shade tree that has reached a certain height or diameter at breast height (DBH).

So far, recent policy changes in Ivory Coast and Ghana have had the largest impact on the farmgate price that cocoa farmers receive for their cocoa beans. In 2019, both countries introduced the "Living Income Differential" (LID) policy which has made it compulsory for cocoa buyers to pay a premium of US$ 400 per tonne of cocoa on top of the FOB price. The LID also introduces a new price stabilization fund to improve farmgate price stability across harvest seasons (Boysen, Ferrari, Nechifor & Tillie, 2023). However, soon after the LID policy came into force, it was feared that cocoa buyers would start to source their cocoa from non-LID origins (ICCO, 2021). So far, in Ivory Coast the LID has not led to substantially higher cocoa farmgate prices.

To close the living income gap at current cocoa yield and in absence of significant alternative on- and off-farm income, cocoa farmgate prices should reach at least US$ 3,160 per tonne (see § 2). When cocoa farmgate prices are low (in the Ivorian cocoa sector, the current farmgate price of US$ 2,500 per tonne is a record high), premiums will not close the living income gap by themselves, also because a certain increase in cocoa farmgate prices will cause a proportionally larger chocolate product price increase to the consumers. It is therefore recommended that cocoa farmers not solely rely on premiums, but also improve their cocoa yield (§ 4.1.) and diversify their income resources (§ 4.3.).

4.3. Additional Farmer Income

In both the Oxfam and Galler cases, alternative farmer income activities are actively promoted and supported. They include (*i*) poultry farming; (*ii*) horticultural crop production; (*iii*) cash crop production; (*iv*) beekeeping; and (*v*) savings and credit schemes. Although these activities all have income-generating capacities, they also have a few risks and challenges, including absence of value chains for the latter products and the risk of driving cocoa farmers' efforts away from cocoa GAP. More specific opportunities and risks of alternative income-generating activities are summarized in table 1.

Table 1

Opportunities and risks of cocoa farmer alternative income-generating activities promoted and supported in the Oxfam (O) and Galler (G) cases

Case	Description	Opportunities	Risks and challenges
G	The Virtuous Beans Project supports several poultry farms centralized across different farmer groups in the Yeyasso cooperative.	Threefold income: from chicken meat, eggs and manure. Manure is an important input for cocoa soil management (see § 4.1.2.).	High investment and labour for chicken cage construction. Feed that mostly needs to be purchased. Absence of buyers of chicken products (certainly if they lack purchase power).
O	A horticultural project was attempted on 2 ha where the women from cocoa farming families cultivated tomatoes (*Solanum lycopersicum*), eggplants (*Solanum melongena*), watermelons (*Citrullus lanatus*) and okra (*Abelmoschus esculentus*). The project was financed by the Saving and Credits Systems (SCS) (see below).	Contribution of horticultural produce to food security (particularly micronutrient supply).	Sensitivity of horticultural crops to pests and diseases. Seasonality of the crops; *i.e.* during the main rainy season (April-July). Top-down approach; the initiative did not come from the women themselves; lack of ownership causes neglect of the crops. Market chains need to be organized.

G, O	Similar to the horticultural project, in both cases, a plot (around 1 ha) of cassava (*Manihot esculente*) was planted by a group of women. Other cash crop projects included the production of rice (*Oryza glaberrima*) and maize (*Zea mays*).	Cassava is a high-value cash crop. Transformation of cassava tubers in cassava flour can further add value.	Top-down approach; the initiative did not come from the women themselves; lack of ownership causes neglect of the crop. Market chains need to be organized.
G, O	Fifty beehives (wooden boxes) have been installed in six cocoa farms in the Oxfam case. Beekeeping activities (cleaning, priming with wax, honey harvesting, beehive relocation, etc.) are performed by eight people. Cashew (*Anacardium occidentale*) (Oxfam case) trees or coffee (*Coffea canephora*) (Galler case) (often intercropped with cocoa) are the main pollen and nectar sources (fig. 6).	Each beehive can produce up to 10 L of honey per year, which can be sold at € 4.5 to € 6 per L. Access to organic markets if honey is produced in an 'organic' cocoa landscape (*i.e.* where no pesticides are used).	Current insecticide use threatens bee populations. Beekeeping is technical and requires adequate and careful management. Beehives are pre-financed by the project; there is a risk of non-reimbursement of honey; yields are below expected levels.
G, O	In the Galler case, eight Saving and Credits Systems (SCS) have been established for women, whereas in the Oxfam case three female (fig. 7) and two male SCS were formed. They aim at improving financial autonomy of the cocoa farming families. SCS members make regular savings, which are then given as a loan to small-scale economic initiatives such as horticultural plots, food processing (*e.g.*, machines to transform fermented cassava into *attiéké* granulates) or marketing equipment (*e.g.*, tricycles, facilitating transport of produce to the market) (see above).	Financial autonomy of women is improving. SCS act as a leverage for the local economy.	Training in entrepreneurship is required. Successful commercial projects require market access. Loans might not be paid back if the projects fail.

Fig. 6. — Apiculture project in the Oxfam case (Daloa). Beehive preparation training session (left) and cashew trees (*A. occidentale*) intercropped with cocoa as a pollen and nectar supplier to the apiculture.

Fig. 7. — Gathering of one of the women Savings and Credit groups at Daloa (Oxfam case).

5. Conclusions

Ivorian cocoa supplies 38 % of the global chocolate market. However, Ivorian cocoa farmers are mostly poor. Around 40 % of Ivorian cocoa producers live in extreme poverty and 82 % of them do not earn a living income. If cocoa farmers were to rely on the cocoa price alone, the currently paid farmgate price should reach at least US$ 2,500 per tonne to enable living incomes. Even when cocoa world market prices surge, as has been the case since 2024, Ivorian farmers receive a price below a living income price because of Ivorian cocoa price policies.

In the present paper, we have dealt with three strategies that can contribute to close the living income gap of Ivorian cocoa farming families: (*i*) cocoa productivity; (*ii*) cocoa premiums; and (*iii*) non-cocoa farm income.

The projects developed by Oxfam and Galler which are studied in the present paper make use of all three strategies. The opportunities as well as risks and challenges of the specific actions undertaken in both cases have been identified. Although the latter actions in both cases remain to be quantified and evaluated and will mostly carry out their full impact after a few years, research (van Vliet *et al.*, 2021) has revealed that relying on one strategy alone is unlikely to significantly contribute to closing the living income gap. The diversification of the living income strategies applied in both cases may therefore inspire other cocoa traders, manufacturers, governmental and civil society organizations that aim at eradicating Ivorian cocoa farmer poverty.

NOTES

[1] https://www.fairtrade.net/product/cocoa
[2] https://www.rainforest-alliance.org/commodity/cocoa/
[3] https://www.cocoainitiative.org/
[4] https://www.kakaoforum.de/
[5] https://www.kakaoplattform.ch/
[6] https://www.idhsustainabletrade.com/initiative/beyondchocolate/
[7] https://www.idhsustainabletrade.com/initiative/dutch-initiative-on-sustainable-cocoa-disco/
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In memoriam

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Alfredo López Austin

(Ciudad Juárez, Mexique, 12 mars 1936 – Mexico, 15 octobre 2021)

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Alfredo López Austin était l'un des plus grands spécialistes des cultures mésoaméricaines de sa génération. Apprécié de tous, tant pour ses travaux que ses qualités humaines, il nous a quittés à l'âge de quatre-vingt-cinq ans, au terme d'une carrière bien remplie. Il fut durant près de cinquante ans chercheur à l'*Instituto de Investigaciones Antropológicas* de la *Universidad Nacional Autónoma de México* (UNAM) et professeur à la faculté de philosophie et lettres de la même université. Il avait accédé à l'éméritat en 2000.

Alfredo López Austin fut attiré dès son plus jeune âge par les sciences sociales, l'histoire et la philosophie. Il s'intéressait en particulier aux questions liées au fait religieux et aux cultures indigènes du Mexique. Sa famille le poussa toutefois à se lancer dans des études de droit, qu'il effectua à la *Universidad Autónoma de Nuevo León* (1954-1955), puis à la UNAM (1956-1959). Il exerça ensuite la fonction d'avocat durant trois ans, dans sa ville natale de Ciudad Juárez. Cependant, il avait mis à profit son passage à la UNAM pour suivre aussi, en tant qu'auditeur, des cours de philosophie, d'histoire et de langue nahuatl, dans le cadre desquels il fit connaissance avec l'éminent mexicaniste qu'était Miguel León-Portilla.

À l'invitation de ce dernier, il finit par suivre sa vocation et, renonçant à sa carrière d'avocat, il s'installa à Mexico pour devenir chercheur à l'*Instituto de Investigaciones Históricas* de la UNAM. Il occupa le poste de 1965 à 1976, en parallèle aux études d'histoire qu'il entreprit à la faculté de philosophie et lettres. Son mémoire de *maestría*, soutenu en 1972 et publié l'année suivante, *Hombre-Dios: religión y política en el mundo náhuatl*, constituait déjà un jalon important de ses recherches [1]*. Il y développait, au départ de la figure de «l'homme-dieu» Topiltzin Quetzalcoatl, une série de thèmes centraux dans la pensée mésoaméricaine. Il entama ensuite un doctorat, passant à l'*Instituto de Investigaciones Antropológicas* en 1976. Sa thèse, soutenue en 1980 et intitulée *Cuerpo humano e ideología: las concepciones de los antiguos nahuas*, sera publiée la même année [2]. Aujourd'hui encore, elle demeure une œuvre de référence pour les mexicanistes.

Alfredo López Austin a montré, tout au long de sa carrière, un intérêt particulier pour les mythes mésoaméricains, anciens comme modernes. Redéfinissant le mythe dans le contexte des cultures mésoaméricaines, il effectuera des liens incessants entre le matériel ethnographique collecté auprès des peuples indigènes actuels depuis le début du XX^e^ siècle et la mythologie préhispanique telle qu'elle fut transcrite dans les sources du XVI^e^ siècle. Il y consacra de nom-

* Les chiffres entre crochets [ ] renvoient aux notes et références, p. 444.

breuses pages, dans une série de publications débutant essentiellement avec son monumental *Los mitos del tlacuache: caminos de la mitología mesoamericana*, paru en 1990 [3]. C'est par intérêt partagé sur ces thématiques qu'Alfredo López Austin fit la connaissance de Michel Graulich (1944-2015), qui était alors professeur à l'Université libre de Bruxelles, directeur d'études à l'École pratique des Hautes Études à Paris et membre titulaire de l'ARSOM. Au-delà de la collaboration scientifique, ce fut le début d'une longue et sincère amitié entre les deux hommes. En 2000-2001, Michel Graulich invita Alfredo López Austin à intervenir dans le séminaire qu'il dispensait à Paris sur les religions en Mésoamérique. La série de conférences qu'il prononça à cette occasion marqua profondément les étudiants mésoaméricanistes qui y assistèrent, et dont celle qui écrit ces lignes faisait partie. Par les liens ainsi noués avec Michel Graulich et la recherche franco-belge sur la Mésoamérique, se créèrent des échanges réguliers et c'est ainsi qu'Alfredo López Austin fut élu membre correspondant de l'ARSOM.

Alfredo López Austin poursuivit ses travaux avec enthousiasme après son accession à l'éméritat; le jour même de sa mort, il écrivait encore. Il fut également l'auteur de nombreux écrits de divulgation scientifique autour de ses thèmes de prédilection, parus notamment sous la forme de numéros thématiques de la revue *Arqueología Mexicana* [4]. Enfin, avec son collègue andiniste Luis Millones, il s'était aussi lancé dans une série d'études comparatistes entre la Mésoamérique et les cultures andines [5].

Conséquence logique d'une brillante carrière internationale, Alfredo López Austin a été récompensé de prix prestigieux, parmi lesquels on peut retenir l'*Iichiko Prize for Cultural Studies* de l'*Institute for Intercultural & Transdisciplinary Studies* de Tokyo (1993), la médaille et le diplôme du Sénat de l'Université de Varsovie (2008) et la *Henry B. Nicholson Medal for Excellence in Mesoamerican Studies* de l'Université de Harvard (2011). Ces marques de reconnaissance ont bien entendu fait plaisir au chercheur mais, avant tout, il se disait heureux d'avoir pu faire ce qu'il aimait. Par-dessus tout, Alfredo López Austin restera l'un des plus grands chercheurs de sa génération, doublé d'un être humain d'une générosité infinie. Ses analyses de la mythologie mésoaméricaine ont profondément marqué le parcours de nombreux chercheurs actuels.

Sylvie Peperstraete

NOTES ET RÉFÉRENCES

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Paul Gigase

(Antwerp, 9 June 1930 – Antwerp, 30 June 2021)

Introduction

The tropical medicine community, on the one hand, remembers Paul Gigase as a dedicated professor and head of the Laboratory of Pathologic Anatomy at the Institute of Tropical Medicine (ITM) in Antwerp. From 1955 to 2002, he lived in or travelled to sub-Saharan Africa and Asia while studying various infectious and parasitic diseases in the field and in the laboratory. He was instrumental in moving the ITM out of the colonial era, and was for many years on the boards of the Belgian Tropical Medical Fund (FOMETRO) and of *Médecins Sans Frontières*.

For palaeontologists worldwide, on the other hand, Paul Gigase was a gifted amateur palaeontologist, who collaborated for more than fifty years with renowned scientists in this field and donated numerous key fossils to the Royal Belgian Institute of Natural Sciences. Who was this multifaceted scientist, deeply Belgian, flawlessly multilingual, committed to tropical diseases and humanitarian causes but also passionate about fossils and evolution?

The First Twenty-Five Years: Development of a Sensitivity to Humanitarian Causes (1930-1955)

Paul Louis Joséphine Gigase was born on 9 June 1930 as the only child in a middle-class family in Antwerp. His parents rented in the city centre an old house, on the first floor of which they ran an optical store and a repair workshop for second-hand microscopes and other optical devices. From an early age, Paul became thus familiar with microscopes and things invisible to the naked eye, but through a friend of his father's, also with fossils. He received most of his primary and secondary education at the Jesuit school of *Onze-Lieve-Vrouwecollege* where lessons were taught in Dutch but French was prominent in the classroom and playground. As most children in his school and social class, he became and remained perfectly bilingual.

On the first day of the Second World War, 10 May 1940, his father was recruited as a reservist in the Belgian army, more specifically at the *Hôpital militaire de Réserve 60*, situated in Blankenberge. Ten days later, the unit was evacuated to France during the night when the German army reached the Belgian coast. As many others, the entire Gigase family joined the fleeing troops. For three months, Paul — just ten years old — and his parents travelled across France in a convoy of army trucks. In July, the unit was disbanded and the Gigase family returned home.

The occupied city of Antwerp was heavily bombarded throughout the war. For many nights, the Gigase family would seek refuge in a small coal cellar while Allied bombers flew over the city. One afternoon, on 5 April 1943, Paul was searching fossils at the sandy *Wilrijkse Plein* when the sirens went off. American and British aircraft bombed from high altitude the suburb of Mortsel, where vast repair shops of the Luftwaffe were located. Unfortunately, the bombs missed their targets and destroyed the nearby village centre, including several schools. In a few minutes, nine hundred and sixty-three civilians, including over two hundred and fifty school-children, were killed; thousands more were severely injured. Paul, who was only twelve years old, was deeply affected by the sight of trucks loaded with dead and maimed people.

Paul, however, remained fond of palaeontology, continuing to collect fossils during his youth and throughout his life. Although he could have had a splendid career in this field, his parents convinced him to pursue a more respectable and secure medical vocation. In 1948, Paul started his studies at the Catholic University of Leuven in the French section (UCLouvain). When he was in his third year, his father obtained a position at the *Institut pour la Recherche scientifique en Afrique centrale* (IRSAC). In September 1951, Paul's parents left Antwerp for the Congo (then Belgian Congo), where his father handled the ordering and maintenance of scientific equipment at the IRSAC research centre Lwiro, near Lake Kivu in East Congo. Paul travelled to Congo for the first time in the summer of 1952 to visit his parents and was impressed by the tropical surroundings and the medical challenges he observed.

The Colonial Doctor in Kivu (1955-1961)

Paul Gigase obtained his medical degree from the UCLouvain in June 1955. In December of the same year, he left for Congo as a young "colonial doctor" for the *Fondation médicale de l'Université de Louvain pour l'Afrique centrale* (FOMULAC), which ran a hospital in Katana along Lake Kivu, around 40 km north of Bukavu (fig. 1). He lived only 7 km away from the IRSAC where his father worked. Recruited for a term of three years, he was in charge of the ward for adult men as well as the radiology and laboratory departments. Apart from practising medicine and managing the wards, he lectured at the adjoining school for nurses and medical assistants. The hospital provided medical care to a population of about one hundred thousand people, belonging to the Bashi and Bahavu ethnic groups. The local language was Shi (or Mashi), but most locals also spoke Swahili, in which Paul managed quite well.

The Katana hospital complex was located on top of a hill with a splendid view of Lake Kivu. This "hospital for Africans" included separate wards for women and men, a maternity ward and a newly-built paediatric ward. It was equipped with facilities for laparoscopy, physiotherapy, radiology, electrocardiography, laboratory diagnosis and emergency care. The nursing staff consisted of a dozen Belgian nuns and locally trained auxiliary staff. The laboratory was basic, but samples could be sent weekly to the provincial laboratory in Bukavu. Special attention was paid to the numerous, often advanced cases of tuberculosis. Paul quickly developed a keen interest and knowledge of laboratory diagnosis.

Near the shore at the foot of the hill stood the "hospital for Europeans" with about ten rooms, a small operating theatre and a delivery room. The Europeans' houses and the nuns' convent were idyllically located on the slope of the hill.

Fig. 1. — The hospital of Katana in the 1950s.

In 1958, Paul met there Michelle Rémy, a young French lady who was looking after the three children of baron Michel de Mévius in the mission of the White Fathers, north of Katana. In March 1959, back in Antwerp after Paul's first term in Congo, Michelle Rémy became Michelle Gigase. That same year, the young couple returned to Congo for a new term of three years. This time Paul's mission was to record and study cancer cases in the area of Katana. He retained his status as a colonial physician, but was seconded to a cancer registry project funded by the USA National Cancer Institute, led by Prof. Maisin from the UCLouvain, and Dr Clemmesen from Copenhagen, who was famous for his pioneering research on the relationship between tobacco and lung cancer. Supported by a grant from the James Coffin Memorial Fund, Paul first made a tour of several months to visit established cancer registries in London, Sheffield, Copenhagen, Oslo, Amsterdam, Cape Town, Johannesburg, and Kampala. His new field mission started in September 1959 in Katana, where soon after his first child Yves was born. Paul recruited a field crew and obtained an off-road van to visit the rural sites. In early 1960 the cancer registry work finally took off.

On 30 June 1960, however, only six months later, Congo suddenly gained independence after a series of chaotic and unforeseen events. Wholly unprepared and undermined by Belgian and international interests, the country quickly sank into unrest, violence and uprisings. In order to squash revolts of the garrisons in Stanleyville (now Kisangani) and Bukavu, the Congolese government sent troops via Usumbura (now Bujumbura) in Ruanda-Urundi, still Belgian territory at that time. In the night of 31 December, the Congolese troops attacked the rebels in Bukavu and fights broke out all over the area. The remaining Europeans were forced to flee; Paul, pregnant Michelle and toddler Yves escaped from Katana on 16 January 1961. After a hazardous trip through several roadblocks, they reached the UN camp in Bukavu from which they sailed with British soldiers in a small motorboat to Cyangugu, on the Rwandan shore of Lake Kivu. From there, they travelled by road to Usumbura where a few weeks later, their second son Pierre was born. Early in March, Michelle and the children returned to Belgium; Paul stayed on for a while in the hope of pacification, but as no such relief came in sight he too returned to Belgium on 13 April 1961.

Professor and Researcher at the Institute of Tropical Medicine, Antwerp (1963-1995)

Back in Belgium, Paul Gigase obtained a modest stipend from the *Institut belge pour l'Encouragement de la Recherche scientifique outre-mer – Belgisch Instituut ter Bevordering van het Wetenschappelijk Onderzoek Overzee* (IBERSOM-BIBWOO). This institute was specially created for the reintegration of the colonial scientists who found themselves suddenly unemployed after the events in Congo. Under the wings of Prof. Maisin, Paul started his training in laboratory medicine and pathological anatomy at the UCLouvain. Based on his tropical experience and research, Paul received his accreditation as a clinical biologist and anatomical pathologist after only two years, instead of the regular four years.

In 1963, he started at the Institute of Tropical Medicine (ITM) in Antwerp as a researcher and teacher of tropical pathological anatomy. Given his knowledge of cancer epidemiology, he was also contracted by the World Health Organization (WHO) for a mission in Uganda to study Burkitt's lymphoma, which had just been described by Dr Denis P. Burkitt, a surgeon in Kampala. This mission took him on a three-month trip to Geneva and fifteen African countries.

In 1964, Paul was appointed lecturer at the ITM, in charge of the pathological anatomy laboratory. For the next thirty years, he would examine countless biopsies from all over the world, acquiring a truly unique mastery of tropical pathology. In the meantime, he initiated experimental research lines, among others on schistosomiasis and trypanosomiasis, while remaining interested in Kaposi's sarcoma, Burkitt's lymphoma and other "tropical" cancers. His clinical and research topics further extended to leishmaniasis, blastomycosis, oesophagostomiasis, rhinosporidiosis and other tropical diseases. He was gradually entrusted with ever larger and more important parts of the tropical medicine teaching curriculum, and in 1972, he was promoted to associate professor. Meanwhile, he also set up a small private laboratory of anatomical pathology, in order to supplement the modest academic stipends at the ITM.

However, Paul remained very committed to health development and medical research in the tropics, coordinating various field projects on behalf of the Belgian Development Cooperation and other agencies. From 1974 to 1979, for instance, he travelled ten times to Cameroon for a project of upgrading a nursing school in Ayos, a small rainforest town located east of Yaoundé.

Paul also became increasingly involved in the academic and administrative management of the ITM, supporting the efforts of the then director Prof. Pieter Janssens to redefine the role and position of the post-colonial institution. Upon the latter's retirement in 1975, Paul was widely considered as the prime candidate for his succession. His modest reply was: "I would become extremely unhappy in a role for which I was not made". The position was filled by Prof. Luc Eyckmans, under whom Paul remained a driving force for renewal and progress at the ITM. In 1976, he was appointed full professor and chair of tropical and geographic pathology.

As his laboratory expanded, Paul recruited younger assistants, with a keen eye on talent and new tropical health priorities such as schistosomiasis. This water-borne disease, transmitted by freshwater snails, expanded quickly in the 1970s due to the development of hydrological infrastructure such as hydroelectric dams and agricultural irrigation systems. Between 1975 and 1995, schistosomiasis was the main research topic of his department, both in the laboratory and in the field (fig. 2). He sent a young pathologist, Erik van Marck, for two years to Salvador Bahia in Brazil to be trained in experimental schistosomiasis research. Erik Van Marck became associate professor and research leader at the ITM laboratory, later moving on to the University of Antwerp as professor and head of anatomical pathology at the Faculty of Medicine, where he eventually became dean. At the ITM, he was joined by Luc Kestens and Guido van Ham, who further developed and exploited an ingenuous mouse model of immunopathological liver fibrosis in schistosomiasis. Both of them later became professors and unit or department heads of, respectively, immunology and virology at the ITM. Noticing the shift from snail control to mass chemotherapy for the fight against schistosomiasis in the field, Paul recruited in 1979 another young medical doctor, Bruno Gryseels (present co-author of this *in memoriam*), rather than a biologist, to run novel research and control programmes in Congo (Maniema, Kinshasa), Burundi (Rusizi Plain) and elsewhere. Bruno Gryseels later became associate professor of parasitology at the University of Leiden (Netherlands) and ultimately director of the ITM (1995-2019). Apart from his own legacy, Paul had thus important impact on science, tropical health and the ITM through his trainees.

In the 1990s, HIV/AIDS became a predominant focus for the ITM under the leadership of Peter Piot, Guido van der Groen, Bob Colebunders and others. Paul realized better than anyone that this new and frightening pandemic required all available resources and that immunopathology was a crucial component of the clinical management and research of HIV/AIDS. He reoriented his research laboratory almost entirely towards HIV/AIDS and integrated his group in the multidisciplinary HIV/AIDS team of the ITM, one of the world's pioneering groups at that time. Once again, Paul was instrumental to move this urgent priority to the forefront of ITM's priorities, which was not evident in the early years of HIV/AIDS. At the same time, he was a key agent in the development of new postgraduate curricula, focusing on research and disease control of AIDS as well as tropical diseases, besides the well-established master courses in primary health care.

In conlusion, the impact of Paul Gigase on the post-colonial development of the ITM cannot be overestimated. Besides his scientific rigour and consistent rationality, his gentle leadership style and great communication skills — including a good sense of humour — were a core part of his intellectual authority. The pleasant team spirit in his laboratory, located in the iconic "corner building" of ITM, was a privilege to enjoy. Paul was genuinely interested in the personal lives of all his collaborators, and on several occasions provided discrete but effective assistance in times of need. Every year, he invited his entire team to a cosy family dinner with Michelle and their children — joined meanwhile by young Patrick and little Elizabeth — at his home in Wilrijk.

Fig. 2. — Paul Gigase behind the microscope at the laboratory of pathological anatomy at the ITM (around 1988). © ITM

Over the course of his long tenure, Paul travelled extensively to meetings, conferences and field projects all over the world, either for the ITM or on behalf of other organizations such as the Belgian Development Cooperation Agency, the World Health Organization, *Médecins Sans Frontières* (MSF) and so on. He was a member of numerous selection, examination and review committees for a variety of organizations and institutions (fig. 3). As a key member of the staff selection board for the Belgian Cooperation Agency, he influenced the fate of many projects and, not least, the lives of many *coopérants* and their families.

Commitment to Health beyond Research

The political and cultural developments of the 1970s led Paul Gigase to reflect more broadly on society and health. He joined the progressive *Groupe d'Étude pour une Réforme de la Médecine* (GERM), an influential think tank including three hundred members about the reform of health systems in Belgium and across the world. He once remarked that "…often medicine reflects society and is largely a commercial system with patients who consume medicine like others consume candy". However, he was often critical of the theoretical, sometimes dogmatic views of would-be reformers.

In 1980, Paul Gigase took over the courses on tropical and international health at the Faculty of Medicine of Ghent University, where he became full professor (part-time) in 1989.

Fig. 3. — Paul Gigase delivering diplomas of advanced training in Bujumbura, Burundi (around 1985). © ITM

Paul was an outstanding, popular and well-prepared professor; his marvellous lecture notes still form a basis for the recently-developed "Wikitropica" of the ITM. He followed up and assisted many students in their further career, assisting wherever he could. He was elected to the board of directors of MSF in 1988 and served as vice-president in 1991-1992. He visited many MSF projects in sometimes very dire conditions, *e.g.* in Khmer territory in Cambodia, Liberia in civil war, the Ceaușescu orphanages in Romania, the Somali refugee camps in eastern Kenya. His last mission for MSF, in September 1994, brought him back to Maputo (Mozambique), where he had performed his very first international mission for the WHO in 1964.

In 1995, Paul Gigase retired from the ITM and from Ghent University, but continued his other commitments. He became managing director of the *Fonds médical tropical* (FOMETRO) of the Belgian Development Agency, founded in 1961 to provide assistance to the Belgian doctors in Congo, especially to the national programme for the control of sleeping sickness (fig. 4). The continuation, modernization and nationalization of this vast logistical operation were vital to prevent the resurgence of this once devastating scourge, but ever more difficult as the bilateral relations between Congo and Belgium deteriorated. Paul travelled to most provinces where the programme was active, and steered the Belgian input gradually towards integration in the Congolese Ministry of Health. By 2009, FOMETRO could be dissolved and the control programme integrated in the regular structures of the Ministry of Health. Today, the *Programme national pour la Lutte contre la Trypanosomiase africaine humaine* (PNLTHA) is close to eradicating the disease in Congo, with support from the Belgian Agency for International Cooperation, the Bill and Melinda Gates Foundation, WHO and the ITM.

Fig. 4. — Paul Gigase observing the screening of sleeping sickness in Karawa hospital, North Equator Province, RD Congo (1995). © ITM

Paul Gigase was elected as an associate member of the Section of Natural and Medical Sciences of the Royal Academy for Overseas Sciences (RAOS) in 1990 before becoming fellow member in 1994. In 2010 he organized a congress entitled “FOMETRO: un demi-siècle d’assistance médicale. Passé et avenir de la coopération médicale belge en Afrique centrale”, which traced the remarkable history of this institution.

In September 1998, the King of Belgium elevated Paul to the prestigious rank of *Grootofficier in de Leopoldsorde*.

Palaeontology: A Second Life

Paul Gigase started collecting fossils in 1941, at a very young age. Among the most common species of fossil gastropod shells he found in Antwerp, he realized that the shell of one specimen was spiralled in the opposite direction to all others. At first, he thought it was because the snail was fossil and thus different from extant gastropods. His father took him to a fossil collector and that day Paul, only 11 years old, learned that his specimen was a rare case of levorotary snail (turning in counter clockwise direction from the apex) instead of dextrorotatory. His passion for palaeontology was definitely awakened and would remain with him for the rest of his life.

During the war, travelling by bicycle, Paul collected numerous other fossils in different areas in and around Antwerp, such as the Oligocene Boom Clay Formation, from which he brought

back a remarkable collection, including vertebrates. After Belgium's liberation in September 1944, the situation in Antwerp became even more hazardous. The German army launched thousands of V1 and V2 bombs on the city, a supply port for the Allied forces. Nevertheless, little Paul was still looking for fossils in the ditches of the old fortifications, which now form the Antwerp ring road. But as insecurity increased day by day, the Gigase family moved to Brussels from October 1944 until April 1945. Paul's passion was the strongest and he went searching for fossils at the Heysel stadium, where the Germans had dug trenches into the middle Eocene fossiliferous sands.

It is noteworthy that Paul's passion for fossils led him to join the Belgian Society of Geology as early as 1949, four decades before joining RAOS. In the second and third years of his medical studies, Paul attended the palaeontology courses for zoologists and mining engineers as a free student.

After his return from Congo, Paul continued to collect fossils in the Oligo-Mio-Pliocene deposits of the Antwerp area and expanded his prospections during family holidays, such as in the Palaeozoic of Boussu-en-Fagne and in the Jurassic and Cretaceous of Villers-sur-Mer in 1966. He passed on his passion to his children, particularly to his son Pierre (Lambert & Gigase, 2007).

Paul Gigase gradually built up an important collection of vertebrate fossils of great interest to palaeontologists, part of which was beautifully displayed in his family home. He collaborated with the Royal Belgian Institute of Natural Sciences (RBINS) from the 1970s onwards and until two years before his death, he worked among others with Thierry Smith (present first author of this *in memoriam*). He was also a member of the *Belgische Vereniging voor Paleontologie*, an association of amateur palaeontologists founded in 1977.

In 1983, Paul contributed to his first palaeontology paper, describing a vertebral column of a pterosaur he acquired from the early Cretaceous Santana Formation in Brazil (Wellnhofer *et al.*, 1983). The specimen included, at that time, the best preserved and most complete known notarium, a structure of fused vertebrae that helps brace the chest against the forces generated by the wings.

In 1989, Paul carried out a very important excavation with Richard Smith, another amateur palaeontologist, in the famous fossil site of Dormaal. The two passionate collectors became close friends and built up collections that were highly complementary to those of the RBINS, compiled and studied among others by the famous palaeontologists Louis Dollo and Pierre Teilhard de Chardin (Dollo, 1923; Teilhard de Chardin, 1927). In Dormaal, Paul found out numerous specimens of *Teilhardina*, the oldest-known primate. Among them was the only jaw of *Teilhardina* that had already lost its first premolar, the earliest evolutionary sign of face reduction in haplorrhine primates (Morse *et al.*, 2019).

The important scientific contributions of Paul Gigase to palaeontology were acknowledged by many researchers and even left him with a series of eponyms in his honour such as *Rachiosoma gigasei*, a Cretaceous echinoderm (Geys, 1983), *Diacodexis gigasei*, the oldest artiodactyl (Smith *et al.*, 1996), *Lusitanops gigasei*, a Pliocene marine gastropod (Marquet, 1998), and *Brabocetus gigaseorum*, a Pliocene porpoise (Colpaert *et al.*, 2015). The last research work of Paul was in palaeontology, including papers on the earliest primate *Teilhardina belgica* (Morse *et al.*, 2019) and on *Saniwa orsmaelensis*, the oldest varanid lizard (Augé *et al.*, 2022).

Conclusion

We will remember Paul Gigase as a generous but self-effacing source of superb knowledge, warm friendship and critical rationality, with huge legacies in several fields. He led a busy and productive triple life as a physician, a palaeontologist and, first and foremost, a loving family man and friend. He authored or co-authored one hundred scientific papers in the domains of tropical medicine and palaeontology. He trained numerous young physicians and researchers in tropical medicine and had, often behind the scenes, an immeasurable impact on the evolution of the ITM, FOMETRO, MSF and other organizations. From his early days as a colonial doctor in Kivu to his later contributions to global health, including his academic tenure at the ITM, Paul's life and work were driven by a genuine commitment to humanitarian causes, scientific rationality and societal progress. Our Academy can be proud to have counted him among its members.

Thierry Smith & Bruno Gryseels

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