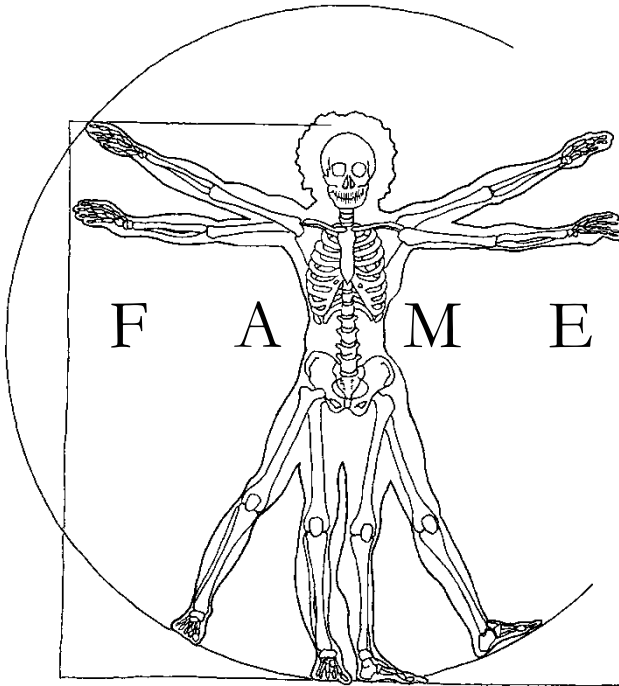


Fysisch-Anthropologische Mededelingen



Newsletter of the Dutch Association of Physical Anthropologists

No. 25, January 2017

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From the editor

Allereerst mijn dank voor zij die bijdragen hebben geleverd aan deze 25^e editie van de FAME. De grote verscheidenheid aan onderwerpen die deze artikelen en samenvattingen representeren geven een hele goed indicatie van de (beroepsmatige) achtergronden van onze leden. Een groot deel van de samenvattingen betreffen poster- en podiumpresentaties die onze leden op verschillende internationale symposia en congressen gehouden hebben. Ook zijn er enkele samenvattingen van commercieel uitgevoerde fysische antropologische en bioarcheologische projecten opgenomen.

Het najaarssymposium in 2016 richtte zich volledig op het door de RCE gehonoreerde project “Synchrotron-based X-Ray Fluorescence of Strontium and Calcium in Dental Enamel for the Reconstruction of Breastfeeding and Weaning Practices in Past Populations” van dr. Andrea Waters-Rist van de Universiteit van Leiden. Ook de korte samenvatting van deze presentatie is in de FAME opgenomen.

Ik kijk uit naar jullie bijdragen voor de volgende, 26^e FAME!

Lisette

Synchrotron-based X-Ray Fluorescence of Strontium and Calcium in Dental Enamel for the Reconstruction of Breastfeeding and Weaning Practices in Past Populations

Andrea Waters Rist

Leiden University

Today, as in the past, the way we feed our babies has a tremendous impact on their health and survival. By determining the breastfeeding and weaning practices of our ancestors, archaeology can contribute to our understanding of both the biological constraints and cultural flexibilities of infant feeding behaviours. Methodological limitations have constrained archaeological reconstructions of breastfeeding and weaning in many populations. A novel, non-destructive method of acquiring this information from synchrotron-based x-ray fluorescence measurements of strontium and calcium in dental enamel will be groundbreaking in increasing and improving such knowledge. A multidisciplinary partnership with an on-going clinical research project will investigate the links among infant feeding, health, and demography, to improve our understanding of both past and present populations. This research will generate innovative data about the implications of infant feeding practices for the health, demography, and social-cognition of our species.

Short articles

The Quest for the Lost Grave of Andreas Vesalius

Theo Dirix¹

Isn't it amazing how much we know about a scientist and physician who lived five hundred years ago, I am referring, of course, to the prominent figure of Andreas Vesalius (1514-1564)?² After a jump start in academia in Italy, the Flemish anatomist made a sudden career move and became the family physician of Charles V, Emperor of the Holy Roman Empire, and to his successor Philip II and their powerful entourage in Spain. His brilliant early work, *De Humani Corporis Fabrica Libri Septem*, a milestone in the transition

¹ The author thanks Maurits Biesbrouck, Sylviane Déderix, Jan Driessen, Theodoor Goddeeris, Akis Ladikos, Pavlos Plessas, Pascale Pollier, Apostolos Sarris, Maria Sidirokastriti - Kontoni and Omer Steeno.

² Maurits Biesbrouck upgraded Dr. Harvey Cushing's list of publications on Vesalius to more than 3000 records: <http://www.andreasvesalius.be>, accessed 8 January 2017.

to empiric research, which has a revolutionary pedagogical and artistic approach, still inspires.

Isn't it even more amazing that new discoveries about this giant and his achievements steadily continue to surface?³ Most amazing, though, is that several hoaxes, mainly about his final months and days, doggedly survive.⁴ Where is that undeniable proof that he ever ran into the otherwise so well documented inquisition?⁵ Vesalius left Spain as a pious pilgrim. A laissez-passer by Philip II and letters from the Spanish Embassy in Venice are conserved in archives in Spain. Even the thanking note by the Custodian of the Holy Places in Jerusalem, which Vesalius was to hand over to Philip II, reached its destination.⁶ That unequivocally refutes the other obstinate prank a shipwreck during his return was the cause of his death. Some now argue that scurvy may have been the cause; Omer Steeno, Maurits Biesbrouck and Theodoor Goddeeris point in the direction of general fatigue.⁷ Obviously, only the discovery of his remains will help determine why he collapsed on the quay of Zakynthos, then a Venetian colony, as described in a recently rediscovered eyewitness report.⁸ He was buried in the local catholic church of Santa Maria delle Grazie. Several Jerusalem pilgrims have indeed described his epitaph. Unfortunately, the church has disappeared. During its history, it was sacked, abandoned, damaged and finally, after major earthquake in 1953, bulldozed into the sea.

In view of the quincentenary of the anatomist, medical artist Pascale Pollier, hoping to reconstruct his face from his cranium, started a romantic quest for his remains. Under the impetus of the author and the Embassy of Belgium in Athens, archaeologists have been involved: Prof. Jan Driessen, *Université Catholique de Louvain* (UCL) and Director of the Belgian School in Athens, EBSA, and Apostolos Sarris, Deputy Director of the *Institute for Mediterranean Studies - Foundation for Research and Technology, Hellas* (IMS-FORTH).

In 2014, Dr. Sylviane Déderix (UCL/IMS-FORTH) checked the presumed location of the church through the spatial analysis of a Geographical Information System (GIS). With that digital tool, she displayed, corrected and analysed historical maps on modern cartographic data. The result confirms that the ruins of the Santa Maria delle Grazie and its annexes are to be found to the northwest of the intersection of Kolyva

³ In 2007 a Canadian book collector bought Vesalius' own copy of the 1555 edition of the *Fabrica*, heavily annotated in preparation of a never published third edition. In 2014 Vesalius' own annotated copy of *Institutiones* by his teacher, J.G. von Andernach, came to light.

⁴ DIRIX, Theo: Andreas Vesalius and his hoaxes, *con variazioni*, in: Vesalius, *Journal of the International Society of the History of Medicine*, Vol. XXII, nr. 1, June 2016, Special Issue, Proceedings of A Tribute to Andreas Vesalius, Padua, Italy - December 2015, pp. 103 - 111.

⁵ The source is post-mortem gossip spread in January 1565 by the French diplomat, Hubertus Languetus, in a note of 24 lines opening with: "rumour has it". See: BIESBROUCK, Maurits, Theodoor GODDEERIS, Omer STEENO. 'Post Mortem' Andreae Vesalii (1514-1564), Deel I. De laatste reis van Andreas Vesalius en de omstandigheden van zijn dood, in: A.Vesalius, nr. 3 september 2015, Alfagen, Leuven, pp 154-161.

⁶ In total four letters have been discovered by José Baron Fernandez in the archives of Simancas, described and published since 1965.

⁷ BIESBROUCK, Maurits, Theodoor GODDEERIS, Omer STEENO. 'Post Mortem' Andreae Vesalii (1514-1564), Deel II. Het graf van Andreas Vesalius op Zakynthos, (vervolg en slot na Deel I in vorig nummer), in: A.Vesalius, nr. 4 december 2015, Alfagen, Leuven, pp 193-200.

⁸ *ibid*

Street and Kolokotroni Street (figure 1), partly below the asphalt and partly under private property of emergency lodgings, which date from the '53 earthquake, and partly under a fairly new construction.

To enrich the GIS of the first phase, a geophysical approach of anomalies under the surface should now follow. In this urban environment only non-destructive methods like ground penetrating radar (GPR) and electrical resistivity tomography (ERT) can be carried out. With the necessary permissions and funding, a team of researchers could be deployed to collect and process such data. If these are conclusive, a third phase of small scale excavations in search of remains may follow.

To top up personal investments, Vesalius Continuum⁹ has launched a crowd funding campaign to sponsor the second phase. If you wish to contribute to finding the real cause of Vesalius's death and help Pascale Pollier reconstruct the face of a genius whose legacy survives to this very day, visit: <https://www.gofundme.com/VesaliusContinuum>



Figure 1.

⁹ Within the initial ad hoc organising committee of the Vesalius Continuum Conference in September 2014 in Zakynthos, medical artist Pascale Pollier and the author, then Consul at the Embassy of Belgium in Athens, formed the Search team. See: DIRIX, Theo, *In Search of Andreas Vesalius, The Quest for the Lost Grave*, LannooCampus, Leuven, 2014.



The Beguines of Breda (AD 1267 – 1530)

Cora van Beek

Around AD 1200 new religious ideas spread all over Europe, and many new orders were founded, such as the new Franciscan order. Also many women were attracted to these new religious ideas, such as the Beguines. Beguines were women who lived an austere life, without taking religious vows or entering a convent. They lived in cities, alone or in groups. Beguines were regarded as a threat by the Catholic Church, as they believed that women were not supposed to concern themselves with theological problems. Moreover, they could not be controlled by a regular confessor or put behind convent walls, as Beguines were neither ordinary citizens or nuns. In AD 1318, Pope John XXII banned the movement. Only those beguines who were already living in Beguinages (*begijnhoven*) could continue their way of life and were placed in the care of a priest (Rijpma & Maat, 2005). Beguines are self-supporting; they earned their living by working as maids in beguine households or by repairing cloths in factories (*noppen*), and therefore contributed to the economic development of the city.

During the 1995 archaeological excavation campaign at Park Valkenberg in Breda, the lost Beguinage churchyard was uncovered: a unique possibility to assess health in a Beguine society. In total, the skeletal remains of 120 individuals were recovered, which were taken to Barge's Anthropologica (LUMC) for further osteoarchaeological research (see Rijpma & Maat (2005) for physical anthropological and palaeopathological data). Sex could be determined for 99 individuals: 90 females, nine males and seven children (under the age of 19). Parturition scars on pubic bones were recognised in three cases. Although Beguines are often associated with unmarried women, widows (and their children) could enter Beguinages as well. The skeletal remains of no more than five females and one male (!) were recovered within the Church foundations. Historical sources inform us that male individuals that are recovered within or outside Beguinage churches often belonged to priests or hired working man who were responsible for conducting physical heavy work. Health can be inferred from at least two osteological indicators: length and age of death. Once the Beguines passed the age of 20 years, the average age at the death of the Beguines ($n=78$) is 43.0 years (females only), the average length ($n=50$) is 159.9 cm (ditto). Overall, health indicators as stature, incidence of infections and diseases, joint generations support the theory that the Beguines' health was very reasonable, and they were economically well off.

A few individuals show remarkable pathologies. One female individual shows evidence of a dental wear channel that, in later periods, would have been linked to smoking habits. However, as tobacco was not yet introduced at this point in time in Europe, it is unknown what practise caused this distinctive wear pattern. Remarkable was a single case of heavy unilateral depositing of calculus on the left side in a 51-year-old female. She possibly did not use the left side of her mouth, resulting in the excessive development of tartar. One older woman (63-68 year) showed evidence of

metastasis in the skull and Reiter's disease. This syndrome is usually found in men. In this project, one male and one female were diagnosed with Reiter's syndrome. Both skeletal remains showed bilateral sacro-illitis, and spine and arthrotic changes of the large peripheral joints.

A request to rebury the skeletal remains within the walls of the Beguinage was submitted by the Stichting Begijnhof in 2016, which was acknowledged and accepted. Two burial faults were placed in which all 120 individuals were laid to a final rest. After a short ceremony lead by the priest, the burial faults were hermetically sealed, disabling future investigations. The question rises, however, whether "forever peace" can be achieved, as the current Beguinage is not perceived as a place of silence and meditation anymore.





A new book will be published about the Beguinage in March 2017: Hans de Kievith en Erik Peters - Het oude Begijnhof aan het Kasteelplein. In: Het Bredase Begijnhof, een geschiedenis van 750 jaar. Breda, maart 2017

Literature:

F. Koorn en M. van der Eycken, 1987 - Begijnen in Brabant, de Begijnhoven van Diest en Breda. Breda/Antwerpen 1987

F.E. Rijpma en G.J.R. Maat , 2005 - A physical anthropological research of the Breda 1267 to 1535 AD, In: Barge,s Anthropological nr. 11, Leiden

Een laatste rustplaats op het Begijnhof, 2016 - In: BN/De Stem, dd. 8 september 2016

Populatieonderzoek

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Memento Mori; een archeologische opgraving rondom de St. Plechelmuskerk, Oldenzaal. ADC Monografie 21, G. L. Williams (red.)

Dit jaar is het opgravingsrapport gepubliceerd van de opgraving die tussen 2011 en 2013 plaatsvond op het voormalige kerkhof van de St. Plechelmusbasiliek te Oldenzaal. Hierbij zijn onder andere 2750 primair begraven skeletten opgegraven, daterend tussen de 6^e eeuw en 1829. Hiervan zijn 200 skeletten uitgebreid onderzocht door middel van fysische antropologie, paleopathologie en DNA- en isotopenonderzoek. Het is een bijzonder onderzoek omdat we voor het eerst op zo'n grote schaal deze verschillende onderzoeksmethoden hebben kunnen combineren. De resultaten hiervan zijn beschreven in hoofdstuk 6 en 7 van het opgravingsrapport, dat te downloaden is via de volgende link: <https://www.oldenzaal.nl/nieuws/presentatie-onderzoeksresultaten-archeologie-en-populatieonderzoek>



Archeologisch DNA-onderzoek op menselijke resten

E. Altena

Leids Universitair medisch Centrum

Archaeologica Naerdincklant 2016-1: 30-33

Archeologisch DNA-onderzoek wordt al uitgevoerd sinds de jaren '80 van de vorige eeuw, maar vanaf 2006 zijn de mogelijkheden enorm toegenomen en kan het op grotere schaal worden toegepast. De reden hiervoor zijn verschillende technologische ontwikkelingen. DNA-onderzoek op archeologische resten raakt dan ook steeds meer ingeburgerd in de Nederlandse archeologie. Desondanks blijft het voor velen toch een beetje een doos van Pandora. In dit artikel zal kort worden uitgelegd wat DNA is, waarom archeologisch DNA anders is en hoe je er mee om moet gaan. Daarnaast zal aan de hand van verschillende publicaties een idee gegeven worden van de diversiteit aan mogelijkheden met archeologisch DNA-onderzoek. DNA-onderzoek kan in principe

worden uitgevoerd op elk organisch materiaal dat DNA bevat, zoals bot, gebits-elementen, plantaardige resten, gewei en textiel. Dit artikel behandelt echter enkel onderzoek op menselijk materiaal.

Het volledige artikel is te downloaden via de volgende link:

https://www.academia.edu/24202965/Archeologica_Naerdincklant_2016-1_Moderne_technieken_in_de_archeologie



Samenvatting van de rapportage van het fysisch-antropologisch onderzoek van het menselijk skeletmateriaal aangetroffen bij de opgraving ‘Sir Winston Churchillaan’, Rijswijk (RCL 1013-1 en RCL 1013-2)

Birgit Berk

Birgit Berk Fysische Antropologie

Bij de opgraving ‘Rijswijk Sir Winston Churchillaan’, uitgevoerd door de gemeente Rijswijk, is een grafveld uit de Romeinse tijd gevonden met tien crematiegraven en één inhumatiegraf. Opvallend is dat er zeer veel verschillende graftypes zijn. Van de 11 graven waaraan een type toegewezen kon worden, betreft het een inhumatiegraf, twee bustumgraven (type D), een urngraf (type U), een crematierestendepot (type A), een crematierestendepot met verbrandingsresten (type B) en twee verbrandingsrestendepots (type C). Verder zijn er drie graven die type C of B kunnen zijn. Al met al zijn dus alle mogelijke graftypes vertegenwoordigd in dit kleine grafveld. Er was dus niet één wijze van begraven. Het lijkt erop dat er per begraving een keuze werd gemaakt. Waarop deze keuze voor een bepaald graftype gebaseerd was, is niet duidelijk.

Tijdens de opgraving zijn in veel van de graven bijgiften gevonden. Het betreft verschillende soorten aardewerk (waaronder Terra Sigilata), haarnaalden, fibulae, weefgewichten, een maalsteen, een pijparden beeldje, kralen, bewerkt bot, spijkers, een gebronse beker, dun glas, ijzer en druif. De bijgiften waren zowel verbrand als onverbrand.

Ook zijn er tussen het crematiemateriaal fragmenten van andere vondstcategorieën aangetroffen. Het betreft houtskool, aardewerk, steen, (gesinterde) grond, glas, metaal, schelpen, crematieslak en dierlijk botmateriaal (verbrand en onverbrand). In bijna alle graven is dierlijk botmateriaal aangetroffen. In de meeste gevallen was het dierlijk botmateriaal onverbrand of slechter verbrand dan het menselijk botmateriaal. Het lijkt er dus op, dat de dieren niet direct op de brandstapel werden gelegd, maar ernaast. Er werd een grote variëteit aan dieren meegegeven in het graf, zoals vis, hond, vogel en grotere zoogdieren.

Het botmateriaal was in goede staat voor fysisch-antropologisch onderzoek. Het botmateriaal is vrij homogeen verbrand, met een overheersende verbrandingsgraad van 5 en een range van 3 tot 5. In de tien crematiecontexten zijn 13 zekere individuen

aangetroffen, plus drie mogelijk extra individuen. Er zijn twee dubbelgraven aangetroffen, waarbij in één graf een volwassene met een baby lag en in een ander graf twee volwassenen en een jong kind. Het betreft zeven volwassenen en zeven kinderen, waarvan er twee jonger waren dan één jaar. Het percentage van 50% onvolwassenen op dit grafveld is hoog voor een archeologisch onderzoek, maar het komt waarschijnlijk juist in de buurt van de werkelijke kindersterfte in die tijd. De leeftijdsverdeling lijkt erop te wijzen dat het hier een ‘normale’ begraafplaats betreft, behorende bij een nederzetting. Het geslacht van de volwassenen kon in geen enkel geval met zekerheid bepaald worden, doordat er te weinig geslachtsbepalende elementen aanwezig waren om te determineren. Drie van de negen (jong)volwassen individuen zijn waarschijnlijk vrouwelijk, één individu is mogelijk vrouwelijk. Het feit dat bij geen van de graven een mannelijk geslacht is vastgesteld, is waarschijnlijk toeval. Er is geen reden om aan te nemen dat het hier een gemeenschap van alleen vrouwen en kinderen betrof. De mogelijk vrouwelijke individuen zijn in graven met verschillende graftypes aangetroffen. Er lijkt dus geen verband te zijn tussen het graftype en het geslacht.

Het individu uit het inhumatiegraf is een kind van 11 tot 12 jaar oud, met tekenen van lichte infecties (gezezen en actieve) overal in het lichaam. De oorzaak hiervan is waarschijnlijk een systemische infectie. Ten tijde van het overlijden had het individu een longinfectie. Verder had het individu cribra orbitalia en emailhypoplasie dat ontstaan is op een leeftijd van 6 maanden. Opvallend is slijtage aan de onderrug, gezien de jonge leeftijd van het individu. Het kraakbeen van de tussenwervelschijven zal door een genetische factor waarschijnlijk minder goed zijn aangelegd, waardoor in combinatie met zware belasting van de rug deze pathologie is ontstaan. De pathologische botveranderingen die bij de crematiegraven aangetroffen zijn, betreffen gewrichtsslijtage van met name de tussenwervelschijven en de facetgewrichten en tekenen van ontstekingen (onder andere aan de binnenzijde van de schedel en de longen).



Dry bone histology of bone tumours

H.H. de Boer & G.J.R. Maat

Int. J. Paleopathol. (2016) (*e-pub ahead of print*) - DOI: 10.1016/j.ijpp.2016.11.005

This article focuses on the application of dry bone histology in the diagnosis of a series of different bone tumours. It provides a short introduction on bone tumour classification and how tumours may affect the skeleton. To illustrate the value of dry bone histology in the diagnostic process we studied the ‘fresh’ and ‘dry’ bone histology of a series of well-documented, recent clinical cases of various benign and malignant bone tumours. We show that histology is a valuable instrument to assess bone tissue architecture, which provides information on the biological behaviour of a tumour. Though histology may reveal the specific ‘tumorous’ bone deposition of high-grade conventional osteosarcomas, all other bone tumours display common, unspecific features. This holds for the following

tumours: osteochondroma, hyperostotic meningioma, high-grade angiosarcoma, grade 2 chondrosarcoma, myoepithelial carcinoma, high-grade osteosarcoma and four carcinoma metastases. We conclude that histology is useful in cases where the biological behaviour of a tumour is to be defined, and is particularly an aide in the diagnosis of high-grade conventional osteosarcomas. Nevertheless, the differential diagnosis on the bone tumours in our series should primarily be based on a combination of physical anthropological patient data (age, sex), gross anatomy (e.g. tumour morphology and location), and radiography.



Diagnostic dry bone histology in human paleopathology

H.H. de Boer & A.E. van der Merwe

Clinical Anatomy 29:831–843 (2016) - DOI: 10.1002/ca.22753

Paleopathology is the study of trauma and disease as may be observed in ancient (human) remains. In contrast to its central role in current medical practice, microscopy plays a rather modest role in paleopathology. This is at least partially due to the differences between fresh and decomposed (i.e., skeletonized or “dry bone”) tissue samples. This review discusses these differences and describes how they affect the histological analysis of paleopathological specimens. First, we provide a summary of some general challenges related to the histological analysis of palaeopathological specimens. Second, the reader is introduced in bone tissue histology and bone tissue dynamics. The remainder of the paper is dedicated to the diagnostic value of dry bone histology. Its value and limitations are illustrated by comparing several well-studied paleopathological cases with similar contemporary, clinical cases. This review illustrates that due to post-mortem loss of soft tissue, a limited number of disorders display pathognomonic features during histological analysis of skeletonized human remains. In the remainder of cases, histology may help to narrow down the differential diagnosis or is diagnostically unspecific. A comprehensive, multidisciplinary diagnostic approach therefore remains essential.



The Dutch approach in disaster victim identification

H.H. de Boer & G.J.R. Maat

Journal de médecine légale droit médical (2016): 59(1):85-91

A disaster is a ‘sudden calamitous event that seriously disrupts the functioning of a community or society and causes human, material and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources’. Often

disasters coincide with the loss of numerous lives. The recovery, identification and repatriation of the (remains of the) victims is vital to the mourning process of the relatives and is needed for legal clearing. All efforts made for this purpose are referred to as Disaster Victim Identification (DVI). Over the past decades, the Dutch DVI team has made several contributions to increase the efficiency of the internationally accepted Interpol DVI-procedures. This article presents, from a medical officer's point of view, the basics of a disaster victim identification response and discusses some of the recent methodological advances used by the Dutch DVI team.



Human cranial vault thickness in a contemporary sample of 1097 autopsy cases: relation to body weight, stature, age, sex and ancestry

H.H. de Boer, A.E. van der Merwe & V. Soerdjbalie-Maikoe

International journal of legal medicine (2016): 1-7 - DOI: 10.1007/s00414-016-1324-5

The relation between human cranial vault thickness (CVT) and various elements of the physical anthropological biological profile is subject of ongoing discussion. Some results seem to indicate no correlation between CVT and the biological profile of the individual, whereas other results suggest that CVT measurements might be useful for identification purposes. This study assesses the correlation between CVT and body weight, stature, age, sex, and ancestry by reviewing data of 1097 forensic autopsies performed at the Netherlands Forensic Institute (NFI). In subadults (younger than 19 years of age at the time of death), all frontal, temporal, and occipital CVT measurements correlated moderately to strongly with indicators of growth (body weight, stature, and age). Neither sex nor ancestry correlated significantly with cranial thickness. In adults, body weight correlated with all CVT measurements. No meaningful correlation was found between CVT and stature or age. Females showed to have thicker frontal bones, and the occipital region was thicker in the Negroid subsample. All correlation in the adult group was weak, with the distribution of cranial thickness overlapping for a great deal between the groups. Based on these results, it was concluded that CVT generally cannot be used as an indicator for any part of the biological profile.



Strontium isoscapes in The Netherlands. Spatial variations in $^{87}\text{Sr}/^{86}\text{Sr}$ as a proxy for palaeomobility

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Journal of Archaeological Science: Reports 6, 1-13

Strontium isotope analysis has been successfully applied to archaeological questions of residential mobility and animal husbandry for over three decades. To obtain a full understanding of variations in archaeological samples, spatial variations in bioavailable strontium should be accurately mapped or inferred. This paper presents the first archaeological bioavailable strontium map of The Netherlands. The map is compiled solely from archaeological enamel samples of rodents and selected mammals as they are considered to provide the best proxy of bioavailable Sr. The diversity of the Dutch geological subsurface is directly reflected in the spatial distribution of $^{87}\text{Sr}/^{86}\text{Sr}$ ratios. Six isoscapes are defined: A) Lower terrace of the river Meuse (0.7074–0.7091, n=2); B) Marine and river Rhine sediments (0.7088–0.7092; n=85); C) Holland peat area, Kempen and northern sand areas (0.7091–0.7095, n=14); D) Rur Graben (0.7095–0.7105, n=11); E) Push moraines (0.7095–0.7110, n=7) and F) Northern and southern loess areas (0.7104–0.7113, n = 15). Although individual isoscapes may show some overlap, the mean of each isotope is statistically significant different, except for zones D and E. Five other geological environments yielded no archaeological data, mainly due to poor preservation in acidic soils. To fill this data gap, additional biosphere samples will be collected and analysed. This approach, however, will require validation of the extent to which specific floral are offset compared to the average archaeological bioavailable strontium. The base map presented here now allows such a detailed assessment of potential offsets in the $^{87}\text{Sr}/^{86}\text{Sr}$ recorded by different proxies at the regional scale.



Dynamics of Indian Ocean slavery revealed through isotopic data from the Colonial Era Cobern Street burial site, Cape Town, South Africa (1750-1827)

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The Dutch East India Company (VOC) intended the Cape of Good Hope to be a refreshment stop for ships travelling between the Netherlands and its eastern colonies. The indigenous Khoisan, however, did not constitute an adequate workforce, therefore the VOC imported slaves from East Africa, Madagascar and Asia to expand the workforce. Cape Town became a cosmopolitan settlement with different categories of people, amongst them a non-European underclass that consisted of slaves, exiles, convicts and free-blacks. This study integrated new strontium isotope data with carbon and nitrogen isotope results from an 18th-19th century burial ground at Cobern Street, Cape Town, to identify non-European forced migrants to the Cape. The aim of the study was to elucidate individual mobility patterns, the age at which the forced migration took place and, if possible, geographical provenance. Using three proxies, ⁸⁷Sr/⁸⁶Sr, $\delta^{13}\text{C}_{\text{dentine}}$ and the presence of dental modifications, a majority (54.5%) of the individuals were found to be born non-locally. In addition, the ⁸⁷Sr/⁸⁶Sr data suggested that the non-locally born men came from more diverse geographic origins than the migrant women. Possible provenances were suggested for two individuals. These results contribute to an improved understanding of the dynamics of slave trading in the Indian Ocean world.



The analysis of thermally altered human remains, new insights and possibilities.

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Oral presentation - International Academy of Legal Medicine – Intersocietal symposium Venice, Italy

Background and aims

Information on the temperature and duration that skeletal remains have been exposed to, can be crucial in a legal investigation. Because the bone matrix consists out of an in- and organic component it changes in a predictable sequence when exposed to heat, first dehydration, than carbonization, followed by calcination. There is much discussion on temperature estimations because not only temperature but also duration, and the presence of soft tissue have to be taken in to account. Therefore, we systematically studied the temperature and duration dependent changes in two surrounding media.

Materials and methods

Transverse sections of fresh human long bone diaphysis were exposed to heat in a muffle oven in either air or fat as surrounding medium, the latter to mimic the presence of soft tissue. The experiment consisted out of 47 successive temperature – duration categories (at least N=5 per category), up to 900°C and with a maximum duration of 50 minutes. All samples were analyzed with a calibrated flatbed scanner to obtain the average R/G/B values, and L*A*B* coordinates for statistical analysis. Randomly selected samples, from each category, were irradiated with a set of alternate light sources with excitation bandwidths in the range of 350nm to 560nm. The observed intensity of the fluorescence was scored for each sample. Lastly, the samples heated to temperatures up to 400°C, for various durations, were decalcified and processed in to thin section of 4µm and stained for microscopic analysis.

Results

Based on colorimetric analysis it is possible to differentiate between grossly 5 temperature ranges. The R/G/B values showed more temperature and duration related changes than the L*A*B* coordinates. Also a longer duration at a lower temperature can reflect a shorter duration at a higher temperature. The intensity of the fluorescence of bone was dependent of the presence of char. Completely charred samples showed no fluorescence while fresh and calcined samples did. Histological changes of the organic matrix showed the first signs of thermal degradation from 200°C onwards, and hence, precedes the changes in color and fluorescence.

Conclusion

Colorimetric analysis provides a good indication of the exposure temperature and duration, but also leads to relative broad temperature ranges. Histology and fluorescence can be used to narrow these broad ranges, and even provide more relevant information for the reconstruction of the perimortem events.



Differentiating between fresh and thawed amputated decomposing limbs, a macro- and microscopic approach

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Oral presentation - International Academy of Legal Medicine – Intersocietal symposium Venice, Italy

Background and Aims

Quartering and freezing can be a convenient method for storage, transport and disposal of remains to cover-up a homicide. In the forensic work up of such cases the question may rise whether an amputated extremity has been frozen prior to disposal. Little is known on the effect of a freeze-thaw cycle on the subsequent rate of decomposition, and whether it is possible to differentiate, macro- or microscopically, between fresh and frozen tissue during the subsequent decomposition. We therefore investigated the macro- and microscopic changes of fresh and thawed amputated limbs.

Materials and methods

Distal limbs of slaughtered pigs (*Sus scrofa*) were used in the experiment, of which one set was fresh, and one another, equally sized set, had undergone a freeze-thaw cycle. Half of both sets were left to decompose on the surface, and the remaining half was buried in standardized sandy loam soil. During the experiment the humidity, pH of the soil, and ambient temperature were logged and the soil water content was kept constant. The state of preservation of the limbs on the surface was documented on a daily basis. After either 30 or 60 days the buried limbs were exhumed, and documented. Biopsies from skin and muscle were taken from the limbs in fresh state, after the freeze-thaw cycle, and after 30 or 60 days of decomposition from both groups. The biopsies were processed in to thin sections, and stained for microscopic analysis.

Results

Before decomposition the fresh and thawed limbs did not differ macroscopically, but clear differences were observed microscopically. The limbs that decomposed on the

surface mummified, with the thawed limbs reaching this stage earlier than the fresh limbs. Furthermore the thawed limbs exhibited a deviating, macroscopically observable, change during early decomposition. Minor differences were found microscopically. The buried limbs showed clear macroscopic signs of decomposition after 30 days, no further changes were observed up to 60 days. In this group, no macroscopic difference was found between the fresh and the thawed limbs. Histological differences were observed between various anatomical structures, in general the thawed tissue was better preserved.

Conclusions

Differences were observed between the rate and process of decomposing fresh and frozen amputated limbs, both subaerial and subsurface. The observed differences became less apparent and overruled by general taphonomic processes in the course of time.



Subaerial cadaver decomposition of juvenile remains; new insights and serious implications for casework.

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The estimation of the postmortem interval is a challenging task for a forensic medical doctor, pathologist, anthropologist or entomologist, particularly when decomposition is advancing. Numerous studies have been carried out in the field of forensic taphonomy in other countries, especially in the United States. However, little has been done so far in Western Europe, especially with a focus on juvenile remains. This leads to a serious knowledge gap, making it difficult to accurately estimate the postmortem interval. To address this issue, a research facility was created to study outdoor cadaver decomposition in the Netherlands by means of pigs as a proxy (*Sus scrofa*). The rate of decomposition was scored on the basis of an existing scorings index and external variables were recorded. The results show clear seasonal differences in both speed and observed phases of decomposition. Furthermore, new insights were gained in the effect of external variables on the rate and extent of postmortem alterations. The results have to be considered to be a first step in a multiannual, international, and interdisciplinary research project.



Life in Transition. An osteoarchaeological perspective of the consequences of medieval socioeconomic developments in Holland and Zeeland (AD 1000-1600)

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Phd Dissertation - Promotors: prof. M.L.P. Hoogland, prof. P.C.M. Hoppenbrouwers, and A.L. Waters-Rist

This research investigates the impact of socioeconomic developments on the physical condition of medieval populations in Holland and Zeeland between AD 1000 and 1600 through the analysis of human skeletal remains from three archaeological sites. In a brief period of time, this region went from being scarcely populated to an area characterised by expanding urban centres and flourishing trade systems. These large scale developments had an impact on the daily lives of medieval people. Focusing on several skeletal indicators of disease, activity, and diet, this research has studied the physical consequences of medieval socioeconomic developments from a hitherto unexplored perspective.

Although differences are observed between the skeletal collections, the key finding is the absence of a marked distinction between town and country. The noted variations in skeletal indicators of disease, activity, and diet are minor and do not support the traditional idea that towns and villages in medieval Holland and Zeeland had become worlds apart. While urban living is frequently associated with negative consequences, this is not supported by this research. Especially in terms of disease, a more nuanced view is necessary. While the risks appear to have been different, one living environment cannot be considered better than the other.



A possible case of metastatic carcinoma in the Medieval Netherlands

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Poster presented at the conferences of the British Association for Biological Anthropology and Osteoarchaeology (BABAO), Kent 2016.

Metastatic carcinoma is not commonly encountered in the archaeological record, leaving a lacuna in our understanding of cancer in the past. During the excavation of the medieval hospital site in Kampen, The Netherlands, skeletal remains of an adult individual with possible metastases was found. While the individual is fragmentary and incomplete, all surviving bone elements appear to be affected. The left scapula shows

several sclerotic lesions as well as irregular spicules and patches of new bone. The left ribs are swollen with periosteal bone formation on both visceral and exterior surfaces. The lateral end of the left clavicle also displays periosteal new bone. An unidentified neural arch fragment appears to have been affected by a similar process. This poster will discuss the macroscopic and radiological analyses of the lesions and presents a differential diagnosis including primary bone cancers, haematological disorders, infectious conditions, and metastatic carcinoma. While a conclusive diagnosis is difficult because the remains are fragmentary and incomplete, we suggest that metastatic carcinoma is the most likely cause of the skeletal lesions in this individual.



A palaeopathological and isotopic approach to dietary changes in medieval Holland

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Podium presentation at the conference European Associations for Archaeologists (EAA), Vilnius 2016

The late medieval period in Holland was characterised by substantial socioeconomic changes. While the region was largely undeveloped prior to AD 1200, after came large scale urbanisation and flourishing international trade, changes that would have impacted many aspects of life. This paper investigates the effect of these changes on diet by comparing skeletal collections from the central medieval village of Blokhuisen (AD 1000-1200) to the late medieval town of Alkmaar (AD 1448-1572) using a combination of dental disease and stable isotope data.

The caries results clearly point to a dietary shift (213 individuals analysed). The urban population of Alkmaar has a significantly higher caries frequency, which begins at a younger age, than the individuals from Blokhuisen, suggesting increased consumption of cariogenic products, such as sugars and starches. Significant dietary differences are also demonstrated by the stable isotope data (sample of 50 individuals analysed). The population of Alkmaar showed significantly enriched $\delta^{15}\text{N}$ ratios and had more variable $\delta^{13}\text{C}$ ratios than the population from Blokhuisen. This may be due to increased consumption of freshwater or marine fish by the people of Alkmaar. Alternatively, the consumption of animals/animal products of a high trophic level such as chicken, eggs, and pigs could have contributed to enriched $\delta^{15}\text{N}$ ratios.

A difference in the patterning of caries and isotopic data in males versus females between the two populations also demonstrates a dietary shift. In rural Blokhuisen, there was a significant difference between males and females in regards to caries frequency but not stable isotope values. This likely reflects the universal biophysiological phenomenon of higher caries frequencies in women. In urban Alkmaar, there was no significant difference in male-female caries frequencies, suggesting the diet changed in such a way

that the expected difference was eliminated. The males were eating a certain type of food that was rarer in the female diet, that did not shift their $\delta^{13}\text{C}$ values away from that of the females, but elevated their frequency of caries. This could include more starches or sugars, but also increased consumption of beer should be considered.

The combination of caries and isotopic data points to clear changes in diet for urban individuals of late medieval Holland. It is hypothesised that an increase in market dependence and availability of international trade products in the late medieval period contributed to this dietary shift. Through the urban markets, new products such as fresh fruits, but also sugar and honey, became more widely available. Additionally, new techniques for preserving fish may have resulted in increased consumption of marine foods in towns. Moreover, a greater component of omnivores of high trophic levels in the diet could have contributed to the observed dietary shift. This study demonstrated that the integration of paleopathological and isotopic research provided a more complete understanding of dietary changes in medieval Holland.



The impact of sociocultural habits on childhood vitamin D deficiency visible as residual rickets in five post-Medieval populations from the Netherlands

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PPA New Orleans 19-04-2017

Vitamin D is obtained from sunlight and diet, and attaining sufficient amounts is affected by several factors that vary within and between populations. Inadequate levels in childhood can be evident in adults, called residual rickets, via remnant bending deformities of the lower limb. Limited research has explored the impact of sociocultural factors, such as division in activities, on vitamin D levels, especially in rural and small urban Dutch populations. For this paper, five post-Medieval skeletal collections from different parts of the Netherlands with varying population sizes are analysed: Gouda ($n = 46$), Roosendaal ($n = 45$), Silvolde ($n = 20$), Hattem ($n = 30$), and Beemster ($n = 200$). Residual rickets prevalence ranges from 8.7% in Gouda to 14.7% in Beemster and there is a different distribution of affected individuals among the samples. Since none of these populations were highly industrialised communities, typical factors, such as narrow architecture, overcrowding, and air pollution, are unlikely to have been at play in the development of vitamin D deficiency. Rather sociocultural habits are postulated to have contributed to childhood vitamin D deficiency. This is seen in (a) Gouda, where the majority of a high status family showed residual rickets and (b) Beemster, a rural population where women were at a higher risk of developing vitamin D deficiency most likely due to a gender related division in activities. This paper emphasizes the need to research small urban and rural populations to enhance our understanding of the

sociocultural factors that affect vitamin D levels.



An accessory skull suture mimicking a skull fracture

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This paper describes an investigation of the sudden and unexpected death of a five-and-a-half-month-old boy. As in every Dutch case of sudden unexpected death in infancy (SUDI), a multidisciplinary diagnostic approach was used. This included post-mortem radiography, showing a linear discontinuity of the parietal bone. Originally this was interpreted as a skull fracture, but autopsy indicated no signs of mechanical trauma. Instead the defect was defined as a unilateral accessory suture of the parietal bone. The initial erroneous diagnosis had severe adverse consequences and thus every health care professional or forensic specialist dealing with paediatric mechanical traumas should be cautious of this rare anomaly.



Challenges in ancient microbiome reconstruction using 16S rRNA gene amplification

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Podium presentation at the American Association Physical Anthropologists (AAPA) 13-16 April, Atlanta, USA

Dental calculus, formed by mineralization of dental plaque, is an ideal biomolecular reservoir as we seek to understand the ancient oral microbiome. To date, characterization of the ancient oral microbiome, as well as the ancient gut microbiome (i.e., coprolites), has primarily been accomplished through a phylotyping approach involving targeted amplification and sequencing of variable regions in the 16S rRNA gene. Specifically, the V3 region (*E coli* 341-534) of this gene has been identified through *in silico* and *in vitro* analyses as an excellent candidate for ancient DNA amplification and community reconstruction. Nevertheless, in practice this phylotyping approach often results in

unusual taxonomic frequency data. In this study, we use targeted (amplicon) and non-targeted (shotgun metagenomics) sequencing methods on four archaeological dental calculus samples to better understand these discrepancies. The four samples were chosen from diverse geographic and temporal contexts: Middenbeemster, Netherlands (159 BP); Guadeloupe, Caribbean (700 BP); Samdzong, Nepal (1900 BP); and Camino del Molino, Spain (4000 BP). Through comparisons of microbial taxonomic counts from paired amplicon and shotgun sequencing datasets, we show preferential amplification of archaea and the candidate bacterial phylum TM7 and underamplification of Spirochaetes and many important bacterial genera (e.g., *Streptococcus*) in amplicon datasets. Through informatics analysis, we demonstrate that extensive length polymorphisms in the V3 region are a consistent and major cause of amplification dropout and taxonomic bias in ancient microbiome reconstructions based on amplicon sequencing. We conclude that systematic amplification bias confounds attempts to accurately reconstruct microbiome taxonomic profiles using 16S rRNA V3 amplicon data.



Ancient DNA research in Caribbean Archaeology: challenges and prospects

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Podium presentation to invited symposium: primer of the ancient mariner: new perspectives on aDNA research and the prehistoric colonisation of islands at the Society for American Archaeology 6-10 April, Orlando, FL, USA.

Ancient DNA (aDNA) studies have had a major impact in archaeology. However, until now most aDNA studies have been conducted on samples from cold or temperate environments, as DNA degrades more rapidly at higher temperatures. With average annual temperatures of over 25°C, the Caribbean represents a particularly challenging environment for aDNA research and very few aDNA studies have been conducted in the Caribbean to date. Yet, there are many questions in Caribbean archaeology that could be addressed using aDNA, and previous studies have shown that DNA does preserve in the Caribbean context, in some cases possibly up to several thousand years. However, the factors influencing DNA preservation in this challenging environment are as yet not well understood. In this paper, we systematically explore the effects of temperature, age, microbial action, time since excavation, sample and soil type, and burial setting on DNA preservation in the Caribbean, using low-coverage, high-throughput DNA sequencing of human and canine samples from over 20 different sites in across the Caribbean. This study demonstrates the importance of burial context and sample type in the selection of

successful samples with a higher likelihood of amplifiable DNA, especially in these challenging environments.