

## ANTHROPOLOGY AND <sup>14</sup>C ANALYSIS OF SKELETAL REMAINS FROM RELIC SHRINES: AN UNEXPECTED SOURCE OF INFORMATION FOR MEDIEVAL ARCHAEOLOGY

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**ABSTRACT.** Since the early Middle Ages, relics of Catholic saints played an important role in popular religion in Europe. The shrines containing the human remains of the saints, however, are rarely studied, typically only when restoration becomes necessary. Formerly, such study was mostly restricted to the art-historical aspects of the artifacts, sometimes including the counting and rough identification of the bones. In this study, for the first time, and for a number of case studies, a more systematic approach was taken, including detailed physico-anthropological observations, <sup>13</sup>C and <sup>15</sup>N stable isotope measurements, and <sup>14</sup>C analysis of the bones.

The importance of this project lies not only in a critical evaluation of the authenticity of the relics. Fruitful insights could also be gained about the origin, history, and treatment of these parts of our religious heritage. Finally, it has been proven that shrines are an important source of early medieval human skeletal material, which is only rarely found in archaeological contexts in Belgium.

### INTRODUCTION

Since the Middle Ages, relics of Catholic saints played an important role in popular religion in northwestern Europe (see for an historical overview: Herrmann-Mascard 1975; Dierkens 1989; Legner 1989; Angenendt 1994; van Os 2000). Despite the rise of Protestantism in the 16th century (abolishing the veneration of relics), the confiscation of religious goods during the French Revolution and the following Napoleonic period (leading to the destruction of shrines and their contents), and the secularization of modern society, a lot of these remains are still preserved in churches, abbeys, or museums. Nowadays, however, their authenticity is as much questioned as their religious meaning. This tendency is inspired by research that points to the unknown or dubious historical context of a number of relics, or to their status as commercial trade goods in medieval and later times, often leading to clear cases of falsification, theft, etc. (Geary 1978; Dierkens 1999). Moreover, driven by a general skeptical attitude towards everything religious, the question of supernatural meaning is often confounded with that of historical authenticity, resulting in the common “belief” that no relic can be genuine. Scientific or not-so-scientific debates, popularized by the media, of artifacts such as the Turin Shroud hardly helped to change that perception. Therefore, it is often thought that relic shrines contain bones that are much younger than the saint they are ascribed to, or that they hide a mixed assemblage of skeletal elements of very different origin and date, not excluding the presence of animal material.

It is thus no surprise that, within the context of the natural sciences, relics were not often studied. They were regarded as uninteresting and therefore not deliberately chosen as research objects, while, perhaps because of a fear of facing the exposition of new falsifications, in some cases authorization for research was not granted by the church institutions. A rare opportunity to study the contents of the shrines was only offered when the restoration of these pieces of art, or the objects kept in them, became necessary. However, except for a few isolated cases, the contents of the shrines (especially textiles, texts, glass, wooden, and metal objects) were only approached from an art-his-

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torian perspective. The study of the skeletal remains was typically restricted to the counting and identification (sometimes even very roughly) of the bones. Traditionally, obtaining an absolute dating was not attempted (but see Evin and Rillot 2005 for an exception).

In order to breach this trend, over the last 10 yr relic shrines under restoration at the Royal Institute for Cultural Heritage (Brussels, Belgium) were subjected to a more scientific approach, including physical-anthropological observations, radiocarbon dating, and stable isotope analysis. The aim was not only to test authenticity, and historical context in general, but also to extract as much information as possible about what had happened with the artifacts since their origin. Ultimately, it was hoped to add to the historical knowledge about how people treated these pieces of veneration through time. After the first results were published, it became also possible to analyze a number of relics outside of projects of conservation and restoration. By the end of 2007, relics of more than 20 Belgian and Dutch saints were analyzed. Most of the results have been presented in a popular Dutch book (Van Strydonck et al. 2006), but the examples involving bone analysis are discussed here for the first time in an international scientific forum, together with the introduction of some new data.

It should be noted that this project focused upon the skeletal remains of so-called “local” saints. These are saints that have or had only a limited regional impact and that were only worshiped in a geographically very restricted area. Some of the saints represent people whose existence has been attested by reliable historical sources, while others clearly are legendary figures (Figure 1).



Figure 1 Reconstruction of the skeleton of Alena (© KIK-IRPA)

## **MATERIAL AND METHODS**

In this paper, a representative sample of the human remains investigated is discussed, forming a variety of case studies. Some of the shrines contained only small parts of a skeleton while others held an almost complete skeleton. The minimum number of individuals per shrine, and their age at death, sex, and size were established using standard procedures from physical anthropology (Brothwell 1981; Knussmann 1988; Herrmann et al. 1990; Ubelaker 1996; Katzenberg and Saun-

ders 2000). Eventually, traces of injuries or diseases on the skeleton were noted (Aufderheide and Rodriguez-Martin 1998).

For absolute dating, a selection of the human material within the shrines was made on the basis of the anthropological observations, taking into account the presence of the remains of a single or multiple individuals, the admixture of isolated human bones, preservation condition, etc. Collagen was extracted from the bones (Longin 1971) for  $^{14}\text{C}$  dating (Van Strydonck and van der Borg 1990–91) and stable isotope ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) measurements. The  $^{14}\text{C}$  dates were calibrated (Reimer et al. 2004) using OxCal (Bronk Ramsey 1995, 2001). The first approach aimed at testing the chronological validity of the relics; the second was performed in order to evaluate the common statement that the saints lived a humble life, following a vegetarian diet or food rules forbidding the meat of terrestrial animals.

The historical context of the relics was evaluated on the basis of the data about the saints' lives (their *vita*) compiled in the *Acta Sanctorum*, which is the report of centuries of critical analysis, by the Catholic church, of the saints' historical context as known from the written sources (Guérin 1880). When available, secondary literature was also used.

## RESULTS AND DISCUSSION

All  $^{14}\text{C}$  dates and stable isotope data ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) for Belgian saints are shown in Table 1. The calibrated  $^{14}\text{C}$  dates are shown in Figure 2; the stable isotope plot ( $\delta^{13}\text{C}$  vs.  $\delta^{15}\text{N}$ ) is shown in Figure 3. They are not discussed here in detail, except for 1 case study (see further). In general, the bones sampled appeared to be in good condition. C/N ratios were in agreement with the criteria put forward by DeNiro (1985), indicating that collagen was well preserved. Despite their exposure to oxidized environments, contact with other organic and with anorganic materials, fluctuating microclimatic parameters, and possible human "mistreatment" (conditions that are not ideal for the survival of organic material, sometimes resulting in a brittle and cracked appearance of the bones), the relics studied clearly were in a better physico-chemical shape than initially assumed, or feared. In what follows, the results from each case study are shortly discussed, before general conclusions are put forward. The order in which the cases are introduced starts from (assumed) historically reliable relics, and ends with (expected) cases of clear manipulation.

Bavo, patron of the cathedral of Ghent (Gent) and one of its large abbeys, is a saint that is historically well documented. He was actively involved with the early medieval Christianization of the Flemish Scheldt Valley and, according to recent historical research, must have died after AD 651–655 but before AD 659 (Declercq 1997). From his relic (a single part of a humerus) a date was obtained that (within statistical limits) matched this historical event (AD 600–665, 95% probability).

Rumoldus was a Christian missionary. After his death, around AD 775 according to medieval sources, an abbey was founded, eventually leading to the development of the town now known as Malines (Mechelen) (Laenen 1919). However, this late 8th century origin is questioned by historians and archaeologists, stating that an earlier date is more probable.  $^{14}\text{C}$  dating of a part of the relic (an almost complete skeleton) indeed yielded a date in the first half of the 7th century AD.

Vincentius and his wife, Waldetrudis, are known as 7th century AD promoters of the Christian faith and became saints shortly after their death (Deveseleer 1999, 2001). Their children joined the same status and the relic of one of them, Landericus, could be analyzed together with the remains of both parents. The  $^{14}\text{C}$  date for Vincentius coincides with the historical context for this saint, while the  $^{14}\text{C}$  date for Waldetrudis, who is known to have died around the same date as her husband, was signifi-

Table 1  $^{14}\text{C}$  and stable isotope data from skeletal material from Belgian saints.

Saint	Remains	Lab code	$^{14}\text{C}$ age (BP)	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)	C/N	Calibrated age (2 $\sigma$ )
Bavo	Distal part of a humerus.	KIA-20205	1410 $\pm$ 25	-19.24	+10.74	3.2	AD 600 (95.4%) 665
Rumoldus	~40 bones from a male skeleton.	KIA-26720	1430 $\pm$ 25	-19.80	+9.90	3.2	AD 580 (95.4%) 655
Vincentius	Almost complete male skeleton, with only some skull fragments and hand and foot bones missing.	KIA-10575	1385 $\pm$ 35	-19.60	+11.85	3.3	AD 590 (95.4%) 690
Waldetrudis	Almost complete female skeleton. The skull was kept separately.	UtC-9694	1530 $\pm$ 40	-20.58	+15.36	na	AD 420 (95.4%) 610
Landericus	Parts of a juvenile skeleton. Some of the bones are burnt.	KIA-11894	1200 $\pm$ 30	-19.85	+10.88	3.3	AD 710 (6.3%) 750 AD 760 (87.7%) 900 AD 920 (1.3%) 940
Dimpna	Little of the skeleton remained: diaphysis of the left... and of the right femur.	KIA-18743	1255 $\pm$ 25	-19.70	+11.87	3.3	AD 670 (92.5%) 830 AD 840 (2.9%) 860
Gerebernus	Little of the skeleton remained: diaphysis of a femur, mandibula (kept separately).	KIA-18744	1280 $\pm$ 25	-19.75	+12.07	3.2	AD 660 (95.4%) 780
		KIA-18745	1045 $\pm$ 25	-19.75	+10.11	3.2	AD 890 (5.8%) 920 AD 960 (89.6%) 1030
Odrada	Only the mandibule remained.	KIA-24543	1310 $\pm$ 25	-18.18	+11.70	3.40	AD 650 (95.4%) 780
Ermelindis	Almost complete female skeleton, with pelvis from a second person.	KIA-26730	1395 $\pm$ 25	-20.40	+10.20	3.2	AD 605 (95.4%) 670
		KIA-26731	1850 $\pm$ 25	-20.00	+10.50	3.3	AD 80 (95.4%) 240
Alena	Male skeleton, with bones from a neonatus.	KIA-30654	1150 $\pm$ 25	-19.57	+10.72	3.3	AD 780 (95.4%) 980
		KIA-30655	1100 $\pm$ 25	-20.34	+10.64	3.3	AD 880 (95.4%) 1000
Hilduardus and Christiana	Skeleton 1: large parts of the skeleton remained.	KIA-24008	1400 $\pm$ 30	-19.46	+12.62	3.3	AD 595 (95.4%) 670
	Skeleton 2: only a few bones remained.	KIA-24009	1265 $\pm$ 30	-18.60	+10.26	3.2	AD 660 (93.1%) 830 AD 840 (2.3%) 860
	Skeleton 3: only a few bones remained.	KIA-26721	1370 $\pm$ 20	-20.70	+11.70	3.4	AD 635 (95.4%) 680
	Skeleton 4: only a few bones remained.	KIA-26722	1200 $\pm$ 20	-20.00	+9.10	3.3	AD 770 (95.4%) 890
	Skeleton 5: only a few bones remained.	KIA-26723	1320 $\pm$ 30	-20.30	+11.20	3.3	AD 650 (95.4%) 780
Donatus	Skull.	KIA-16748	1975 $\pm$ 30	-19.89	+10.26	3.4	50 BC (95.4%) AD 90
"Enclosed Garden"	Ulna.	KIA-20206	1235 $\pm$ 30	-19.34	+8.24	3.3	AD 680 (95.4%) 880
Eibertingen	Tibia.	KIA-20212	665 $\pm$ 20	-18.59	+12.29	3.5	AD 1270 (50.6%) 1320 AD 1350 (44.8%) 1390
	Fibula.	KIA-20209	910 $\pm$ 25	-19.57	+9.04	3.2	AD 1030 (95.4%) 1210
"Enclosed Garden"	Fibula of a child.	KIA-27136	970 $\pm$ 25	-19.80	+9.70	3.2	AD 1010 (95.4%) 1160
Tielt-Winge	Humerus.	KIA-27591	1180 $\pm$ 30	-19.80	+10.92	3.3	AD 770 (86.0%) 900 AD 910 (9.4%) 970
	Small bone fragment (possibly animal).	KIA-27618	1310 $\pm$ 30	-21.24	+9.54	4.6	AD 650 (95.4%) 780

cantly older than expected (5th–6th century AD). However, stable isotope analysis suggests that the skeleton attributed to the female saint derives from a person who included an important part of freshwater fish in her diet. A reservoir effect for freshwater organisms could thus explain the anomaly in the  $^{14}\text{C}$  dates. At first sight, the difference in diet between wife and husband might seem surprising, but it should be realized that both persons ended their lives staying in (2 separate) monasteries (Deveseleer 1999, 2001), in which food habits or rules could well have been rather different. Finally, the dating of the remains of Landericus, showing a time gap larger than possible between parents and child, suggests that this relic is not what it claims to be (a result that was expected on historical grounds). The difference in  $^{14}\text{C}$  age between the 2 skeletons is calculated as 130–240 yr (68.2% probability) and 50–280 yr (95.4% probability).

The relics of Domitianus and Mengoldus are kept at Huy. The first saint is supposed to have died around the middle of the 6th century AD, the second towards the end of the 9th century AD (Charlier



Figure 2 Calibrated <sup>14</sup>C ages from skeletal material from Belgian saints

and Georges 1982). Documents other than his *vita* endorse the existence of Domitianus. This, however, is not the case for Mengoldus. The relics ascribed to Domitianus represent a single skeleton, but the collection of bones supposed to have belonged to Mengoldus contains elements of a third individual. <sup>14</sup>C dates place the remains of Domitianus in the 5th or the first half of the 6th century AD, while the bones of the skeleton believed to represent Mengoldus date back to the second half of the 6th or the first half of the 7th century AD. The admixture of bones to this last skeleton gave a broad dating from the end of the 7th to the late 9th century AD. The second relic thus presents problems in terms of authenticity, although it is still an early medieval artifact.

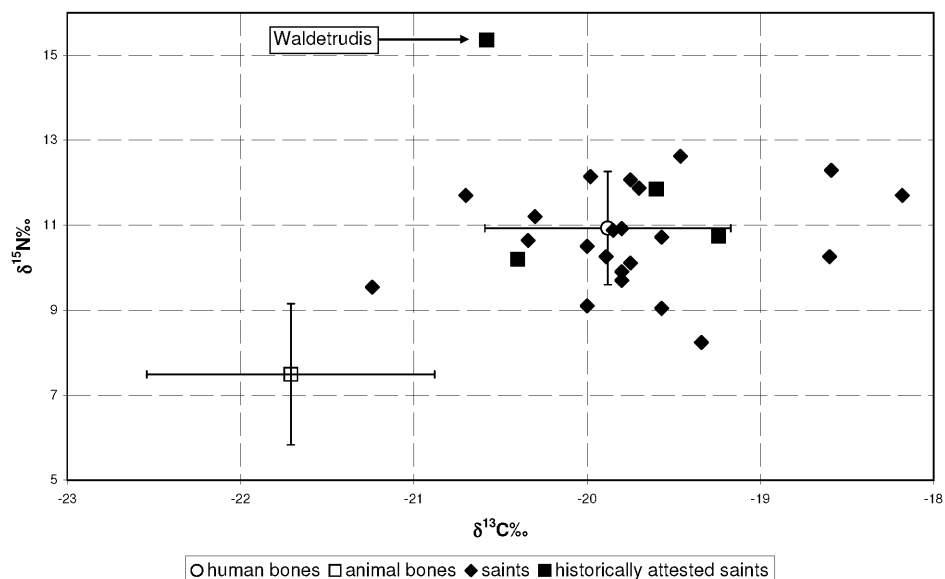


Figure 3 Stable isotope data from skeletal material from Belgian saints (historically attested individuals marked separately) compared with (unpublished) measurements from medieval animal (herbivore) and human bones.

According to their *vita*, Dimpna, an Irish princess, and Gerebernus, her mentor and priest, fled from their native country to escape the assaults of an incestuous father. Inevitably, they were hunted down and killed by the Irish king. This dramatic event is believed to have happened in the Flemish Campine area, around Geel, around AD 600 (Onkelinx 1981). The (mixed) relics of both saints only contain some isolated bones, of 2 different individuals, indeed 1 (robust) male and 1 female.  $^{14}\text{C}$  analysis reveals that (statistically) both individuals can have died at the same moment in time, be it during the end of the 7th or the 8th century AD, but not around AD 600. The relics thus possibly reflect a historical event, later popularized within the wrong chronological framework.

What is known about Odrada of Balen is a set of miraculous events, involving her taming of a white horse (a pagan symbol), the planting of a lime tree that grew for centuries, and the origin of a freshwater spring (Jansen 1990). The story has an uncertain historical framework but contains many style elements referring to an early medieval context. From the saint, only a female mandibula remains at Balen, yielding a  $^{14}\text{C}$  date in the second half of the 7th or the 8th century AD. Even without clear historical corroboration, we are certainly dealing with early medieval material.

Ermelindis of Meldert is also a (female) saint for whom the historical dossier is rather faint. However, a reinterpretation of the written data suggests that she died during the second half of the 7th century AD (Degeest and Dewinter 2000), a conclusion that matches the  $^{14}\text{C}$  date extracted from an almost complete female skeleton found in the shrine. Strangely enough, an isolated pelvis fragment, also present in the shrine, represents a second individual, dating to the Roman period.

The relics of Alena, a 7th century AD female saint, are kept in 4 different shrines and have been dispersed over 2 Flemish villages, Vorst and Dilbeek (Van Strydonck et al., in press). Analysis of 1 set of relics revealed that the authenticity of the human remains must be questioned. The anthropological observations suggest a male origin for the bones preserved and the  $^{14}\text{C}$  dates obtained indicate a 9th to 10th century AD context. This case is in fact the only one in which the anthropological observations clearly contradict the identification of the saint. An attempt to use DNA analysis to solve this problem failed because of bad preservation of the biomolecules.

Hilduardus and Christiana are the patrons of the town of Dendermonde and are thought to have been connected with an early medieval, 7th to 8th century abbey at Dikkelvenne. Popular history states that the remains of both persons were transferred to Dendermonde because of the Viking attacks in the 9th century AD (Stroobants and Pée 2004). The relics are kept in a communal shrine, which, after recent inspection, proved to contain the skeletal elements of at least 5 individuals, 2 men and 3 women. Two skeletons are rather complete, derived from a male and a female person. However, rather than representing the 2 patron saints, these skeletons are the remains of people that died minimally 110 yr and maximally 280 yr apart. All 5 individuals, however, belong to the early medieval period (7th and 8th c. AD) and it must thus be concluded that a set of early medieval human remains (from excavated graves?) has been “promoted” into a shrine, some time during the medieval period.

From the Roman soldier Donatus, an early Christian serving within the 2nd century AD Roman army, the skull would be preserved within a wooden bust kept at Schulen. This human material would derive from the catacombs at Rome, from which human remains were excavated and often redistributed during the postmedieval period (Geelen 2004). During the conservation of the relic, the cranial material was sampled and <sup>14</sup>C dating revealed that the skull indeed dated back to the Roman period. However, the <sup>14</sup>C date indicated an older chronology (50 BC–AD 90 at 95.4% probability) than the presumed life history of the saint (which most probably must have been a construction in itself, given the historical context). Moreover, during restoration, it was observed that the bust once showed the name of another saint, Hubertus, historically known from the 7th–8th century AD. Clearly, this artifact represents the construction of a relic using “recycled” material.

A special case is formed by the “enclosed gardens” (Fr.: *jardins clos*; Nl.: *besloten hoffjes*), displays made with relics (mostly bones), textiles, paper, and fine metal, often representing scenes from the life of Jesus or his mother. Sometimes, the remains of tens of saints are included in the construction, carefully labeled with small paper strips (Vandenbroeck 1994). An analysis of 2 examples, 1 from Eibertingen and 1 from Tielt-Winge, revealed that indeed chronologically very different material is part of the “enclosed gardens” but, surprisingly, that early medieval material, i.e. 7th to 8th c. AD bone fragments, is also present.

## CONCLUSION

In general, the anthropological studies do not contradict the identification of the saints (except for Alena). Indeed, often more or less complete skeletons or at least a set of bones possibly from a single individual were found in the shrines. Sometimes, extra human bones appear to have been added, but in almost no cases animal bones were found. In terms of skeletal material, the relics clearly are mostly not the frauds they are claimed to be.

Although the attribution of the skeletal remains to a certain historical person is always questionable, it must be noted that in some cases the <sup>14</sup>C dates match the historical data available. From the 4 historically attested persons (Waldetrudis, Vincentius, Ermelindis, and Bavo), only the skeletal remains of Waldetrudis have an aberrant <sup>14</sup>C age. However, it is clear from Figure 3 that an important part of her diet consisted of freshwater fish, resulting in a <sup>14</sup>C age that is too old. The <sup>14</sup>C ages of the remains of the 3 other persons are statistically in agreement with their assumed year of death (Van Strydonck et al. 2006). This was expected because, taking into account that the  $\delta^{15}\text{N}$  value of an organism is about 2–4‰ higher than the food it consumes, the shift in  $\delta^{15}\text{N}$  between the domesticated herbivores and the humans (Figure 3) reflects a terrestrial diet (except for Waldetrudis). In general, no reservoir effect due to fish consumption has thus to be taken into account. The saints Domitianus, Mengoldus, and Rumoldus (called Rombout in an earlier publication) have already been dated previously, but without stable isotope measurements (Gilot 1997). Taking into account

an isotope correction, these data stand the comparison with the dates reported in this paper (Van Strydonck and Boudin 2004–2005). The previous dates were used by Lanting and Van der Plicht (1995/1996) to show that, although the  $^{14}\text{C}$  age of Domitianus was in agreement with his supposed year of death, Rumoldus and Mengoldus were dated too old. They suggested a reservoir age due to fish consumption, but did not consider the possibilities of a wrong chronological context (in the case of Rumoldus) or a faint historical attribution of the remains (in the case of Mengoldus).

As a general pattern, the isotope data do not corroborate a strictly vegetarian diet for the saints. This part of their behavior must indeed have been idealized in many *vitae*. More striking, however, is the near absence of a “fish signal” in the isotope data, implying that most of the animal protein consumed by the persons investigated derived from meat, not fish (while fish consumption was accepted in most monastic food rules). One could conclude that the diet of the saints was not different from that of other medieval people (see Figure 3). It should be remembered that a very limited consumption of marine products was to be expected for the 1st millennium AD, taking into account our knowledge of the development of coastal and marine fisheries in the Low Countries (Van Neer and Ervynck 2006), but catching freshwater and anadromous fish in inland waters is thought to have been common during that period of history. Apparently, a frequent consumption of these fishes is only suggested by the isotope data for Waldetrudis.

Most surprisingly, early medieval dates were also obtained for bones associated with “legendary saints,” without any historical background. The investigation shows that most of the bones date back to the 7th–9th centuries AD, which counters the popular belief that most of the relics are concoctions made within the context of popular commerce, during the 12th–13th centuries AD, using (at that time) recent material. Only the bust of Donatus forms a clear case of historical fraud, using a Roman skull as relic of an early medieval saint (Hubertus), later to be renamed as a Roman martyr.

The most important result of the dating project of the relics is the recurrent presence of early medieval material. Apparently, through their special religious status, an important collection of 7th to 9th century AD human skeletal elements seems to have survived into recent times, even when all historical context is lost, or when the remains have been relocated, repacked, or reused in later constructions (such as the “enclosed gardens”). Consequently, the relic shrines are an important source of early medieval human skeleton material, which is seldom found in archaeological contexts in Belgium, especially not in the sand and loam regions of the northern and central parts of the country, where bone material rarely survives in the soil. In a number of cases, for local villages, the bones in the shrines even represent the only early medieval heritage surviving.

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