Under the high auspices of the
Croatian Academy of Sciences and Arts

22nd

European Meeting of the Paleopathology Association

Sheraton Hotel, Zagreb, Croatia
August 28th – September 1st 2018

BOOK OF ABSTRACTS

INSTITUTE FOR ANTHROPOLOGICAL RESEARCH

Paleopathology Association

SCIENTIFIC COUNCIL FOR ANTHROPOLOGICAL RESEARCH OF THE CROATIAN ACADEMY OF SCIENCES AND ARTS

GeaCroatica

Published by:

Institute for Anthropological Research, Zagreb, Croatia

For the publisher:

Saša Missoni

Editors:

Mario Novak, Barbara Cvitkušić, Ivor Janković, Morana Jarec, Saša Missoni

Cover photo:

Mario Novak

Graphic layout and design:

Ivo Mađor

ISBN:

978-953-8092-11-4

Zagreb, 2018

TABLE OF CONTENTS

KEY-NOTE LECTURES

A HISTORY OF PALEOPATHOLOGICAL RESEARCH IN CROATIA WITH EMPHASIS ON RECENT INVESTIGATIONS DEALING WITH THE WAYS IN WHICH LOW INTENSITY, ENDEMIC WARFARE AFFECTS HEALTH ----------1
Mario ŠLAUS

NEANDERTAL PALEOPATHOLOGY: A TENTATIVE SYNTHESIS ----------1
Fred H. SMITH, Maria O. SMITH

MOLECULAR DETECTION OF ANCIENT PATHOGENS IN THE ERA OF BIG DATA ----------1
Kirsten I. BOS

SYMPOSIA

The ecology of climate change and infectious diseases: A gateway between past and present ----------2

DEBUNKING THE "HUMAN ECTOPARASITE HYPOTHESIS ----------2
Ole Jørgen BENEDICTOW, Raffaella BIANUCCI

DISEASE DYNAMICS IN THE HOLOCENE LEVANT AS REFLECTED FROM THE MIDDLE EAR ----------2
Katarina FLOREANOVA, Hila MAY

MOLECULAR DETECTION OF DISEASES FROM THE EUROPEAN LITTLE ICE AGE IN MECHELEN, BELGIUM ----------3
Karen L. GIFFIN, Katrien VAN DE VIJVER, Ron HÜBLER, Felix M. KEY, Susanna SABIN, Alexander HERBIG, Kirsten I. BOS

PARASITIC INFECTION IN A MARSHLAND CLIMATE: THE BRONZE AGE PILE DWELLING SETTLEMENT OF MUST FARM, UK (920-790 BC) ----------3
Marissa L. LEDGER, Elisabeth GRIMSHAW, Madi FAIREY, Rachel BALLANTYNE, Mark KNIGHT, Piers D. MITCHELL

THE INFLUENCE OF CLIMATE ON TUBERCULOSIS EVOLUTION IN THE LATE PLEISTOCENE/EARLY HOLOCENE ----------4
David MINNIKIN

PARASITES AND CLIMATE IN MEDIEVAL IBERIA: INTESTINAL PARASITES IN SIX ISLAMIC PERIOD CESSPITS FROM CÓRDOBA (SPAIN) AND MÉRTOLA (PORTUGAL) ---------4
Piers D. MITCHELL, Delaney KNORR, William SMITH, Marissa L. LEDGER, Leonor PEÑA-CHOCARRO, Jordà PÉREZ-GUILLEM, Rafael CLAPÉS, Maria de Fátima PALMA

DROUGHT, POLITICAL DECLINE, AND TUBERCULOSIS IN HUARI, PERU ----------5
Elizabeth A. NELSON, Aditya Kumar LANKAPALLI, Maria SPYROU, Åshild J. VÅGENE, Alexander HERBIG, Tiffiny A. TUNG, Kirsten I. BOS

ANCIENT *MYCOBACTERIUM LEPRAE* GENOMES REVEAL AN UNEXPECTED DIVERSITY OF LEPROSY IN MEDIEVAL EUROPE ----------5
Verena SCHUENEMANN, Charlotte AVANZI, Ben KRAUSE-KYORA, Alexander SEITZ, Alexander HERBIG, Sarah INSKIP, Michael TAYLOR, Pushpendra SINGH, Jesper BOLDSEN, Helen D. DONOGHUE, Sonia Ruth ZAKRZEWSKI, Andrej BENJAK, Kay NIESELT, Stewart COLE, Johannes KRAUSE

SOCIO-ENVIRONMENTAL CHANGES AND MALARIA INFECTION IN KOREA BEFORE 20TH CENTURY ----------6
Dong Hoon SHIN, Min SEO, Jong Ha HONG, Eunju LEE

Anthropology of violence - Soldiers, warriors and everyday life ----------6

NEW INSIGHTS FROM TRAUMA ANALYSIS OF SKELETAL REMAINS FROM THE BENEDICTINE MONASTERY IN BIJELA, CROATIA ----------6
Željka BEDIĆ, Andrej JANEŠ, Mario ŠLAUS

THE COUNT GUECELLO II OF PRATA, A FREDERICK II HOHENSTAUFEN'S LIEUTENANT. PALEOPATHOLOGICAL FINDINGS IN A MEDIEVAL KNIGHT ----------6
Ester BRUNETTI, Marialuisa CECERE, Dario INNOCENTI, Paola IACUMIN, Fabio CAVALLI

ANTHROPOLOGY OF VIOLENCE: AN INTERDISCIPLINARY FRAMEWORK ----------7
Fabio CAVALLI

“TO DIE BUT DO NOT FALL BACK”. ANTHROPOLOGICAL STUDY OF SKELETAL REMAINS OF THE FIRST WORLD WAR SOLDIERS ----------7
Lisa DE LUCA, Dario INNOCENTI, Marialuisa CECERE, Tomaž FABEC, Fabio CAVALLI

GOING BALLISTIC: IDENTIFYING SLING SHOT INJURIES IN PREHISTORIC EUROPE ----------8
Linda FIBIGER

CRANIAL TRAUMA FROM MONGOLIA: CONFLICT, CRIME AND/OR PUNISHMENT ----------8
Judith Helen LITTLETON, Bruno FROHLICH, Tsend AMGALANTUGS, Paul MORROW

THE "TERRITORIAL IMPERATIVE": THE ORIGIN OF WARFARE IN THE SOUTHERN LEVANT ----------8
Hila MAY, Omry BARZILAI

A NEW COLLECTIVE VIOLENCE SITE FROM EARLY NEOLITHIC CENTRAL EUROPE: THE MASS GRAVE OF HALBERSTADT AND ITS CONTEXTUAL INTERPRETATION ----------9
Christian MEYER, Corina KNIPPER, Nicole NICKLISCH, Angelina MÜNSTER, Olaf KÜRBIS, Veit DRESELY, Harald MELLER, Kurt W. ALT

HEAD WOUNDS BY FIREARM AND SHARP WEAPON AT THE S. MARTINO BATTLE (1859, ITALY) ----------9
Simona MINOZZI, Valentina GHIROLDI, Gino FORNACIARI

CARE AND CONSEQUENCES OF TRAUMATIC BRAIN INJURY IN NEOLITHIC SWEDEN -------10
Anna TORNBERG, Lars JACOBSSON

EVIDENCE FOR INTER-PERSONAL CONFLICT IN EARLY MEDIEVAL SÄBEN-SABIONA, ITALY ----------10
Daniela TUMLER, Alice PALADIN, Albert ZINK

Source combination in paleopathology. Paleopathography at the frontier between history and medicine ----------11

COMBINING PALEOPATHOGRAPHY AND PALEOPATHOLOGY: THE EXAMPLE OF THE MEDICI, GRAND DUKES OF FLORENCE ----------11
Valentina GIUFFRA, Gino FORNACIARI

INCORPORATING MEDICAL RECORDS IN PALEOPATHOLOGY: INVESTIGATING RESPIRATORY DISEASE IN POST-MEDIEVAL LONDON ----------11
Cara Stella HIRST

WHEN AND HOW WERE HELMINTHS ERADICATED IN ENGLAND? ----------12
Hannah RYAN, Patrik FLAMMER, Adrian SMITH, Greger LARSON

THE SECRET BEHIND NATURAL SOPRANOS: PALEOPATHOLOGY OF THE CASTRATO GASPARE PACCHIEROTTI ----------12
Alberto ZANATTA

REGULAR CONFERENCE PROGRAM

A CASE OF TUBERCULOSIS OF THE HIP JOINT IN AN ADOLESCENT OF A MODERN (19TH - 20TH C.) ITALIAN IDENTIFIED SKELETAL COLLECTION ----------13
Simona AFFINITO, Valentina MARIOTTI, Maria Giovanna BELCASTRO

NEW INSIGHTS OF LEPROSY FROM SOUTH-EASTERN FRANCE ----------13
Yann ARDAGNA, Avril MEFFRAY, Eloïse HOURIEZ, Anne RICHIER, Philippe BIAGINI

***CRIBRA FEMORALIS*: ISSUES SURROUNDING AETIOLOGY AND STANDARDISED RECORDING ----------14**
Jennifer AUSTEN, Mary E. LEWIS

CAN FEMORAL BONE SHAPE BE TRUSTED AS AN INDICATOR FOR LIFESTYLE? ----------14
Hadas Leah AVNI, Victoria ROUL, Ruth PELLEG-KALLEVAG, Frank RÜHLI, Hila MAY

GRANULOMA AND TERATOMA IN A PROBABLE POTTER FROM ANCIENT NUBIA ----------15
Brenda J. BAKER

INFLICTED TRAUMA AMONG THE PICENI POPULATION FROM IRON AGE NECROPOLIS OF NOVILARA (ITALY – PESARO, 8TH-7TH C. BC) ----------15
Michael Allen BECK DE LOTTO, Zita LAFFRANCHI, Chiara DELPINO

HUMAN SKELETAL REMAINS FOR SALE: A REASSESSMENT OF ETHICAL PRACTICES IN THE UNITED STATES ----------16
Bobbie Maxine BENAVIDEZ, Sarah Ashlyn LACY

RESULTS OF THE ITALIAN ARCHAEOLOGICAL AND ANTHROPOLOGICAL RESEARCHES IN SUDAN AT JEBEL BARKAL (2016-2017) ----------16
Francesca BERTOLDI, Francesca IANNARILLI, Federica PANCIN, Martino GOTTARDO, Emanuele CIAMPINI, Mohamed ELTOUM

HEALTH STATUS OF A LATE ANTIQUITY HUMAN POPULATION FROM PIAZZA CORRUBBIO-VERONA, ITALY ----------17
Francesca BERTOLDI, Valentina GIACOMETTI, Roberto CAMERIERE, Francesco PAGLIARA, Daniela COTTICA

THE MIDDLE AGE BURIALS OF DOGALETTO DI MIRA (VE): CASES OF CONTEMPORARY DEATHS OF WOMEN AND CHILDREN ----------17
Francesca BERTOLDI, Piera Allegra RASIA

A HISTOLOGICAL APPROACH TO THE IDENTIFICATION OF CALCIFIED SOFT TISSUE MATERIAL IN SKELETAL REMAINS, PROCEDURES DISTINGUISHING ATHEROSCLEROTIC PLAQUES AND OSSIFYING COSTAL CARTILAGE ----------18
Lucie BIEHLER-GOMEZ, Emanuela MADERNA, Cristina CATTANEO

THE CAL MILANO CEMETERY SKELETAL COLLECTION: A MODERN AND DOCUMENTED ITALIAN IDENTIFIED SKELETAL COLLECTION ----------18
Lucie BIEHLER-GOMEZ, Mirko MATTIA, Debora MAZZARELLI, Cristina CATTANEO

NON-ADULTS BURIALS FROM A BYZANTINE PERIOD CEMETERY IN TROGIR, CROATIA ---19
Michaela BINDER, Paul KLOSTERMANN, Lujana PARAMAN, Marina UGARKOVIĆ, Martin STESKAL

SPINAL LIGAMENTOUS OSSIFICATIONS IN A YOUNG ADULT OF 13TH CENTURY FROM THE MEDIEVAL SITE OF ALGHERO LO QUARTER (SASSARI, SARDINIA, ITALY) ----------19
Anna BINI, Pasquale BANDIERA, Marco MILANESE

IN SILICO SCREENING METHODS IN DETECTION OF ANCIENT TUBERCULOSIS (aTB) ------19
Paulina BORÓWKA, Łukasz PUŁASKI, Błażej MARCINIAK, Beata BOROWSKA-STRUGIŃSKA, Elżbieta ŻĄDZIŃSKA, Jarosław DZIADEK, Wiesław LORKIEWICZ, Dominik STRAPAGIEL

***HYPEROSTOSIS FRONTALIS INTERNA* IN THE BRITISH ROYAL NAVY (1750-1815) ----------20**
Ceridwen BOSTON

AGE ESTIMATION FROM BONE MINERAL DENSITY: THE INFLUENCE OF OSTEOPOROSIS ON ESTIMATES ----------21
Deona BOTHA, Niels LYNNERUP, Maryna STEYN

NEW INSIGHTS ON NUTRITIONAL DEFICIENCIES AT THE *CIVITAS* CAPITAL OF *AVENTICUM* IN ROMAN SWITZERLAND (1ST-3RD C. AD) ----------21
Chryssa BOURBOU

OSTEOLYTIC METAPHYSEAL LESIONS AND A CALCIFIED CYST IN A PRE-FARMING (6700-6200 BP) SKELETAL ASSEMBLAGE FROM NORTHERN VIETNAM: POSSIBLE HYDATIDS DISEASE ----------22
Hallie Ruth BUCKLEY, Monica TROMP, Marc OXENHAM, Hiep Hoang TRINH, Kate DOMETT, Anna WILLIS

THE FRUIT OF THE LOOM. PALEOPATHOLOGICAL RESULTS ABOUT ACTIVITIES RELATED TO SPINNING AND WEAVING IN ROMAN TIME ----------22
Allesandro CANCI, Anita RADINI, Cecilia ROSSI

THREE BRONZE AGE TREPANATIONS FROM CROATIA ----------23
Mario CARIĆ, Dinko TRESIĆ PAVIČIĆ, Ilija MIKIĆ, Ivor JANKOVIĆ, Mislav ČAVKA, Mario NOVAK

INTRABONE STABLE ISOTOPE VARIATION IN SKELETONS WITH PATHOLOGICAL LESIONS ----------23
Ana CURTO, Patrick MAHONEY, Anne-France MAURER, Cristina BARROCAS-DIAS, Teresa FERNANDES, Geraldine FAHY

SKELETAL DEVELOPMENTAL ANOMALIES ACROSS THE GENEALOGICALLY DOCUMENTED SAMPLE (BOHEMIA, 19TH TO 20TH CENTURIES) ----------23
Jan CVRČEK, Vítězslav KUŽELKA, Ondřej NAŇKA, Sylva KAUPOVÁ, Jaroslav BRŮŽEK, Petr VELEMÍNSKÝ

MICROBIOLOGICAL ANALYSIS OF A CHILD MUMMY FROM ZAGREB CATHEDRAL ----------24
Mislav ČAVKA, Andrea JANEŠ, Katarina DUJMOVIĆ, Jasenka ŠKRLIN

PALEORADIOLOGICAL ANALYSIS OF A CHILD MUMMY FROM ZAGREB CATHEDRAL -------24
Mislav ČAVKA, Mladen TOMORAD, Ivana ŠTIMAC, Ivor JANKOVIĆ, Mario NOVAK, Frank RÜHLI, Patrick EPPENBERGER

INSIGHTS FROM MOLECULAR EVIDENCE OF *MYCOBACTERIUM LEPRAE* FROM 15TH CENTURY NORMANDY, FRANCE ----------25
Helen D. DONOGHUE, Lauren OVEREND, Mark SPIGELMAN, Joël BLONDIAUX, Cecile Chapelain DE SERÉVILLE-NIEL

DENTAL DISEASE IN ABORIGINAL SOCIETIES FROM THE DULCE RIVER BASIN IN NORTHWESTERN ARGENTINA ----------25
Hilton DRUBE, Susana MARTÍNEZ, Elina SILVERA, Guillermo LAMENZA

THE CASE OF HIP DYSPLASIA OF THE ADULT FROM THE LATE ANTIQUITY SITE OF VELEBIT (SERBIA) ----------26
Ksenija ĐUKIĆ, Tamara PAVLOVIĆ, Petar MILENKOVIĆ, Đurđa BRACANOVIĆ, Marija ĐURIĆ

EVIDENCE OF VIOLENCE IN BURNED HUMAN REMAINS OF THE 3RD CENTURY AD FOUND IN THE ROMAN VILLA OF ELS MUNTS (TARRAGONA, SPAIN) ----------26
Andrea FERNÁNDEZ-VILELA, Josep Anton REMOLÀ, Maria Eulàlia SUBIRÀ

THE SYPHILIS OF MARIA SALVIATI (1499-1543), WIFE OF GIOVANNI DE' MEDICI NAMED "OF THE BLACK BANDS" ----------27
Antonio FORNACIARI, Raffaele GAETA, Simona MINOZZI, Luca VENTURA, Angelica VITIELLO, Gino FORNACIARI, Valentina GIUFFRA

THE FEMORAL SHAFT: WHAT DO WE DO WITH ALL THOSE CYLINDERS? ----------27
Samuel FRANCIS, Ruth PELLEG-KALLEVAG, Hadas Leah AVNI, Victoria ROUL, Hila MAY

THE FIRST COMPLETE DESCRIPTION OF ACROMEGALY IN BOLOGNA IN 1809: A JOURNEY THROUGH PALAEOENDOCRINOLOGY ----------28
Francesco Maria GALASSI, Emanuele ARMOCIDA, Mirko TRAVERSARI, Luisa LEONARDI, Christian MANCINI, Nicolò Nicoli ALDINI, Roberta BALLESTRIERO, Maciej HENNEBERG, Frank RÜHLI, Alessandro RUGGERI

SEARCHING FOR MALARIA IN THE ARCHAEOLOGICAL RECORD: BIOMOLECULAR APPROACHES AND ISSUES OF PRESERVATION ----------28
Michelle GAMBLE, Alvie LOUFOUMA-MBOUAKA, Frank MAIXNER, Albert ZINK, Michaela BINDER

PREVALENCE OF LARGE-JOINT AND EXTREMITIES OSTEOARTHRITIS IN A MEDIEVAL (13TH-16TH) URBAN POPULATION FROM LEIRIA (PORTUGAL) ----------29
Susana J. GARCIA

OSTEOLOGICAL EVIDENCE OF DISPROPORTIONATE GROWTH ON A JUVENILE INDIVIDUAL FROM THE 13TH CENTURY AD (LEIRIA, PORTUGAL) ----------29
Susana J. GARCIA, Ana Luisa SANTOS

TREPANATION IN ITALY: A REVIEW OF THE LITERATURE AND A NEW CASE ----------30
Valentina GIUFFRA, Giulia RICCOMI, Gino FORNACIARI

THE BATTLE OF WAGRAM 1809 - PALAEOPATHOLOGICAL EVIDENCE OF LIFE AND DEATH DURING THE NAPOLEONIC WARS ----------30
Hannah GRABMAYER, Michaela BINDER

CRANIOFACIAL DYSPLASTIC BONE DISEASE IN PALEOPATHOLOGICAL INVESTIGATIONS ----------31
Julia GRESKY

OSTEOPETROSIS AND ACCOMPANIED SKELETAL CHANGES IN A SKELETON FROM ALBANIA ----------31
Julia GRESKY, Emmanuele PETITI

EVIDENCE FOR ADAPTATION TO MALARIA IN A 2.58-MILLION-YEAR-OLD PROXIMAL *AUSTRALOPITHECUS AFRICANUS* FEMUR FROM MAKAPANSGAT, SOUTH AFRICA ----------31
Martin HAEUSLER, Sabine LANDIS, Bernhard ZIPFEL, Viktoria A. KRENN, Cinzia FORNAI

POSSIBLE CASE OF LEPROSY AND TUBERCULOSIS CO-INFECTION FROM THE SARMATIAN PERIOD (2ND-5TH CENTURY AD) ----------32
Tamás HAJDU, Antónia MARCSIK, Lucia HLAVENKOVÁ, Ivett KŐVÁRI, Kinga KARLINGER, Zsuzsanna MÉSZÁROS KIS, Enikő SZVÁK, Antal SKLÁNITZ, Lénárd SZABÓ, Olivia CHERONET, Kendra SIRAK, Tamás SZENICZEY, Tadeusz KRASSOWSKI, Ron PINHASI

DISH AND DIET: STABLE LIGHT ISOTOPIC ANALYSIS ACROSS THREE SOUTH AFRICAN SKELETAL POPULATIONS ----------32
Rachel L.V. HOLGATE, Gabrielle C. KRUGER, Charlotte E.G. THEYE, Ericka N. L'ABBE, Maryna STEYN

A BIOARCHAEOLOGICAL ANALYSIS OF THE ISLAMIC CEMETERY OF EL QUEZ, ALBERITE DE SAN JUAN, ZARAGOZA, SPAIN ----------33
Tina JAKOB, Joe Wallace WALSER III

PALEOPATHOLOGICAL PIECES: EVALUATING HEALTH FROM COMMINGLED BYZANTINE MONASTIC SKELETAL REMAINS AT MOUNT NEBO, JORDAN ----------33
Margaret JUDD

ČERINA-JOSIPOVAC CEMETERY - BIOARCHAEOLOGICAL ANALYSIS OF NEWLY FOUND CEMETERY NEXT TO OSIJEK, EASTERN CROATIA ----------34
Marijana JUKIĆ

I DON'T GET THIS HOLE-THING - AN ATTEMPT OF STATISTICAL ANALYSIS TO DECIPHER THE INDICATION OF SURGICAL TREPANATIONS ----------34
Kitty KIRÁLY, Gréta ELEKES, Mátyás BUKVA, Zoltán PINTÉR, Erika MOLNÁR, György PÁLFI, Zsolt BERECZKI

A POSSIBLE CASE OF METASTATIC CANCER FROM KEHIDA-FÖVENYES (7TH-8TH CENTURY A.D.) ----------35
Krisztián KISS, Tamás SZENICZEY, Kinga KARLINGER, Zsuzsanna MÉSZÁROS KIS, Enikő SZVÁK, Erika MOLNÁR, Antónia MARCSIK, Antal SKLÁNITZ, Lénárd SZABÓ, Zsolt DALLOS, Viktória KOVÁCS KIS, Krisztina BUCZKÓ, Tamás HAJDU

PREVALENCE OF HYPERCEMENTOSIS IN MIDDLE AND UPPER PALEOLITHIC HUMANS ---35
Sarah Ashlyn LACY

SMALL BUT HEALTHY? A CASE STUDY FROM PREHISTORIC COASTAL BRAZIL ----------36
Luis Pezo LANFRANCO, Sabine EGGERS

A POSSIBLE CASE OF PITUITARY DWARFISM FROM THEBES, EGYPT ----------36
Orsolya LÁSZLÓ

***"*LONG-GONE CHILDREN" - COMPARATIVE PALEOPATHOLOGICAL ANALYSIS OF NON-ADULT HUMAN REMAINS FROM AVAR (7TH-8TH C.) AND MEDIEVAL HUNGARIAN (12TH-14TH C.) CEMETERIES ----------37**
Orsolya LÁSZLÓ, Tamás SZENICZEY

VITAMIN D DEFICIENCY AND THE ANTIQUITY OF MODERN TRENDS: SKELETAL EVIDENCE FROM THE ROMAN PERIOD SITE OF ISOLA SACRA ----------37
Laura LOCKAU, Stephanie ATKINSON, Simon MAYS, Tracy PROWSE, Michelle GEORGE, Luca BONDIOLI, Carolan WOOD, Marissa L. LEDGER, Megan BRICKLEY

HEALTH-RELATED STRESS AT AN EARLY URBAN CENTRE: TIMING AND FREQUENCY OF ACCENTUATED LINES IN HUMAN DENTAL ENAMEL IN 3RD MILLENNIUM BCE LARGE TRADING AND CRAFTS CENTRE IN SE IRAN ----------38
Kirsi O. LORENTZ, Simone LEMMERS, Wendy DIRKS, Donald REID, Patrick MAHONEY, Farzad FORUZANFAR, Mansoor SAJJADI

NEW BIOARCHAEOLOGICAL AND PALEOPATHOLOGICAL FINDINGS ABOUT THE MUMMIFIED SUBADULT FROM GRUTA DEL INDIO SITE (SAN RAFAEL, MENDOZA, ARGENTINA) ----------38
Leandro Hernán LUNA, Claudia Marcela ARANDA, Pablo RODRÍGUEZ, Luis BALLARINI

KNEE ANKYLOSIS IN A FEMALE FROM THE LISBON SKELETAL COLLECTION ----------39
Giovanni MAGNO, Susana J. GARCIA

GASTROINTESTINAL PARASITE MARKERS AS EVIDENCE FOR WASTE MANAGEMENT -----39
Céline MAICHER, Antoni PALOMO, Christian HARB, Matthieu LE BAILLY

LEPROSY AND PULMONARY TUBERCULOSIS IN MEDIEVAL/MODERN ODENSE, DENMARK: PALAEOPATHOLOGICAL ANALYSIS OF RIB LESIONS AND INFERENCES FOR THE CROSS-IMMUNITY AND CO-INFECTION HYPOTHESES ----------39
Vitor MATOS, Carina MARQUES, Daniela PACHECO, Ana Luisa SANTOS

CAL: AN OSTEOLOGICAL TIMELINE FROM THE ROMAN AGE TO CONTEMPORARY TIMES ----------40
Mirko MATTIA, Daniel GAUDIO, Barbara BERTOGLIO, Debora MAZZARELLI, Emanuela SGUAZZA, Lucie BIEHLER-GOMEZ, Pasquale POPPA, Anna Maria FEDELI, Cristina CATTANEO

RECOVERY OF SKELETAL REMAINS FROM ARCHAEOLOGICAL BURIAL SITE: WHAT IS THE RATE OF MISSING BONES? ----------40
Mirko MATTIA, Emanuela MADERNA, Debora MAZZARELLI, Emanuela SGUAZZA, Cristina CATTANEO

FOOD PRESERVATION AND HUMAN HEALTH: THE CASE OF THE YOUNG EGYPTIAN PRIEST "IRET-HOR-R-U" ----------41
Hila MAY

LONGER LEGS, FEWER LEH, BUT SHORTER ADULT LIVES: A SIGNATURE OF IMMUNOLOGICALLY NAIVE MIGRANTS IN LONDON DURING THE INDUSTRIAL REVOLUTION? ----------41
Gina Patricia MCFARLANE

HISTOPATHOLOGY OF THE GREAT HUNGER: INCORPORATING HISTOLOGICAL METHODS TO EXAMINE THE HUMAN BIOLOGICAL RESPONSE TO FAMINE AND POVERTY IN MID-19TH CENTURY IRELAND ----------42
Lauren A. MECKEL, Jonny GEBER, Hallie Ruth BUCKLEY

ABOUT A NEW CASE OF LEPROSY FROM AMIENS CITY (FRANCE), 10TH-11TH CENTURY: PALEOPATHOLOGICAL AND PALEOMICROBIOLOGICAL APPROACHES ----------42
Avril MEFFRAY, Eloïse HOURIEZ, Yann ARDAGNA, Carole FOSSURIER, Annick THUET, Philippe BIAGINI

SURVIVAL OF A ONE-ARM WARRIOR IN PRE-ANTIBIOTIC ERA: A CASE STUDY FROM AN ITALIAN LONGOBARD NECROPOLIS (6TH-8TH CENTURIES AD) ----------43
Ileana MICARELLI, Robert R. PAINE, Caterina GIOSTRA, Mary Anne TAFURI, Antonio PROFICO, Marco BOGGIONI, Fabio DI VINCENZO, Andrea PAPINI, Danilo MASSANI, Giorgio MANZI

ANALYSIS OF THE SKELETONS FROM THE MUSLIM CEMETERY OF SONGO MNARA (TANZANIA). INTEGRATING OSTEOLOGICAL DATA WITH THE STUDY OF MALARIA aDNA ----------43
Francesca Bianca Maria MIGLIACCIO, Katharine ROBSON-BROWN, Jeffrey FLEISCHER, Stephanie WYNNE-JONES

OSTEOMYELITIS IN A MEDIEVAL BURIAL FROM SMEDEREVO FORTRESS, SERBIA ----------44
Nataša MILADINOVIĆ-RADMILOVIĆ, Vesna BIKIĆ, Ksenija ĐUKIĆ, Petar MILENKOVIĆ, Dragana VULOVIĆ

ENAMEL HYPOPLASIA AND HEALTH CONDITION THROUGH SOCIAL STATUS IN THE ROMAN IMPERIAL AGE ----------44
Simona MINOZZI, Walter Benedetto PANTANO, Carla CALDARINI, Valentina GIUFFRA, Paola CATALANO

METASTATIC PROSTATE CARCINOMA FROM IMPERIAL ROME (1ST-2ND CENTURY A.D.) ----------45
Simona MINOZZI, Agata LUNARDINI, Carla CALDARINI, Davide CARAMELLA, Gino FORNACIARI, Paola CATALANO, Valentina GIUFFRA

A CASE OF SYSTEMATIC UNILATERAL DEGENERATIVE JOINT DISEASE (UDJD) IN 14TH-17TH CENTURY TRANSYLVANIA, AND ITS IMPLICATIONS FOR THE EFFECT OF MINING ON POPULATION HEALTH ----------45
Priscilla MOLLARD

DIAPHYSOMETAPHYSEAL PATHOLOGICAL DEFORMATIONS AND EXTRACORTICAL POROSITY IN INFANTS FROM THE DISCALCED TRINITARIAN CONVENT, MADRID ---------46
Álvaro Manuel MONGE CALLEJA, Berta MARTÍNEZ, Luis RÍOS, Maria Paz DE MIGUEL, Francisco ETXEBARRIA, Almudena GARCÍA-RUBIO, Ana Luisa SANTOS

FIRST RESULTS ON THE STABLE ISOTOPIC ANALYSIS OF THE INDIVIDUALS UNEARTHED NEAR THE LEPROSARIUM OF BARCELONA, SPAIN (12TH-14TH CENTURIES) ----------46
Núria MONTES, Clara JÁUREGUI, Maria Eulàlia SUBIRÀ

FOUR SIMULTANEOUS SHARP FORCE INJURIES WITH SIGNS OF HEALING IN A SKULL FROM THE MIDDLE BRONZE AGE SITE OF AL-ADDEISEH, PALESTINE ----------47
Lucia MUÑOZ UGARTE, Nataša ŠARKIĆ, Miriam SAQQA CARAZO

THE MASS GRAVE IN THE SCHOTTENSTIFT, VIENNA, AUSTRIA – PALAEOPATHOLOGICAL PERSPECTIVES ON A MEDIEVAL MYSTERY ----------47
Christina MUSALEK, Michaela BINDER, Karin WILTSCHKE-SCHROTTA, Elfriede Hannelore HUBER

DENTAL HEALTH AND DIET OF THE IRON AGE NORTH PONTIC PASTORALISTS ----------47
Irina NECHAYEV, Svetlana ANDRUKH, Robert JURMAIN

AN UNUSUAL BI-RITUAL BURIAL OF THE URNFIELD CULTURE IN LOWER AUSTRIA -------48
Friederike NOVOTNY, Ute Michaela SPANNAGL-STEINER, Alexandra C.J. VON MILLER

VITAMIN DEFICIENCY IN EARLY MEDIEVAL SUB-ADULTS: INDICATIONS FOR METABOLIC DISORDERS IN THE EASTERN ITALIAN ALPS ----------48
Alice PALADIN, Daniela TUMLER, Albert ZINK

PROBABLE SYPHILIS-TUBERCULOSIS COINFECTION IN PARTIALLY MUMMIFIED HUMAN REMAINS - PALEOPATHOLOGICAL STUDY OF AN 18TH CENTURY MIDWIFE'S MUMMY ----------49
György PÁLFI, Ildikó SZIKOSSY, Orsolya VÁRADI, András SZEKERES, Kinga KARLINGER, Mark SPIGELMAN, Helen D. DONOGHUE, Frank MAIXNER, Albert ZINK, Olivier DUTOUR, Erika MOLNÁR, Ildikó PAP

EXTRACTING OBSTETRICAL HISTORIES FROM PELVIC FEATURES ----------49
Doris PANY-KUCERA, Ute Michaela SPANNAGL-STEINER, Katharina REBAY-SALISBURY

A TUMOUR SUPPRESSOR GENE VARIANT PREDISPOSING TO COLORECTAL CANCER FOUND IN A MUMMY FROM THE PRE-INDUSTRIALIZED ERA OF HUNGARY ----------50
Ildikó PAP, Israel HERSHKOVITZ, Ella H. SKLAN, Gila Kahila BAR-GAL, Ildikó SZIKOSSY, Rina ROSIN-ARBESFELD, Michal FELDMAN

THE TIME BEFORE LORDOSIS: WHAT IMMATURE VERTEBRA CAN TELL US ABOUT CHILDREN IN HISTORICAL TIMES? ----------50
Ruth PELLEG-KALLEVAG, Hadas Leah AVNI, Samuel FRANCIS, Hila MAY

STRESS MARKERS IN TEETH - SIGNALS OF PREHISTORIC LIFESTYLES? ----------51
Kristina PENEZIĆ, Marko PORČIĆ, Jelena JOVANOVIĆ, Petra Kathrin URBAN, Ursula WITTWER-BACKOFEN, Sofija STEFANOVIĆ

CONE-BEAM COMPUTED TOMOGRAPHY IN PALEODONTOLOGY AND BIOARCHAEOLOGY ----------51
Bojan PETROVIĆ, Kristina PENEZIĆ, Marko PORČIĆ, Jugoslav PENDIĆ, Sanja KOJIĆ, Jelena JOVANOVIĆ, Sofija STEFANOVIĆ

RECONSTRUCTION OF NEW ANCIENT *MYCOBACTERIUM LEPRAE* GENOMES FROM EUROPE ----------51
Saskia PFRENGLE, Judith NEUKAMM, Sarah INSKIP, Rezeda TUKHBATOVA, Nataliya BEREZINA, Alexandra BUZHILOVA, Stian SUPPERSBERGER HAMRE, Vitor MATOS, Maria Teresa FERREIRA, Ella REITER, Johannes KRAUSE, Verena SCHUENEMANN

PALEOPATHOLOGICAL INVESTIGATION OF HUMAN MUMMIES FROM GANGI, SICILY ------52
Dario PIOMBINO-MASCALI, Mark VINER, Gerald CONLOGUE, Ronald BECKETT

CONTINUITY OR DISCONTINUITY OF THE LIFE-STYLE IN CENTRAL EUROPE DURING THE LATE ANTIQUITY AND EARLY MIDDLE AGES TRANSITION: HEALTH, DIET, AND BIOLOGICAL ADAPTATION ----------52
Janusz Andrzej PIONTEK

"BRING OUT YOUR DEAD!": DIFFERENTIAL STRATEGIES FOR DEALING WITH THE DEAD AT MEDIEVAL THORNTON ABBEY ----------53
Caterina RAFFONE, Katie HEMER, Hugh WILLMOTT

HYDROCEPHALUS IN A CHILD FROM NUŠTAR ----------53
Petra RAJIĆ ŠIKANJIĆ, Dejana NIKITOVIĆ, Anita RAPAN PAPEŠA

POSTMORTEM MEDICAL PROCEDURES IN INDIVIDUALS FROM A PORTUGUESE IDENTIFIED SKULL COLLECTION (1895-1902 AD): FIRST EVIDENCE OF POSSIBLE TEACHING OF MODERN DACRYOCYSTORHINOSTOMY ----------53
Rosa RAMOS GASPAR, Ana Luisa SANTOS, Inês LEANDRO, Inês OLIVEIRA-SANTOS, Bruno Miguel MAGALHÃES

ANCIENT PARASITES IN THE MEDITERRANEAN BASIN: REVIEW AND NEW DATA ----------54
Kévin ROCHE, Matthieu LE BAILLY, Isabelle JOUFFROY-BAPICOT, Olivier DUTOUR, Alain BOUET

PHYSICAL BURDEN AND LOWER LIMB BONE STRUCTURE FROM THE TERMINAL PLEISTOCENE TO HOLOCENE, LEVANT ----------54
Victoria ROUL, Hadas Leah AVNI, Samuel FRANCIS, Hila MAY

GROWING UP BETWEEN WARS AND EPIDEMICS: TEETH ALTERATIONS IN AN INDIVIDUAL FROM THE S. FRANCISCO CONVENT OF COIMBRA (19TH CENTURY, PORTUGAL) ----------55
Ana Isabel RUFINO, Maria Teresa FERREIRA, Sofia WASTERLAIN

SLAVES' DIET: DENTAL CARIES AND WEAR IN A SAMPLE OF AFRICAN INDIVIDUALS FROM VALLE DA GAFARIA (15TH - 17TH CENTURIES, LAGOS - PORTUGAL) ----------55
Ana Isabel RUFINO, Maria Teresa FERREIRA, Sofia WASTERLAIN

A LUNG NODULE AS A RICH SOURCE OF HOST AND PATHOGEN DNA: ANALYSIS OF A 17TH CENTURY *MYCOBACTERIUM TUBERCULOSIS* GENOME FROM LUND, SWEDEN --------56
Susanna Jacey SABIN, Alexander HERBIG, Åshild J. VÅGENE, Torbjörn AHLSTRÖM, Gracijela BOZOVIC, Elizabeth A. NELSON, Caroline ARCINI, Kirsten I. BOS

BIOMECHANIC OF FOOT WITH BIPARTITE MEDIAL CUNEIFORM IN MEDITERRANEAN SERIES ----------56
Eduardo SALDIAS, Assumpció MALGOSA, Albert ISIDRO

INVESTIGATING HEALTH AND DIETARY PATTERNS BETWEEN INLAND AND COASTAL 17TH AND 18TH CENTURY POPULATIONS FROM FINLAND ----------57
Kati Hannele SALO, Dimitra Ermioni MICHAEL, Elissavet DOTSIKA

SINES ON THE ROUTE BETWEEN AFRICA AND THE AMERICAS: SKELETAL AND DOCUMENTAL EVIDENCE ----------57
Ana Luisa SANTOS, Sónia SOARES, Sónia FERRO, Paula ALVES PEREIRA

MEDIAEVAL AND CONTEMPORARY CERVICAL SPINE - PALEOPATHOLOGICAL AND CLINICAL RESEARCH ----------58
Snježana SCHUSTER, Mario ŠLAUS, Matej MUSTAPIĆ

RECONSIDERING PALEOEPIDEMIOLOGICAL INVESTIGATIONS IN PALEO-ONCOLOGY, WITH REFERENCE TO MEDIEVAL POLAND ----------58
Thomas SIEK

THE CHALLENGES OF BIOMOLECULAR PALEOPATHOLOGY ----------59
Václav SMRČKA

RARE MANIFESTATIONS OF SPINAL TUBERCULOSIS IN THE ROBERT J. TERRY ANATOMICAL SKELETAL COLLECTION (NATIONAL MUSEUM OF NATURAL HISTORY, SMITHSONIAN INSTITUTION, WASHINGTON, DC, USA) ----------59
Olga SPEKKER, David R. HUNT, Orsolya A. VÁRADI, William BERTHON, György PÁLFI, Erika MOLNÁR

A ONE-EYED SOLDIER FROM EL-DETTI, SUDAN? ----------60
Magdalena T. SRIENC

NEW POSSIBLE CASE OF SPINAL TUBERCULOSIS IN AN OSTEOARCHEOLOGICAL SAMPLE FROM 6TH-7TH CENTURIES (AVAR AGE) IN HUNGARY (TRANSDANUBIA, KÖLKED FEKETEKAPU „A") ----------60
Tamás SZENICZEY, Kinga KARLINGER, Zsuzsanna MÉSZÁROS KIS, Enikő SZVÁK, Antal SKLÁNITZ, Lénárd SZABÓ, Krisztián KISS, István RÁCZ, Tamás HAJDU, Antónia MARCSIK

***HYPEROSTOSIS FRONTALIS INTERNA* IN ANCIENT POPULATIONS - A POSSIBLE NEW WAY TO THE LIFE-STYLE RECONSTRUCTION ----------61**
Tamás SZENICZEY, Antónia MARCSIK, Zsófia ÁCS, Timea BALASSA, Zsolt BERNERT, Katalin BAKÓ, Tamás CZUPPON, Anna ENDRŐDI, Sándor ÉVINGER, Zoltán FARKAS, Lucia HLAVENKOVÁ, Krisztina HOPPÁL, Csaba Kálmán KISS, Krisztián KISS, Kinga KOCSIS, Loránd Olivér KOVÁCS, Péter F. KOVÁCS, Kitti KÖHLER, László KÖLTŐ, Ivett KŐVÁRI, Orsolya LÁSZLÓ, Gabriella LOVÁSZ, Júlia LOVRANITS, József LUKÁCS, Zsófia MASEK, Mónika MERCZI, Erika MOLNÁR, Csilla Emese NÉMETH, János ÓDOR, László PAJA, Ildikó PAP, Róbert PATAY, István RÁCZ, Zsófia RÁCZ, Ágnes RITOÓK, Gergely SZENTHE, Gábor SZILAS, Béla Miklós SZŐKE, Zoltán TÓTH, Tivadar VIDA, Katalin WOLFF, Michael FINNEGAN, Tamás HAJDU

TRACES OF GOUT IN THE MUMMY OF AN 18TH CENTURY TB INFECTED WOMAN, VÁC, HUNGARY ----------61
Ildikó SZIKOSSY, Ildikó PAP, Zsolt BERECZKI, Orsolya VÁRADI, András SZEKERES, Kinga KARLINGER, Mark SPIGELMAN, Helen D. DONOGHUE, Olivier DUTOUR, Frank MAIXNER, Albert ZINK, György PÁLFI

PATHOLOGICAL ALTERATIONS IN HUMAN MUMMIES OF THE GAMHUD CEMETERY -------62
Enikő SZVÁK, Antal SKLÁNITZ, Lénárd SZABÓ, Áron BÉNI, István JÁNOS, Márta DOBRÓNÉ TÓTH, Zita SZIKSZAY, Zsófia KERTÉSZ, Mihály MOLNÁR, István MAJOR, Hedvig GYŐRY, Karola BIACSI, György PÁLFI, Erika MOLNÁR, Ildikó PAP, Tamás HAJDU, Tamás SZENICZEY, Edina BARANYAI, Virág PABESCHITZ, Ildikó SZIKOSSY

THE STORY OF MY MISFORTUNES: A CASE STUDY OF INDIVIDUAL WITH SEVERAL SEVERE CONDITIONS INCLUDING SYPHILIS, RESIDUAL RICKETS AND FRACTURES (SPAIN, 16TH-18TH CENTURY) ----------63
Nataša ŠARKIĆ, Lucia MUÑOZ UGARTE, Goran ZEBIĆ, Rosa DINARÈS, Jesus HERRERÍN

PALEOONCOLOGICAL STUDIES ON SKELETAL REMAINS OF HISTORICAL POPULATIONS FROM HUNGARY ----------63
Krisztina TAKÁCS-VELLAI, Tamás HAJDU, Antónia MARCSIK, György PÁLFI, Tamás SZENICZEY, Endre NEPARÁCZKI, Tibor TÖRÖK, Erika MOLNÁR

A PROBABLE CASE OF RHEUMATOID ARTHRITIS FROM MEDIEVAL NORTHERN ITALY (12TH-13TH CENTURIES) ----------64
Chiara TESI, Valentina GIUFFRA, Gino FORNACIARI, Omar LARENTIS, Monica Rita MOTTO, Marta LICATA

DIFFERENTIAL SUBADULT HEALTH STATUS INFORMED BY ODONTOMETRIC, GENETIC, AND CULTURAL ESTIMATES FOR SEX ----------64
Lindsey Jo Helms THORSON, Vlasta VYROUBAL, Željka BEDIĆ, Mario ŠLAUS, Patrick J. GRAY

PERIODONTITIS IN THE HISTORICAL POPULATION OF RADOM (POLAND) FROM THE 11TH TO 19TH CENTURIES ----------65
Jacek TOMCZYK, Anna MYSZKA, Marta ZALEWSKA

LINEAR CUTTING TREPANATION IN ITALY: A UNIQUE CASE FROM HELLENISTIC SICILY (3RD CENTURY BC) ----------65
Giorgia TULUMELLO, Giulia RICCOMI, Simona MINOZZI, Valentina GIUFFRA

MARKERS OF DISEASE IN JUVENILE REMAINS FROM A SECOND ANGLO BOER WAR CONCENTRATION CAMP CEMETERY, SOUTH AFRICA ----------65
Stephany Yvonne VAN DER WALT, Willem Coenraad NIENABER, Anja MEYER, Maryna STEYN

TOWARDS AN INTEGRATED ANALYSIS OF OSTEOPOROSIS: A NEW BIOARCHAEOLOGICAL APPROACH IN PALEOPATHOLOGY ----------66
Anne-Marijn VAN SPELDE, Anna KJELLSTRÖM, Hannes SCHROEDER, Kerstin LIDÉN

A UNIQUE CASE OF MULTIPLE FRONTAL SINUS OSTEOMA FROM LATE ROMAN SICILY (CATANIA, 5TH-6TH CENTURY AD): MORPHOLOGICAL, RADIOLOGICAL AND HISTOLOGICAL ASSESSMENT ----------66
Elena VAROTTO, Rodolfo BRANCATO, Lorenzo MEMEO, Maria Teresa MAGRO

ÖTZI: NEW ANTHROPOLOGICAL ANALYSIS USING 3D VISUALIZATIONS FROM 2013 CT SCANS ----------67
Chiara VILLA, Kirstine BOYSEN, Mari BØKSET, Mathias SØDERLUND, Albert ZINK, Niels LYNNERUP

A CONTRIBUTION TO THE HISTORY OF MEDICINE IN 19TH-CENTURY CROATIA ----------67
Vlasta VYROUBAL, Danijel LONČAR, Marija MIHALJEVIĆ, Marina MATKOVIĆ VRBAN, Mario ŠLAUS

THE VIENNA PATHOLOGICAL ANATOMICAL COLLECTION - A PARADISE FOR PALAEOPATHOLOGISTS ----------68
Karin WILTSCHKE-SCHROTTA, Eduard WINTER, Verena HOFECKER, Anatol PATZAK, Andreas WASSERSCHEID, Walter FEIGL

RHINOMAXILLARY FEATURES OF TWO PROBABLE CASES OF LEPROSY IN A JOSEON PERIOD POPULATION OF SOUTH KOREA ----------68
Eun Jin WOO

HEALTH STATUS OF SOLDIERS IN THE LIKA REGIMENT OF THE CROATIAN MILITARY FRONTIER BETWEEN 1788 AND 1850 ----------69
Matea ZAJC PETRANOVIĆ, Alexander BUCZYNSKI, Petra RAJIĆ ŠIKANJIĆ, Vedran KLAUŽER, Juraj BALIĆ, Goran OVČARIČEK

'STORIES FROM BONES' - THE POTENTIAL OF 3D SCANNING AND BIOMECHANICAL MODELLING IN PALAEOPATHOLOGY ----------69
Sonia Ruth ZAKRZEWSKI, Stephanie EVELYN-WRIGHT, Martin BROWNE, Christopher J. WOODS, Mark Noel MAVROGORDATO, Katy E. RANKIN, Oliver J. STOCKS, Alexander S. DICKINSON

MULTI-OMICS STUDY OF THE ICEMAN - INSIGHTS INTO HEALTH, DIET AND DISEASE EVOLUTION ----------70
Albert ZINK, Thomas RATTEI, Rudolph GRIMM, Frank MAIXNER

KEY-NOTE LECTURES

A HISTORY OF PALEOPATHOLOGICAL RESEARCH IN CROATIA WITH EMPHASIS ON RECENT INVESTIGATIONS DEALING WITH THE WAYS IN WHICH LOW INTENSITY, ENDEMIC WARFARE AFFECTS HEALTH

Mario ŠLAUS (Croatian Academy of Sciences and Arts)

This presentation deals with the manner in which scientists from a small country, often considered to be on the periphery of European science, can contribute to global knowledge. To this end I showcase the contributions of Croatian bioarchaeology and paleopathology throughout history, from the remarkable discoveries and analyses of Dragutin Gorjanović Kramberger in Krapina, through the interdisciplinary work of Franjo Ivaniček in the late forties and early fifties of the last century, all the way to contemporary paleopathological analyses carried out in Croatia. Several rare and interesting recent paleopathological findings are presented but special attention is given to population oriented studies. Specifically, I analyze the ways in which low intensity, endemic warfare afflicted the health of populations that were exposed to it. To this end, three large composite skeletal series, comprising more than 1500 skeletons are analyzed for the presence of osteological and dental markers of subadult stress, metabolic and dental diseases, and trauma.

NEANDERTAL PALEOPATHOLOGY: A TENTATIVE SYNTHESIS

Fred H. SMITH, Maria O. SMITH (Illinois State University)

The fossil human taxon that we colloquially refer to as Neandertals, is the most thoroughly studied pre-modern human skeletal sample known to science. There are several reasons for this: Neandertals have been known since the nineteenth century; there is a relatively large and well-preserved sample; and they have an enigmatic evolutionary relationship to anatomically modern Homo sapiens sapiens. As we all know, paleopathology has played a key role in the framing of the Neandertal phenotype. Surviving the original characterization of rickets and feeble-mindedness, the taxon became defined as stoop-shouldered and bent-kneed due to the misidentification of osteoarthritis in the La Chapelle-aux-Saints individual. Most paleopathological assessments of Neandertals have been case studies, however, broader queries have provided quality of life and lifestyle information based on (for example) the patterns of traumatic injuries, habitual posture, treatment of the ill and infirmed, and oral health. To date, this information has not been synthesized. The Croatian location of a paleopathological conference is a particularly fitting venue for such a synthesis given the significance of the Hrvatsko Zagorje region as the home of arguably the largest single-site Neandertal sample from Krapina. This site provides the unique opportunity to study paleopathology of a Neandertal "population."

MOLECULAR DETECTION OF ANCIENT PATHOGENS IN THE ERA OF BIG DATA

Kirsten I. BOS (Max Planck Institute for the Science of Human History)

The past decade has demonstrated an impressive contribution from molecular methods for understanding the distribution and evolutionary history of a growing number of historical infectious diseases. With genomic analyses quickly becoming standard, analytical techniques have become increasingly specialized. This lecture will explore the brief but influential history of so-called "next-generation sequencing", its application to the study of past disease, and current techniques that are used for detection of pathogen DNA in archaeological tissues. Using a New World colonial-era epidemic as a model study, I will offer perspectives on molecular preservation, taphonomic influence, as well as the challenges and benefits that accompany genome-level pathogen reconstruction and analysis

SYMPOSIA

The ecology of climate change and infectious diseases: A gateway between past and present

Moderators: Raffaella BIANUCCI, Dong Hoon SHIN

DEBUNKING THE "HUMAN ECTOPARASITE HYPOTHESIS"

Ole Jørgen BENEDICTOW, Raffaella BIANUCCI

The key role of rats and their fleas in the spread of plague during the Black Death and the Second Pandemic has been challenged. Based on absence of historical descriptions of rats' epizootics and on an alleged paucity of rats in the archaeological record in central/northern Europe (due to adverse climatic conditions), some scholars theorize that human fleas/lice were the primary vectors of large-scale epidemics. Following their theory, climatic changes in a natural plague focus in Eastern Central Asia produced favorable conditions for the upsurge of plague in wild rodent populations before 1346. Subsequently, contagion would have been regularly transported 4,000 km by camel caravans along the Silk Roads to Kaffa and shipped to Europe. The alleged absence of metapopulations of rats in Europe implied a first introduction and later re-introductions of plague through the main harbors. Resorting to the Reed and Frost model for inter-human spread of viral diseases, it was assumed that the Black Death and later epidemics spread at much higher pace than the third pandemic (a recognized rat-flea pandemic). Hence, human- to- human cross-infection via *P. irritans*/lice is deemed the most probabilistic model. We present historical and biological data that contradict the above theory: 1. The spread of plague by caravans along the Silk Roads is historically disproved: 2. The Golden Horde's lands contained almost continuous plague reservoirs: outbreaks there and transmission to the Mongol-Tartar army beleaguering Kaffa are historically documented; 3. The zoo-archaeological record across Europe supports the role of rats as metapopulations of plague reservoirs; 4. No cases of large-scale epidemics sustained by human fleas/lice are so far documented in settings where plague is endemic and human habitations are densely infested by *P. irritans*/lice. The epidemiological implications of the inability of the human ectoparasites to act as epidemic vectors will be discussed.

DISEASE DYNAMICS IN THE HOLOCENE LEVANT AS REFLECTED FROM THE MIDDLE EAR

Katarina FLOREANOVA, Hila MAY

Studying infectious diseases in ancient times is of significant importance to our understanding of past populations' ways of life. Nevertheless, there are many obstacles (e.g., they rarely leave marks on the bones, the marks present are difficult to interpret) of which many can be grouped under the title "The osteological Paradox". The infection of the middle ear is exceptional, in that it leaves clear marks on the promontory and was known to be a major health hazard prior to the antibiotic era. In the current study we aimed to follow trends in prevalence of middle ear infection throughout the Holocene Levant using a novel, reliable and valid method developed by us. For this purpose, temporal bones of 229 adults from various prehistoric and historic periods of the southern Levant (from Natufian hunter-gatherers, ca. 15000 BP to sedentary late Arabs, 19th century) were examined for evidence of remodeling processes on the promontory surface, using a flexible video naso-pharyngo-laryngoscope (PENTAX Medical VNL9-CP) and an optical microscope (Nikon SMZ745T). Here, we report on two major findings. First, middle ear infection was a major health problem until modern times, infecting one of every second individual. Second, its rate is largely dependent on climatic conditions (wet vs. dry) and habitat conditions (e.g., livestock in the living area, indoor air pollution due to the presence of cooking facilities within the living quarters, etc.).

MOLECULAR DETECTION OF DISEASES FROM THE EUROPEAN LITTLE ICE AGE IN MECHELEN, BELGIUM

Karen L. GIFFIN, Katrien VAN DE VIJVER, Ron HÜBLER, Felix M. KEY, Susanna SABIN, Alexander HERBIG, Kirsten I. BOS

Recent advances in paleogenetics have provided investigators with a critical tool for understanding diseases in past populations. Confirmation of illnesses in historical peoples is often difficult due to the absence of pathognomonic indicators, incomplete or absent documentation and the trace levels of pathogen DNA in archaeological remains. Some form of DNA enrichment method, such as PCR, was often used for its detection. These targeted approaches, while useful for specific detection investigations, carry with them strong biases, as the DNA to be enriched must be selected. Using the non-targeted approach of next generation shotgun sequencing reduces these biases, which is beneficial for initial screenings for disease. We may observe multiple pathogens within a population, or even within the same individual, and it becomes possible to detect more of the many pathogens that leave no visible trace. Parallelisation of sensitive laboratory techniques and computational analyses allow large numbers of samples to be analyzed reliably and concurrently, permitting pattern analysis within population-size collections of data. Here, we screen skeletal material from St. Rombout's parish cemetery in Mechelen, Belgium for molecular signatures of pathogens. This was an important cemetery in the center of the city, used from the 10th to the 18th century. A recent excavation has yielded a skeletal collection of more than 4000 individuals, providing a substantial longitudinal sampling set. The time transect encompasses the Little Ice Age, during which many infectious diseases reached epidemic levels in Europe. Metagenomic data from teeth (n=151) harvested from multiple burials are being analyzed for the presence of pathogen DNA using next generation shotgun sequencing and an in-house computational pipeline. The spectrum of diseases identified will contribute to a better understanding of population-level health during this period, with special attention given to co-infections during this period of climatic instability.

PARASITIC INFECTION IN A MARSHLAND CLIMATE: THE BRONZE AGE PILE DWELLING SETTLEMENT OF MUST FARM, UK (920-790 BC)

Marissa L. LEDGER, Elisabeth GRIMSHAW, Madi FAIREY, Rachel BALLANTYNE, Mark KNIGHT, Piers D. MITCHELL

The site of Must Farm is one of the best-preserved Bronze Age settlements in Europe. Located in the marshes of East Anglia, it was a pile dwelling settlement comprised of a series of stilted structures with a defensive palisade, all constructed over a slow-moving river. Very little is currently known about the kinds of intestinal diseases that infected people in Bronze Age Britain, and especially how these varied in different climates. Therefore, samples of sediment dating from the time of the settlement were taken from five dwellings at their excavation, along with control samples from the site. The samples were processed using microsieves and analysed with digital light microscopy to detect the eggs of intestinal parasitic worms, and with ELISA to detect protozoal parasites that can cause dysentery. The eggs of fish tapeworm, whipworm, giant kidney worm, and *Capillaria* worm were found. This is the earliest evidence for fish tapeworm and giant kidney worm in Britain. Fish tapeworm in northern Europe is contracted by eating raw, smoked, pickled or undercooked freshwater fish, while giant kidney worm is contracted by eating raw fish or frogs. Evidence for these parasites give us insights into dietary and cooking habits in the village. It is unclear whether the whipworm originated in humans or pigs, as the egg of both species appear identical on microscopy. It is interesting that roundworm, generally common in early farming communities across Europe, does not seem to have been present in this population. It appears that the climate and marshy environment of Must Farm put inhabitants at risk of parasites contracted from eating raw fish, while potentially protecting them from infection by roundworm, which needs dry land to complete its life cycle.

THE INFLUENCE OF CLIMATE ON TUBERCULOSIS EVOLUTION IN THE LATE PLEISTOCENE/EARLY HOLOCENE

David MINNIKIN

The oldest cases of tuberculosis (TB) in *Homo sapiens* have been proven in skeletons from settlements in the Eastern Mediterranean, dating from the start of the Holocene around 10 thousand years (10ka) ago. In subsequent benevolent climates, evolving modern tubercle bacilli were disseminated widely in humans and animals. In the late Pleistocene, there are no records of TB in *H. sapiens* but there is developing evidence for TB in megafauna, dating back to at least the Eemian period (~125ka BP). Skeletal TB is very clearly defined in Pleistocene bison by metacarpal lesions "undermining the articular surface". In a 17ka *Bison antiquus* metacarpal from Natural Trap Cave, Wyoming USA, TB was confirmed by amplification of DNA fragments, supported by mycocerosic acid lipid biomarkers. In unpublished work, such lipid biomarkers indicate tuberculosis in a ~45ka *Bison priscus* metacarpal from Kent's Cavern, UK and ~12ka mastodon metacarpals from Hiscock, NY USA. Micro-CT scanning of bison metacarpals reveals TB diagnostic internal lesions, back to a ~120ka *B. priscus* from Shropham, UK. The logical hypothesis is that TB evolved from environmental mycobacteria in Eurasian Pleistocene megafauna, able to tolerate the coldest depths of the Ice Age climate that H. sapiens could not survive. The first tubercle bacilli, related to "*Mycobacterium canettii*", may have become sufficiently hydrophobic for aerosol transmission from ~50ka onwards. It is possible that this upsurge in TB virulence may have contributed to megafaunal extinctions up to the onset of the Holocene. Improving Eurasian climate proved attractive to humans, migrating out of Africa, who could have contracted highly-virulent TB from diminishing herds of megafauna. It is probable such encounters resulted in the oldest TB cases in *H. sapiens*, such as ~9ka Atlit-Yam (Israel) and ~10ka Dja'de el Mughara (Syria).

PARASITES AND CLIMATE IN MEDIEVAL IBERIA: INTESTINAL PARASITES IN SIX ISLAMIC PERIOD CESSPITS FROM CÓRDOBA (SPAIN) AND MÉRTOLA (PORTUGAL)

Piers D. MITCHELL, Delaney KNORR, William SMITH, Marissa L. LEDGER, Leonor PEÑA-CHOCARRO, Jordà PÉREZ-GUILLEM, Rafael CLAPÉS, Maria de Fátima PALMA

The vast majority of research into ancient parasites in Europe has focused upon archaeological sites from the well-watered northern half of the continent, with very little analysis of the hotter, dryer regions with a Mediterranean climate. Here we present our analysis of six cesspits from southern Iberia. Four cesspits were from 10th-11th century AD Córdoba (Spain) and two cesspits from 12th-13th century Mértola (Portugal). At the time these cesspits were in use, Córdoba was a large and prosperous capital city of the Caliphate of Córdoba, while Mértola was an independent Muslim principality. Multiple samples were taken from each cesspit, and the sediment analyzed for evidence of parasites using digital light microscopy and enzyme-linked immunosorbent assay (ELISA). We found the eggs of roundworm in every cesspit analyzed, but no evidence for other species of helminth, and no evidence for protozoal parasites that cause dysentery. Roundworm is spread by human feces contaminating food and drink, so its presence can be used as a marker of hygiene in a past population. Our findings closely match those obtained by other studies of pelvic soil from medieval Portugal, and our own research in Greece and Turkey, where parasites found were invariably species spread by fecal contamination. This is in contrast with the situation in northern Europe, where there is good evidence for a range of zoonotic parasites contracted from eating the meat of animals. The evidence suggests a clear north-south difference in the types of parasites that infected people in Europe in the past. We suspect the contrast in climate between northern and southern Europe to be the major contributing factor to variations in parasite species found in each area.

DROUGHT, POLITICAL DECLINE, AND TUBERCULOSIS IN HUARI, PERU

Elizabeth A. NELSON, Aditya Kumar LANKAPALLI, Maria SPYROU, Åshild J. VÅGENE, Alexander HERBIG, Tiffiny A. TUNG, Kirsten I. BOS

Throughout history the causative agent of tuberculosis, *Mycobacterium tuberculosis*, has greatly impacted global health. Although paleopathological evidence suggest the frequency of *M. tuberculosis* infections has decreased in recent centuries, tuberculosis (TB) remains a leading cause of death and is currently on the rise once again largely due to the emergence of antibiotic resistant strains. The spread of *M. tuberculosis* is promoted through migration, population crowding, drought, malnutrition, and poverty. Many of these conditions characterize the Late Intermediate Period (LIP, 1000-1400 CE) in the Ayacucho region of Peru. In the early LIP, there was a prolonged and severe drought and the Wari Empire that had ruled from ca. 600 – 1000 CE declined. It remains unclear what role the climate shift played in the decline of Wari. Osteological analyses of commingled human skeletal remains from the Terminal Wari era (950 – 1050 CE) from the capital city of Huari exhibit skeletal changes consistent with TB. Furthermore, populations buried at Huari 300 years later (1300 – 1400 CE), when the drought appears to have been on the wane, exhibit skeletal lesions on the vertebrae that are consistent with TB. To characterize the lineages of tuberculosis present at Huari and to determine their relationship to others circulating within the region we performed molecular analyses. Here we present data from 93 vertebrae and 11 ribs recovered from commingled assemblages within Huari largely from the late LIP but also some representation of the Terminal Wari era of the early LIP. Using novel methods of DNA recovery and detection-based DNA analysis, we were able to identify and recover full *Mycobacterium tuberculosis* genomes from a minimum number of 6 individuals. This provides insight into the ecology and evolutionary history of TB in the Andes and its possible relationship to the onset and long duration of severe drought.

ANCIENT *MYCOBACTERIUM LEPRAE* GENOMES REVEAL AN UNEXPECTED DIVERSITY OF LEPROSY IN MEDIEVAL EUROPE

Verena SCHUENEMANN, Charlotte AVANZI, Ben KRAUSE-KYORA, Alexander SEITZ, Alexander HERBIG, Sarah INSKIP, Michael TAYLOR, Pushpendra SINGH, Jesper BOLDSEN, Helen D. DONOGHUE, Sonia Ruth ZAKRZEWSKI, Andrej BENJAK, Kay NIESELT, Stewart COLE, Johannes KRAUSE

Studying ancient DNA allows us to retrace the evolutionary history of human pathogens, such as *Mycobacterium leprae*, one of the two causative agents of leprosy. Leprosy is one of the oldest recorded and most stigmatized diseases in human history. Widespread in medieval Europe, leprosy declined in the 16th century and subsequently disappeared from Europe. However, leprosy is endemic mainly in the tropics and subtropics, with over 200,000 new cases recorded annually. Previous studies on worldwide modern and European medieval *M. leprae* genomes revealed that they cluster into five separate lineages of which two were present in medieval northwestern Europe. In our present study, we analyzed additional medieval *M. leprae* genomes including the so far oldest *M. leprae* genome from one of the earliest known cases of leprosy in the United Kingdom—a skeleton from the Great Chesterford cemetery with a calibrated date of 415–545 AD. This latest dataset provides a genetic time transect of *M. leprae* diversity in Europe over the last 1500 years. We find four of the five known distinct *M. leprae* lineages to be present in the early medieval period, and three lineages were detected within a single cemetery from the high medieval period. Altogether these findings suggest a higher genetic diversity of *M. leprae* strains in medieval Europe at various time points than previously known. The resulting more complex picture of the past phylogeography of leprosy in Europe impacts current phylogeographical models of *M. leprae* lineages suggesting alternative models for the past spread of leprosy such as a widespread prevalence of different lineages in Eurasia already in antiquity or maybe even an origin in Western Eurasia. Furthermore, these results highlight how studying ancient *M. leprae* strains improves understanding of the history of leprosy worldwide.

SOCIO-ENVIRONMENTAL CHANGES AND MALARIA INFECTION IN KOREA BEFORE 20TH CENTURY

Dong Hoon SHIN, Min SEO, Jong Ha HONG, Eunju LEE

Malaria, still affecting many people worldwide, was one of the deadliest infectious diseases in human history. *Plasmodium vivax* is the subtype of malaria commonly found in temperate-zone countries. In this presentation, we will talk about the history of malarial infection in Korea, considering Joseon documents and the related scientific information from the perspectives of host-vector-pathogen-climate-environment relationship. We will show how much Joseon people's historical behaviors or climate changes affected malaria infection rate in history of Korea. Our findings clearly indicate that the environmental changes due to human behavior must be regarded as important as natural changes in climate was. Taken both factors together, we can manage to reveal the relationship between ecology of climate change and infectious diseases more evidently. This research was supported by Basic Science Research Program of the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2017R1D1A1B03030127).

Anthropology of violence - Soldiers, warriors and everyday life

Moderator: Fabio CAVALLI

NEW INSIGHTS FROM TRAUMA ANALYSIS OF SKELETAL REMAINS FROM THE BENEDICTINE MONASTERY IN BIJELA, CROATIA

Željka BEDIĆ, Andrej JANEŠ, Mario ŠLAUS

The ruins of the Benedictine monastery of St. Margaret are situated in Bijela, near Daruvar, in northeastern Croatia. A systematic archaeological campaign started in 2012 and, by 2017, six excavation campaigns have been conducted. Thus far, part of the single-naved monastery church has been excavated, revealing numerous architectural elements, some small finds, and graves. During the 14th and 15th centuries the monastery was one of the most important Benedictine centres in Medieval Slavonia, but at the turn of the 15th century it was used as a fortification. It was thought that the monastery and its church were abandoned after the Ottoman conquest in the mid-16th century, but some of the excavated graves within the church date from the second half of the 16th through to the mid-17th century, indicating continued burial at the site. Anthropological analysis was carried out on 26 skeletons (19 males, 3 females and 4 subadults). Most of the pathological conditions (indicators of subadult stress, evidence of hard physical labour, and dental pathologies) suggest poor living conditions and a low standard of health. Many antemortem and perimortem injuries were recorded on the analysed material. In 19 out of 26 individuals (73.1%) 58 injuries and four possible injuries were identified. Some 14 out of 19 complete adult crania (73.7%), and one out of three complete subadult crania (33.3%) exhibited trauma. Perimortem injuries were observed in four males and two females, while antemortem (healed) sharp force trauma was found in three males. The predominance of craniofacial injuries, as well as the presence of perimortem cranial trauma and healed sharp force lesions suggest that members of this community were subjected to high levels of intentional violence.

THE COUNT GUECELLO II OF PRATA, A FREDERICK II HOHENSTAUFEN'S LIEUTENANT. PALEOPATHOLOGICAL FINDINGS IN A MEDIEVAL KNIGHT

Ester BRUNETTI, Marialuisa CECERE, Dario INNOCENTI, Paola IACUMIN, Fabio CAVALLI

In 1262 the Count Guecello II was buried, by his express will, in the Church of San Giovanni a Prata di Pordenone. Irreducible Ghibelline, he had fought alongside his cousin Ezzelino III "the terrible"

and accompanied the Emperor Frederick II Hohenstaufer in his military activity in Northern Italy. Guecello retired in in his possessions in Prata around 1260, after the tragic end of the da Romano family. During the restoration of the church it was possible to verify that this building was used by the Prata family as a burial place from the middle of the 13th century up to the end of the 14th century. It was also possible to identify the burial of Guecello II. The anthropological, paleopathological and paleoradiological analysis on the remains of Guecello demonstrate the "violent" activity of a medieval knight who succeeded nevertheless to die in his own bed. This paper also discusses the usefulness of paleoradiological analysis of the skeletal remains in the reconstruction of the biological history of this nobleman.

ANTHROPOLOGY OF VIOLENCE: AN INTERDISCIPLINARY FRAMEWORK
Fabio CAVALLI

Interpersonal violence as the resolution of conflicts crosses the whole history of humanity by creating “institutional” figures such as the soldier or, more generally, the warrior authorized to administer the violence. Of course, interpersonal violence is not the prerogative of professionals or present only in periods of social or ethnic conflict or war but permeate all societies as “private” episodes such as murder or personal injury. Not to mention the cases of ritual sacred violence or other forms of traumatic intervention of the body for “good” purposes, like the castration to obtain high-voice singers in XVII-XIX century Europe. These multifaceted presentations of violence needs a multi- or interdisciplinary approach to the problem where the paleopathological approach maintains, nevertheless, a central role.

“TO DIE BUT DO NOT FALL BACK”. ANTHROPOLOGICAL STUDY OF SKELETAL REMAINS OF THE FIRST WORLD WAR SOLDIERS
Lisa DE LUCA, Dario INNOCENTI, Marialuisa CECERE, Tomaž FABEC, Fabio CAVALLI

The tragic events of the First World War left countless victims on the battlefields. This paper deals with the study of some skeletal remains from two different areas of the Italian/Austro-Hungarian front. The first purpose of this study is to set up a combined and detailed “field of application” of two different anthropological approaches: the physical and the forensic. Furthermore, it highlights the relevance of a correct recovery of the remains in order to obtain an accurate reconstruction of perimortem and post-mortem events in order to get to a feasible personal identification of the individuals. A well-executed recovery allowed us to perform several investigations on the remains that led to the identification of biological profile, stress markers, diseases (traumatic or not), and the cause of death of these four individuals. In our soldier’s remains different types of injuries were found: antemortem and perimortem caused by gunfire, and postmortem caused by both anthropic interventions and taphonomic alterations. In one case, thanks to the conservation of the identification tags, it was possible to compare anthropological data with the information reported in the matriculation roll, which allowed to identify one of the soldiers. The research for relatives is still on-going, and it will, in the future, to further confirm the identity through the comparison with DNA data. In another case, thanks to the recovery of some part of the uniform, and the study of the chronicle of the battles, it was possible to identify two graduate that could correspond with the remains. More analysis are currently in progress to verify this match. Our purpose is to present our protocol for the documentation and recovery of the human remains and their study in order to compare our work with those from other specialist that operate on this difficult cases.

GOING BALLISTIC: IDENTIFYING SLING SHOT INJURIES IN PREHISTORIC EUROPE
Linda FIBIGER

This paper presents results of a study that utilised synthetic bone models to experimentally create sling-shot injuries. The use of slings as weapons of interpersonal violence in prehistory, the Neolithic in particular, has been well-documented only for Southeast Europe and Western Asia. Slings have largely been neglected as a potentially important feature of violent interaction in the small-scale societies of Western and Central Neolithic Europe, whose material culture was characterised by 'weapon-tools' rather than dedicated weapons of violence. To date, skeletal trauma caused by slings has only been positively identified in the small number of cases where sling shot could be directly associated in situ with a skeletal injury. As documented in both, the historical and ethnographic record, with practice anybody can learn how to competently use a sling - children and adults, men and women. Depending on preference and local conditions, suitable ammunition is readily available, including clay and stone shot. It makes slings an extremely powerful and potentially ubiquitous weapon. The experimentally obtained fracture patterns presented here call for a revision of the diagnosis of many of the skeletal injuries recorded in the Neolithic (and wider European prehistoric) osteological record. Many of these defects previously recorded as generic blunt force trauma might in fact be the result of sling shot use. This highlights the importance of the emerging field of experimental bioarchaeology and the usefulness of experiments that try to replicate past practices, favouring an actualistic rather than a fully controlled lab-based approach.

CRANIAL TRAUMA FROM MONGOLIA: CONFLICT, CRIME AND/OR PUNISHMENT
Judith Helen LITTLETON, Bruno FROHLICH, Tsend AMGALANTUGS, Paul MORROW

Pastoral societies are often associated with frequent interpersonal violence attributed to the prevalence of raiding among rival groups. Among remains from the early Bronze Age, Mongolia (c3000-2500 BP) we have identified four individuals with extensive sharp force injuries to the cranium. The individuals (all adult males) come from two areas: Hovsgol in Northern Mongolia and Khovds in the west of the country. In this paper we analyse the sequence of injuries and similarities between them. These injuries seem to be part of a wider pattern of violence in early communities of Central Asia. We debate, however, the cause of that violence and explore three options: whether the injuries are sustained during conflict, activities such as raiding or whether they are part of a community sanctioned punishment. In doing so we draw upon the pattern of pathology, the archaeological context, the wider regional history and cross-cultural comparison.

THE "TERRITORIAL IMPERATIVE": THE ORIGIN OF WARFARE IN THE SOUTHERN LEVANT
Hila MAY, Omry BARZILAI

Of the most interesting questions in the history of humankind are why, and when, violent conflicts among human groups began. Is violence an inherent part of human nature, or a result of socio-economic circumstances? Various models have been developed over the years in the effort to answer these questions. A leading hypothesis is that the transition to a food-producing economy triggered hostile encounters due to conflicts over territories, i.e., control over food resources, and due to the emergence of socioeconomic inequality between individuals and groups. Increase in population density also encouraged violent behavior. Identifying signs of violence in skeletal material, however, is a complex task, since in most cases the injuries leave no marks on the bones, and when they do, the distinction between an intentional injury and accidental one is challenging. The current study aims to show that the emergence of vast amount of arrowheads, their evolution and sophistication at the beginning of agriculture in the Levant (Pre-pottery Neolithic period) are probably due to a sharp increase in group conflicts. We here describe a case of a male from the Mishmar Ha'Emek archeological site, dated to the PPNB period, with an arrowhead stuck in his

first thoracic vertebra. We analyzed the circumstances that most probably led to the death of this individual by using advanced imaging of the fractured vertebra and embedded arrowhead, and reconstructing them in three-dimensions.

A NEW COLLECTIVE VIOLENCE SITE FROM EARLY NEOLITHIC CENTRAL EUROPE: THE MASS GRAVE OF HALBERSTADT AND ITS CONTEXTUAL INTERPRETATION

Christian MEYER, Corina KNIPPER, Nicole NICKLISCH, Angelina MÜNSTER, Olaf KÜRBIS, Veit DRESELY, Harald MELLER, Kurt W. ALT

In Central Europe the Early Neolithic Linearbandkeramik (LBK; ca. 5600-4900 cal BC) is the first full farming culture in this area. In addition to several thousand carefully arranged burials usually found in dedicated cemeteries, and sometimes settlements, a few mass graves are currently known from this archaeological culture. These mass graves are characterised by a seemingly total lack of care for the deceased and are mostly interpreted as results of violent massacres if perimortem cranial injuries are present. Recently, another LBK mass grave was excavated at Halberstadt, Saxony-Anhalt, Germany, situated close to a contemporary settlement and cemetery. The whole feature was blocklifted from the field and was later excavated under controlled conditions. The mass grave contained the mostly articulated skeletal remains of nine individuals of which eight were diagnosed as male (89%). Some postcranial bones display perimortem fractures while others show signs of perimortem carnivore activity which apparently included the removal of distal parts of some extremities. All surviving crania show traces of perimortem blunt force trauma consistent with the available weaponry of the time. But in contrast to the LBK mass-violence sites already known, the injuries at Halberstadt cluster almost exclusively at the back of the head. This indicates a violence-related context different from the all-out massacres encountered so far. This view is further supported by the results of Sr and C/N isotope analyses, which set the mass grave assemblage clearly apart from the population buried in the local cemetery. Combining all currently available evidence, an execution-style killing of a non-local group of mostly male individuals seems to be the most likely interpretation. This extends the known scope of violent behaviour of Early Neolithic groups in Central Europe.

HEAD WOUNDS BY FIREARM AND SHARP WEAPON AT THE S. MARTINO BATTLE (1859, ITALY)

Simona MINOZZI, Valentina GHIROLDI, Gino FORNACIARI

On 24 June 1859, the Battles of San Martino and Solferino involved the French Army allied to the Sardinian-Piedmontese Army opposed to the Austrian troops. The victory of the French and the retreat of the Austrians ended the second Italian war for independence. Thousands of deaths of both Armies were hurriedly buried in the next days, but in 1869 the skeletal remains were exhumed and placed in a monumental ossuary. The aim of this work was the study of the head injuries attributable to firearms and bladed weapons in relation to the armaments and the military tactics used in that period. Examination of 817 skulls recovered in the San Martino Ossuary revealed traces of war wounds in 90 skulls that were selected and submitted to anthropological and paleopathological studies. The shape, dimensions and features of the wounds were accurately examined to characterize the lesions. The results evidenced different types of injuries, principally caused by firearms with projectiles of different calibers. The investigation of the caliber and the trajectory of the projectiles, as well as the kind of artillery have been based on the diameter and localization of the holes in the skulls. Some lesions caused by sharp weapons were shot by bayonets and sabres. The presence of several healed lesions, in some cases surgically treated, testifies a rather intense war period, and the capacity of the soldiers to survive even to severe injuries. The prevalence of gunshot wounds is consistent with the military tactics and with the weapons used in that period: hand-to-hand combat was restricted and bayonet assault was unsuccessful compared to the use of efficient ranged weapons.

CARE AND CONSEQUENCES OF TRAUMATIC BRAIN INJURY IN NEOLITHIC SWEDEN
Anna TORNBERG, Lars JACOBSSON

A number of papers have provided insight in frequencies of violence related trauma, especially skull trauma, in northern European skeletal assemblages dating to the Neolithic and Bronze Age. Although the cases are often well described, they lack further discussion about the consequences of skull trauma for the injured individual and the implications for the surrounding society, especially considering severe skull trauma leading to traumatic brain injuries (TBI). It has been suggested that TBI have had an impact on longevity in past populations but has been regarded too problematic to infer from skeletal remains. An interdisciplinary collaboration between bioarchaeology and neuropsychology has however opened up for discussions about care and consequences of TBI also in past populations. In this paper we address questions of trauma and care for one individual associated with the Swedish-Norwegian Battle Axe Culture who suffered from two severe ante-mortem skull traumas probably leading to brain injuries. These questions are addressed using the web-based application and analytic tool Index of care. We found that daily care, both short term with basic needs like nutrition and grooming, and long term with cognitive impairments, was available in the Neolithic society. Considering the frequent number of ante-mortem skull trauma in Neolithic and Bronze Age skeletal assemblages TBI was probably a common phenomenon. We argue that the care provided was a necessity for survival and maintenance of a socially sustainable society.

EVIDENCE FOR INTER-PERSONAL CONFLICT IN EARLY MEDIEVAL SÄBEN-SABIONA, ITALY
Daniela TUMLER, Alice PALADIN, Albert ZINK

Trauma analysis yields essential information on human interaction in past societies and socio-cultural practices and, thereby, shed new light on current notions and hypotheses about inter-individual aggression.
The current study provides insights into the peri-mortem trauma analysis of a human skeleton (SK63) from the Early Medieval cemetery of Säben-Sabiona in South Tyrol, Italy. The grave of SK63 was located in the western part of the southern side aisle of the Early Medieval church. The individual was buried in typical Christian funerary tradition i.e. West-East oriented (head-feet) and in supine position, with the lower arms flexed above the pelvis. Classical osteological methods were applied to reconstruct the biological profile of SK63, for sex and age at death estimation, stature and robusticity calculation, and the analysis of non-metric traits. Further, a systematic study on paleopathology and entheseal changes was performed to assess the general health and physical activity status of the individual. Importantly, a detailed macroscopic and metric analysis of the trauma observed on the cranium and post-cranium was completed, referring to the method proposed by Lewis (2008).
The individual SK63 was a juvenile (19-24 years old) male, with a body height of 168 ± 1.8 cm. Despite the young age, he featured signs of degenerative joint disease and altered entheseal sites, which may indicate horseback riding. The trauma analysis resulted in at least 26 lesions, including three ante-mortem injuries and 23 peri-mortem sharp force trauma on the cranium (n=4) and post-cranium (n=19). After comparing these cut marks with alterations caused by defleshing, it was concluded that the observed lesions were unlikely the result of post mortem dismemberment, but rather most likely linked to inter-personal conflict leading to death.
The present research provides the first evidence of fatal inter-individual aggression in the Early Medieval Eastern Italian Alps. Future analyses will aim to reconstruct the progression of events; to identify the type of weapons used and possibly the quantity of perpetrators involved causing the death of SK63.

Source combination in paleopathology. Paleopathography at the frontier between history and medicine

Moderator: Francesco Maria GALASSI

COMBINING PALEOPATHOGRAPHY AND PALEOPATHOLOGY: THE EXAMPLE OF THE MEDICI, GRAND DUKES OF FLORENCE

Valentina GIUFFRA, Gino FORNACIARI

The study of the Medici family of Florence represents an excellent example of integration between information provided by the historical sources and the data obtained through paleopathological examination. The Medici were one of the most important families of the Italian Renaissance and their health status is known to us thanks to the amount of details reported in contemporary archival documents, including letters of the Medici themselves to other relatives, missives of the ambassadors, and reports of the court physicians. From these records it emerges that several personages were affected by different pathologies, the true nature of which should be clarified. The members of the family belonging to the branch of the Grand Dukes of Tuscany, which began with John of the Black Bands (1498-1526) and ended with Giangastone (1671-1737), were buried under the floor of the Medici Chapels in the Basilica of S. Lorenzo in Florence. Starting from 2004 a multidisciplinary project allowed the exhumation of a number of individuals, whose skeletal remains were studied by macroscopic, radiological, and molecular analyses. The results of this study were compared with the nosographic details reported in written documents. In some cases, the diagnosis made by court physicians was correct and was confirmed by the paleopathological analysis; in other cases the nosological entities were not correctly identified and the modern study permitted to ascertain the true nature of the lesions and also to reveal the conditions affecting the Medici, which otherwise would have been unknown. We present a series of examples, including Joan of Austria (1547-1578), Ferdinand I (1549-1609), Cardinal Carlo (1595-1666) and Don Filippino (1577-1582). In conclusion, in the Medici project the combination of paleopathography and paleopathology was particularly fertile in the study of past diseases of historical personages.

INCORPORATING MEDICAL RECORDS IN PALEOPATHOLOGY: INVESTIGATING RESPIRATORY DISEASE IN POST-MEDIEVAL LONDON

Cara Stella HIRST

Decreases in air quality has been linked to respiratory disease in modern medical literature, with multiple studies investigating the link between air pollutants and respiratory disease across urban populations worldwide. In archaeological research the analysis of palaeopathological lesions on the ventral surface of the ribs, have previously been used to infer respiratory disease and subsequently air quality. These studies, however, are hindered by the nature of biarchaeological material and the limited skeletal responses to pathological conditions. The Historic Hospital Admission Report Project digitised medical records in Britain between 1852 and 1921, allowing epidemiological analysis of respiratory disease among children during a period of increased industrialisation and recorded poor air quality around Britain. The aim of this study was to investigate how the prevalence of respiratory disease among children admitted to hospital changed over time, during this period of industrial expansion in London. Diagnosis, month admitted, period of stay and outcome were analysed. Results were compared to modern epidemiological and archaeological studies which have analysed skeletal lesions as an indicator of respiratory disease, as well as historical reports of air pollution in London during this period. Results demonstrated that the prevalence of respiratory disease among children admitted to hospital increased over time, indicating the impact of increased air pollution on the prevalence of respiratory disease. Furthermore, this study illustrates the value of a multidisciplinary analysis, and the inclusion of historical reports in bioarchaeological analysis.

WHEN AND HOW WERE HELMINTHS ERADICATED IN ENGLAND?
Hannah RYAN, Patrik FLAMMER, Adrian SMITH, Greger LARSON

Gastrointestinal helminths are a global problem, with about a sixth of the world population affected. In 2001, delegates at the World Health Assembly unanimously endorsed a resolution (WHA54.19) urging endemic countries to start seriously tackling worms. Whilst targeted chemotherapy treatment is now available, this will have limited effect in eradicating species. There are however, countries where these worms were endemic in the past but no longer support the transmission cycle. Eradication of these infections is usually attributed to interruption of the fecal-oral route of infection by improved sanitation, better waste disposal systems and transportation of safe water. Unfortunately, assessing the effectiveness of different sanitary elements in tackling helminth infections is difficult. Historical sources provide unique, real-life circumstances with varying types and quality of hygiene infrastructure that allow the effectiveness of changes to be elucidated. Reconstructing the historical epidemiological significance of these worms in countries where they are no longer endemic will further clarify the degree to which modern comparisons can be made. Microscopy and genetic analysis can be used to assess the prevalence of helminths in past populations as well as changes in risk factors (such as age and gender) that might affect parasite epidemiology. For this study, over 300 soil samples from 5 different time periods (Pre-historic, Roman, Anglo-Saxon, later Medieval and Industrial) were examined. The parasite load of historical England was comparable to modern day prevalence rates in rural developing countries, and the change from an endemic to a non-endemic country occurred rapidly, in relatively recent history.

THE SECRET BEHIND NATURAL SOPRANOS: PALEOPATHOLOGY OF THE CASTRATO GASPARE PACCHIEROTTI
Alberto ZANATTA

Following the birth of modern opera in Italy in 1600, the demand for soprano voices grew up and the prepuberal castration was carried out to preserve the young male voice into adult life. Among the castrati, Gaspare Pacchierotti (Fabriano, 1740 – Padua, 1821) was probably one of the most famous. The remains of Pacchierotti were exhumed for the first time in summer 2013 for a research in the reconstruction of his biological profile, to understand the secret of his sublime voice and how the castration influenced the body. Pacchierotti's body can be considered the first whole skeleton of a castrato ever studied.
All the findings discovered, through anthropological and Computed Tomography analyses, are consistent both with the occupational markers of a singer and with the hormonal effects of castration. The erosion of cervical vertebrae, the insertion of respiratory muscles and muscles of the arms can be an effect of the bodily position and exercise during singing. The hormonal effect of castration were related to osteoporosis and to the disorders of spine that had a general calcareous atrophy with multiple cribrosus bones in the vertebral walls. There were also an anterior vertebral wall fracture in both L1 and L2, and several osteophytes between L3 and L4, and a Schmorl's nodes in the vertebral body endplate of L4. In Pacchierotti, even if the skull was not complete, there were no signs of *hyperostosis frontalis interna* (HFI).

WORKSHOP

Paleoradiology meets clinical radiology

Hosts: Mislav ČAVKA, Frank RÜHLI

Although paleoradiology is a part of paleopathology for more than 100 years, today more than ever it plays crucial role in the analysis of ancient bioarchaeological and archaeological remains. Standard x-rays machines are indispensable tools in everyday use but paleoradiology is shifting towards paleoimaging as computed tomography (CT), magnetic resonance (MR), micro CT (μCT) are used more often in analysis of the remains.
The workshop will be held at the University Hospital Centre Zagreb, largest Croatian hospital and university medical centre, where all participants will participate in scanning of various pathological conditions from archaeological context but also some archaeological artefacts (Late Bronze Age urns) on X-ray and CT units, possibly on MR as well. All scanners are set in clinical environment with possibilities of 3D post-processing what will be demonstrated by experienced paleoradiologists.

REGULAR CONFERENCE PROGRAM

A CASE OF TUBERCULOSIS OF THE HIP JOINT IN AN ADOLESCENT OF A MODERN (19TH - 20TH C.) ITALIAN IDENTIFIED SKELETAL COLLECTION

Simona AFFINITO, Valentina MARIOTTI, Maria Giovanna BELCASTRO

We report a case of a severe destruction of the right coxo-femural joint of an adolescent (N.8, M – 14 age) of the modern (19th - 20th c.), identified (sex and age) skeletal collection of Cagliari (Sardinia, Italy). This collection is housed at the Museum of Anthropology of the University of Bologna together with about 1000 identified skeletons coming from many modern Italian cemeteries. For the Cagliari collection, composed by 69 individuals, the cause of death is unknown but the morphological and tomographic analyses have shown many cases with lesions related to tuberculosis (TB). The morphological analysis of this case study has shown several alterations of the hip joint that involve the acetabulum, with a perforated lesion, porotic surface and osteophytes around the cotyloid margin, and the femural head. The destructive process is also spread to the femur diaphysis, with a thinning of the cortical bone, and to the distal femur and proximal tibial epiphyses where the rarefaction of the trabecular bone has been also observed. The state of preservation of the skeleton is quite bad, especially for the ribs and vertebral elements, commonly affected by the skeletal TB. The differential diagnosis led us to correlate these lesions with tuberculosis assuming this case as one of the few examples of TB arthritis in juveniles in pre-antibiotic era. This study is part of a larger morphological and tomographic analysis of the skeletal traits of TB of all the identified collections above cited.

NEW INSIGHTS OF LEPROSY FROM SOUTH-EASTERN FRANCE

Yann ARDAGNA, Avril MEFFRAY, Eloïse HOURIEZ, Anne RICHIER, Philippe BIAGINI

In France, particularly in the southern region, paleopathological cases of Hansen's disease are very scarce despite a large number of excavations. Our study focuses on presenting evocative lesions on subjects from medieval cemeteries in south-eastern France. The first individual (SP 21373 mature adult female) comes from the cemetery of Saint Jean de Todon in Laudun l' Ardoise (Gard)

and presented alterations on the face without a clear picture of rhinomaxillary syndrome. The second individual (SP 2070 subadult SP 2070 of indeterminate sex) from the medieval priory of "Cassan" in Roujan in the Hérault showed the lesions on the bones of the hands, feet and lower limbs. Finally, two individuals (SP 09A mature female adult SP09B mature adult) from the excavation of Frigolet Abbey (Var) showed alterations of the face without giving the complete picture of rhinomaxillary syndrome. Most of the lesions observed are therefore not all typical or sufficient for the diagnosis of leprosy. Moreover the skeletal preservation does not always allow a successful diagnosis. In addition, paleomicrobiological research has been conducted on molecular markers specific to *Mycobacterium leprae*. In order to carry out the analyses, fine bone samples (near the affected areas) and dental samples were taken. Then PCR extraction and amplification of bacterial DNA were carried out. These new data, both paleopathological and molecular, reinforce our knowledge of leprosy in southern France during medieval times.

CRIBRA FEMORALIS: ISSUES SURROUNDING AETIOLOGY AND STANDARDISED RECORDING

Jennifer AUSTEN, Mary E. LEWIS

Examination of cribrous lesions in the postcranial skeleton is a recent and limited focus of palaeopathology. Often these are assumed to be associated with *cribra orbitalia*, yet are typically left underexplored without any standardised recording scheme. To date, six studies have mentioned cribrous lesions in the proximal femur, referred to as *cribra femoralis*. This lesion is specifically located on what is referred to as the 'reaction area' on the anteromedial head-neck junction of the proximal femur. It has been suggested that this could be produced by the occurrence of marrow hyperplasia, an osteological response to anaemic conditions and the retention of red marrow in the proximal femur. But the precise aetiology of this lesion has yet to be established. Furthermore, a set of diagnostic criteria and grading scheme needs to be developed to measure cause and severity. Additional confusion in regards to the identification and recording of *cribra femoralis* is the occurrence of Allen's fossa: this epigenetic trait has a similar appearance to *cribra femoralis*, potentially resulting in misidentification between the two. This paper reviews past thoughts on cribrous lesions and their pathological origin, and provides a thorough comparison with Allen's fossa using identified examples from individuals from post-medieval England (St. Oswald's Priory). By better differentiating the two features, identification of hematopoietic disorders in the past can be better ascertained.

CAN FEMORAL BONE SHAPE BE TRUSTED AS AN INDICATOR FOR LIFESTYLE?

Hadas Leah AVNI, Victoria ROUL, Ruth PELLEG-KALLEVAG, Frank RÜHLI, Hila MAY

Anthropologists use bone morphology to infer the physical burden, ethnicity, health, and so forth of past individuals, based on the notion that post-growth development of the skeleton is negligible and therefore bone shape can be considered stable throughout life. However, is this notion of stability evidence-based? The aim of the current study was to examine shape dynamics in the proximal femoral bone from early adulthood to old age. The shape of the proximal femur was captured using a geometric morphometric (GM) method. The GM model includes 12 landmarks and four curves represented by 31 semilandmarks, applied to virtual three-dimensional femoral surface reconstructions. The model was applied to 174 modern individuals who underwent CT scans prior to the study. We found that proximal femoral shape changes during the human lifetime, regardless of sex. These changes include reduced sphericity of the femoral head, increased concavity of the superior surface of the femoral neck and increased lateral projection of the greater trochanter. This study suggests caution when using femoral features to infer modality of life in past populations.

GRANULOMA AND TERATOMA IN A PROBABLE POTTER FROM ANCIENT NUBIA
Brenda J. BAKER

During the 2016 field season of the Bioarchaeology of Nubia Expedition near al-Qinifab, Sudan, an unusual grave was excavated approximately 25 m downslope of the northernmost graves at Site ASU 09-01. Like most, this grave was disturbed in antiquity but its construction differed from those nearby. Ceramics from the superstructure and grave shaft were unlike any previously recovered with vessel shape and decoration differing from known Kerma period styles. Similar sherds were associated with other graves at this site. The burial was a female who died in her 40s, placed in a flexed position on her right side with head to the east. Leather fragments indicate she was wrapped in a hide, typical treatment for this period. A leather sample yielded a calibrated radiocarbon date of 1751-1619 BC (95.4% probability). Skeletal pathology includes lesions on the internal surfaces of ribs, small calcified plaques, and a calcified nodule (granuloma) indicative of a chronic respiratory disease. A bone tool found along the upper back was likely used for incising and burnishing ceramics. Together, the respiratory infection and tool suggest she was a potter. Silicosis, an occupational hazard of potters, miners, and others who inhale silica particles, or tuberculosis, a frequent complication of silicosis, are the most likely causes. A sample of the granuloma was tested for DNA from the *M. tuberculosis* complex and subsequently subjected to micro-CT scanning to assess its formation. Although the sample yielded DNA, it was negative for tuberculosis, lending support to silicosis as a more likely etiology. Additionally, the pelvis contained four malformed, fully rooted teeth and tissue from a teratoma, a generally benign tumor. Micro-CT scans of two teratoma teeth and normal teeth will permit developmental comparisons. These analyses provide insight into the life of this individual and raise additional questions for further investigation.

INFLICTED TRAUMA AMONG THE PICENI POPULATION FROM IRON AGE NECROPOLIS OF NOVILARA (ITALY – PESARO, 8TH-7TH C. BC)
Michael Allen BECK DE LOTTO, Zita LAFFRANCHI, Chiara DELPINO

Background: our work started from the salvage excavation at Iron Age cemetery of Novilara (8th-7th BC), a Piceni's necropolis located near the city of Pesaro (Marche), partially investigated at the end of the 19th century and re-excavated in 2012-2013, due to the building of the third lane of A14 highway. Our work allowed to bring to light other 150 graves, with 195 skeletons recovered. Proceeding with the anthropological study, 6 cases of inflicted traumas have been recognised (3% of the total number of subjects). Aims: six unreleased case studies are presented in this paper for which we also tried to link them to specific kind of weapon employed, in order to investigate interpersonal violence during Iron Age. Methods: by the macroscopic analysis of the lesions and their comparison with known forensic case studies, it was possible to associate the injury with the type of weapon that caused them. Results: the individual from grave 151 - a young adult male - shows peri-mortal wounds inflicted by an axe with a fatal outcome; this was already visible from the position of the skeleton inside the pit. Regarding the individuals from the graves 41 and 170 - both mature adult males - the traumas were respectively in a healing phase or already fully healed. In the first case the lesion resulted from a cutting weapon while in the second case from a mace. Finally, another three cases shown lesions of probable aggressive origin (grave 103, 162 and 183): two of them shown lesions compatible with a blade, the other one was a blunt force trauma. Conclusions: the results highlight the association between specific kind of weapons and the peri-mortem injuries reported. Piceni population was historically defined as a warrior one and bioarchaeological data here supported the effective presence of interpersonal violence.

HUMAN SKELETAL REMAINS FOR SALE: A REASSESSMENT OF ETHICAL PRACTICES IN THE UNITED STATES

Bobbie Maxine BENAVIDEZ, Sarah Ashlyn LACY

Ethical considerations regarding the handling and analysis of human skeletal remain are considered inconsistent and are problematically applied across disciplines in the United States. Currently, there are no federal mandates regulating the buying and selling of human skeletal materials, and it is difficult to determine how and where remains are acquired. Professional organizations like the Society for Forensic Anthropologists have ethics statements but focus on other topics, namely court etiquette. The ethics of the handling, curation and commercial exchange of human remains are not being policed from within academic and professional disciplines either. Although NAGPRA and state-specific regulations exist to remedy and prevent unethical practices, skeletal collections across the nation continue to demonstrate evidence of racism, classism, and bias in their composition and curation. This research investigates the history of human skeletal remains used in the teaching collection at one academic institution (California State University Dominguez Hills) as a case study by building biological profiles of the remains and attempting to find documentation of their acquisition. Considering the problematic history of the sale of human remains from other countries, namely India, in the middle part of the last century when the university and its labs were established, it is important to recognize the provenience of these remains to give proper recommendations for curations and/or repatriation. As an institution whose student body is predominately people of color, it is our responsibility to address how our own teaching collections reflect past political and social oppression. This study approaches ethical practices and suggests standards that can be implemented when dealing with human skeletal remains based on cross-cultural comparisons.

RESULTS OF THE ITALIAN ARCHAEOLOGICAL AND ANTHROPOLOGICAL RESEARCHES IN SUDAN AT JEBEL BARKAL (2016-2017)

Francesca BERTOLDI, Francesca IANNARILLI, Federica PANCIN, Martino GOTTARDO, Emanuele CIAMPINI, Mohamed ELTOUM

The Italian Archaeological Mission in Sudan works in Jebel Barkal on the area of the ancient site of Napata, Unesco World Heritage, near the modern city of Karima. The excavation started about 40 years ago, initially under the aegis of the University of Roma “La Sapienza” and of Prof. Donadoni, later under the direction of Prof. Roccati and, from 2011 carried out by Prof. Ciampini of Ca’ Foscari University of Venice. The Mission is supported by the Excavations Fund of the University Ca’Foscari, and the Italian Ministry of the Foreign Affairs and, from the 2014 is also part of the Qatar-Sudan Archaeological Project. The main goal is to investigate the area chosen by the Meroitic king Natakamani to realize an impressive royal district (dated to the I century AD.), characterized by the presence of his Royal Palace (B1500) and several other buildings probably related to it, lesser in dimensions but rich of massive architectural sandstone elements, and currently in progress of excavation. Since 2016 the anthropological study of the few burials found at the site started, and in 2017 we obtained the permission to catalogue and analyze also the human skeletal remains held in the Karima Museum and to perform a survey and an evaluation of the preservation state of the natural mummy in the museum’s collections. The human remains consisted of more than 20 subjects, showing extremely well preserved skeletal remains and highly damaged dental ones, all coming from salvage excavations of post-Meroitic sites at the 4th Nile cataract. The anthropological and paleopathological analysis revealed several pathologies and markers of occupational stress and the availability of skeletal remains allowed the basic training of Sudanese personnel on the treatment and recovery of human skeletal evidence.

HEALTH STATUS OF A LATE ANTIQUITY HUMAN POPULATION FROM PIAZZA CORRUBBIO-VERONA, ITALY

Francesca BERTOLDI, Valentina GIACOMETTI, Roberto CAMERIERE, Francesco PAGLIARA, Daniela COTTICA

The human sample analysed come from a necropolis in which 394 tombs have been excavated between 2009 and 2010 (two excavation campaigns) in the very heart of the city of Verona-Italy. Different burial typologies such as cappuccina tombs, burials in amphorae, in brick coffins, stone coffins and simple burials dug in the ground have been used during a long period of exploitation of this urban site as a burial area (first phase: end of 3rd century-beginning of 4th century AD; second phase: 5 to 7th century AD; third phase: 7 to 8th century AD). Up to date 45 burials of the so called "cappuccina" type, 13 from lithic coffins, 10 from brick coffins and 23 from tombs in amphora (with a total figure of 61 adults and 41 juveniles recovered), have been sampled and studied. The aim of our study is to reconstruct palaeodemographic patterns, to evaluate the general health status of this population, the occurrence of dental and skeletal pathologies, nutritional stress markers, markers of occupational stress and to test new methodologies for the diagnosis of periodontal disease. As preliminary paleopathological observations we noticed the presence of osteoarthrosis of the main joints, malformations, fractures, a case of tuberculosis of the spine and a general heavy muscular engagement with the presence of several MOS. For our odontological study on the occurrence of periodontal disease 56 samples from subjects with more than three teeth preserved and aged more than 18-25 (age estimation of the individuals was performed comparing traditional anthropological methods and Cameriere's radiographic method) were taken using new record sheets and trying to understand the percentage of teeth affected and the incidence of this pathology according to sex and age of the deceased. Subjects with vertical bone loss from moderate to severe are 55 out of 56, including 21 males, 19 females and 16 indeterminate subjects.

THE MIDDLE AGE BURIALS OF DOGALETTO DI MIRA (VE): CASES OF CONTEMPORARY DEATHS OF WOMEN AND CHILDREN

Francesca BERTOLDI, Piera Allegra RASIA

The Middle Age cemetery of the monastery of Dogaletto i Mira (Venice), even if connected to a male ecclesiastic community in its earlier age, has been used also for female and children lay burials during its later phase of use. The anthropological study has focused on the remains of 20 individuals buried in 15 tombs and the human sample is formed by males and females of adult age and by 5 juveniles. We noticed that males are always buried in single burials while 3 tombs contained the remains of both females and juveniles together and analysing these double or multiple graves we could put forward several hypotheses regarding the circumstances that led those subjects to death. In one case a female affected by severe hip dysplasia was buried together with a subject of perinatal age and probably the pathology that affected the mother herself caused complications during childbirth that were fatal for both the subjects. In another burial two mature females laid together with two children buried simultaneously with them and probably affected by a contagious and short-term deadly illness. The third double grave with a female and a child was not enough complete to achieve relevant information but also in this case the subjects have been buried together. The graphic reconstruction of the position of the subjects in the grave allowed us to record and better present taphonomical data of these burials.

A HISTOLOGICAL APPROACH TO THE IDENTIFICATION OF CALCIFIED SOFT TISSUE MATERIAL IN SKELETAL REMAINS, PROCEDURES DISTINGUISHING ATHEROSCLEROTIC PLAQUES AND OSSIFYING COSTAL CARTILAGE

Lucie BIEHLER-GOMEZ, Emanuela MADERNA, Cristina CATTANEO

The identification of calcified soft tissue and cartilage in skeletal human remains may be a challenging task. Calcified or mineralized pleurae, arteries, muscular tissue, to name a few, may indicate diseases interesting for the reconstruction of the past; calcified or mineralized cartilage may also be frequently found alongside skeletal remains, but may be difficult to differentiate from calcified soft tissue. Research particularly through microscopy is needed to identify the origin of such small "hard" fragments. In light of the paucity of data in literature, we began with documenting the morphological and histological aspects of atherosclerotic plaques and ossifying costal cartilage. Our study examines 15 samples of atherosclerotic calcifications (plaques) and ossified costal cartilage from skeletal remains of the CAL Milano Cemetery Skeletal Collection, an identified collection constituted of unclaimed skeletonized remains. Samples were processed for histology according to two protocols (calcified and decalcified). Calcified samples were processed in Pertex and let to solidify for 72 hours. Decalcified samples were fixed in formalin, decalcified in Decal (14% hydrochloric acid) and embedded in paraffin after dehydration. Sections of 5 µm were cut and stained with Hematoxylin and Eosin. The histological results displayed distinguishing features for both plaques and cartilage. Plaques even from dry skeletal remains showed a stratified structure with cholesterol crystals and the clearly identifiable "ghost" elements of macrophage foam cells. Ossified cartilage showed the transition phases from cartilage to bone, mainly through the presence of new osteons and the "ghosts" of isogenic cell groups. This presentation provides histomorphological documentation regarding the characteristic features of atherosclerotic calcifications and ossifying cartilage - valid tools for the identification of calcified soft tissues associated with skeletal remains.

THE CAL MILANO CEMETERY SKELETAL COLLECTION: A MODERN AND DOCUMENTED ITALIAN IDENTIFIED SKELETAL COLLECTION

Lucie BIEHLER-GOMEZ, Mirko MATTIA, Debora MAZZARELLI, Cristina CATTANEO

According to Italian law, unclaimed skeletal remains can be granted by cemeteries to universities for education and research purposes. An agreement was concluded between the Laboratorio di Antropologia e Odontologia Forense (LABANOF), the city of Milan and three cemeteries of Milan and resulted in the acquisition and assemblage of a contemporary skeletal collection. The CAL Milano Cemetery Skeletal Collection is a new identified collection constituted of 2127 skeletons and housed in the LABANOF. This modern collection possesses the advantage of being documented: each skeleton is associated with both demographic data (sex, age, dates and places of birth and death) and a death certificate (the stature is not indicated). Indeed, the law forces the completion of a death certificate when the death is pronounced. In collaboration with health services, these death certificates can be recovered and provide the cause of death and its related pathological and/or traumatic chain of events. The collection is equally representative of males (47.9%) and females (51.5%) with ages-at-death ranging from 0 to 104 years. The years of birth range from 1866 to 2000 (including 1637 individuals born before 1940) and those of death from 1910 to 2001. About 90% of the individuals were born in Lombardy. Although 91% of the collection is composed of adults, 189 individuals are subadults including 97 infants. When available, autopsy reports and personal photographs are also added to the documentation. The collection presents tremendous potential for population-specific studies, the testing and development of age and sex estimation techniques for both adults and subadults, the study of taphonomy and trauma but also for bone pathologies. Indeed, the death certificates retrieved in our skeletal collection offer an invaluable tool for the understanding of the aspect of these pathologies on bones given that we know that the individuals were diagnosed with the diseases

during life. This presentation illustrates through a series of examples the potential of this modern collection for the discipline of paleopathology.

NON-ADULTS BURIALS FROM A BYZANTINE PERIOD CEMETERY IN TROGIR, CROATIA
Michaela BINDER, Paul KLOSTERMANN, Lujana PARAMAN, Marina UGARKOVIĆ, Martin STESKAL

In 2018, the Austrian Archaeological Institute/ Austrian Academy of Sciences in cooperation with the Museum Trogir and the Institute of Archaeology in Zagreb commenced excavations in the city centre of Trogir on the central coast of Dalmatia which led to the surprise discovery of five graves dating to the middle Byzantine period. Evidence for settlement in this period in the coastal areas of Croatia is yet very limited, thus little is known about the living conditions is also very scarce. The graves discovered in 2018 all contained well-preserved skeletal remains of non-adult individuals including one fetus, three neonates, one infant between 3 and 5 as well as one juvenile individual. Despite the young age-at-death, all children were buried in carefully prepared, stone-lined graves consistent with contemporary Byzantine burial practices. The paleopathological analysis of the burials focusing on indicators of physiological stress, infectious diseases, malnutrition as well as dental pathologies presented in this contribution for the first time allows for gaining an insight into health and living conditions in Byzantine Dalmatia.

SPINAL LIGAMENTOUS OSSIFICATIONS IN A YOUNG ADULT OF 13TH CENTURY FROM THE MEDIEVAL SITE OF ALGHERO LO QUARTER (SASSARI, SARDINIA, ITALY)
Anna BINI, Pasquale BANDIERA, Marco MILANESE

A 20-24 year-old man from the medieval site of Alghero Lo Quarter (Sardinia, Italy) presents with a strong ossification of the yellow ligament, and an ossification of the posterior longitudinal ligament with well-defined and prominent spurs in the thoracic region: the spurs protrude out of the neural arch and they are long 3-7 mm, with an evident impingement in the neural canal. The archaeologists have found 98 skeletons in the site, datable from the end of 13th to the beginning of the 16th century (22 females, 21 males, 11 adults, and 44 subadults): this is the only skeleton with this specific pathological condition of the spinal column. The ossification of yellow ligament (OYL) is relatively rare clinical entity that have characteristics of lesions generally seen at lower thoracic and lumbar levels. Today, the incidence of these lesions is most frequent in East Asian patients; however, they also have been reported in patients of other ethnicities. The ossification of posterior longitudinal ligament (OPLL) is also a relatively rare clinical entity, with an incidence of 2%-4% in the Japanese population and is well known to occur in Asian people, where it tends to develop in the cervical spine and where it causes spinal canal stenosis. The incidence of coexisting OPLL and OYL has been reported as 30-50% at the thoracic spine. In medical literature, skeletal disorders as spondylotic spurs in the neural canal, ossification of the posterior longitudinal ligament, ossification of the *ligamentum flavum* surveyed in modern skeletal populations clinically may be associated with spinal stenosis and in the most acute cases with mielopathy. In palaeopathological literature, very few studies have been performed on these specific skeletal disorders: some authors associate spinal and extraspinal ossifications with early-stage DISH cases; others associate these alterations with Spontaneous Intracranial Hypotension (SIH) secondary.

IN SILICO SCREENING METHODS IN DETECTION OF ANCIENT TUBERCULOSIS (aTB)
Paulina BORÓWKA, Łukasz PUŁASKI, Błażej MARCINIAK, Beata BOROWSKA-STRUGIŃSKA, Elżbieta ŻĄDZIŃSKA, Jarosław DZIADEK, Wiesław LORKIEWICZ, Dominik STRAPAGIEL

Development of ancient civilizations and rapid population growth contributed to the differentiation of the epidemic and pandemic infectious diseases such as cholera, leprosy, malaria,

plague and tuberculosis, which repeatedly claimed many lives and decimated villages, settlements and cities throughout ancient and historic times of Europe. Members of *Mycobacterium tuberculosis* complex (MTBC) are very closely related genetically, and are causative agents of one of the oldest human infectious disease – tuberculosis, which are currently responsible for nearly 2 million deaths annually, and are still in the greatest interest of anthropologists, paleopathologists and molecular biologist, which is evidenced by the range of available analysis methods. Tuberculosis belongs to the group of diseases which in consequence may leave lesions on the bones that suggest a diagnosis based on the bone morphology, and often could be observed on skeletal elements belonging to ancient individuals. However, paleopathomorphological examinations of tuberculosis could be limited by the fact, which only a small percentage of individuals infected with MTBC show signs of TB-like patterns on bones (3-5%), furthermore, other diseases could present similar, incorrectly identified abnormalities. Identification of tuberculosis causative agents in ancient samples could be complicated by the presence of environmental *Mycobacterium* members (e.g. MOTT), which in some cases could be obligate pathogens causing human pulmonary infections. Here, we review common approaches used in identification of tuberculosis agents in ancient samples and present a proposition strategies for identification of *M. tuberculosis* causative agents in ancient achieved non-enriched NGS data, derived from 30 individuals from a Middle Neolithic population from the Brześć Kujawski Group of the Lengyel culture, present in Kujawy region in north-central Poland between ca. 4600 and 4000 BCE.
The study was financed by Polish Ministry of Science and Higher Education no. DIR/WK/2017/01: ”Biobank network in Poland, within the BBMRI-ERIC Research Infrastructure of Biobanks and Biomolecular Resources”.

HYPEROSTOSIS FRONTALIS INTERNA IN THE BRITISH ROYAL NAVY (1750-1815)

Ceridwen BOSTON

Hyperostosis frontalis interna (HFI) is a common and well-recognised osteological condition in which raised, lobulated outgrowths of bone are present on the endocranial surface of the frontal bone. Although the aetiology of the condition is unclear, its strong association with older, post-menopausal females suggests a hormonal cause - in particular, exposure to the sex hormone oestrogen. HFI is very much rarer in males than females (a ratio of 1:12 in historical skeletal assemblages), and where it does occur, is found predominantly in older males. In modern males, HFI has been associated with testicular atrophy, and with androgen suppression treatment for prostate cancer. It was also recognised in the skeletons of two prepubescent castrates- one being the famous 18th century castrati, Farrinelli. The presence of four cases of HFI in an assemblage of 450 skeletons of British Royal Navy seamen and marines from the first burial ground of the Royal Hospital Plymouth, Plymouth, Devon, England (1756-1824), is thus noteworthy, particularly as this assemblage overwhelmingly comprised younger servicemen who died on active service (most aged less than 40 years). Explanations for the unusual presence of HFI in this group are multiple and possibly fanciful, but reflect the eclectic, international nature of the seafaring community, the physical dangers of sailing a fighting ship, and geopolitical factors of the day. Testicular trauma incurred whilst sailing a ship may account for some of the cases of HFI (contused testicles and groins being a not uncommon cause of admission recorded in the muster books of Plymouth Hospital). One mature adult male with HFI showed craniomorphology strongly suggestive of Far Eastern ancestry, raising the possibility that a eunuch from Imperial China had found his way into the RN. Less probable, yet historically attested is the capture and enslavement of R.N. seamen by Barbary pirates and the Ottoman Empire, both of whom are known to have practiced castration of their male slaves.

AGE ESTIMATION FROM BONE MINERAL DENSITY: THE INFLUENCE OF OSTEOPOROSIS ON ESTIMATES

Deona BOTHA, Niels LYNNERUP, Maryna STEYN

Adult age estimation in the skeleton remains challenging. Recently, bone mineral density (BMD) has been proposed as a possible method to broadly estimate age. The aim of this study was to assess the usability of BMD to estimate age in South African population. In this study, two published methods using BMD for age prediction were tested on a modern skeletal sample of 59 South African white individuals (males n=29, aged 40-91 years and females n=30, aged 21-91 years) with known ages from the Pretoria Bone Collection. The first method, DXAGE (constructed from data of female femora from the Coimbra Identified Skeletal Collection), is a program implemented online that provides quick and easy age predictions. The second method utilises a regression equation constructed from femoral neck BMD values obtained from modern forensic skeletal material and was applied to both sexes. DXAGE predictions using femoral neck BMD resulted in an average underestimation of 25 years for the majority (n=17) of individuals. The eight females that were slightly over-estimated (within an acceptable range) all had osteoporosis. The regression method tended to overage younger individuals and underage older individuals. Predicted ages of individuals with osteopenia/osteoporosis were found to be within acceptable ranges, except for individuals in their early twenties showing reduced BMD values (osteopenia); these individuals were severely overaged. The majority of individuals with normal BMD values were predicted to be younger. This suggests that South Africans may be less osteoporotic than the reference sample. It is possible that a small sample size may have skewed the results. However, using BMD as a predictor of age should be adapted to different contemporary populations before being applied.

NEW INSIGHTS ON NUTRITIONAL DEFICIENCIES AT THE *CIVITAS* CAPITAL OF *AVENTICUM* IN ROMAN SWITZERLAND (1ST-3RD C. AD)

Chryssi BOURBOU

The aim of this paper is to assess the potential impact of environmental constraints on the prevalence of nutritional deficiencies in a human skeletal collection of 169 individuals (76 adults and 93 non-adults) from *Aventicum*/Avenches, the civitas capital of the territory of the Helvetii during the Roman period (1st-3rd c. AD). *Aventicum* was strategically positioned in between the three lakes of Morat, Neuchâtel and Bienne, a location which contributed to the urban development and general prosperity of the city, but was also possibly subject to major environmental events such as recurring floods. Five individuals aged around birth to one month exhibited a number of skeletal lesions suggestive of a systemic pathological condition, and in specific vitamin C deficiency (scurvy). Although caution is needed when interpreting skeletal features in individuals this young, it is argued that these lesions may represent maternal transmission of vitamin C deficiency. In addition, three adult individuals were diagnosed as suffering from vitamin D deficiency already since childhood as verified histologically by the presence of interglobular dentin (IGD), a feature currently associated with the condition. These data offer new insights on nutritional stress experienced primarily by females and children in this population, adding considerably to the discussion on living conditions in the urban centers at the periphery of the Roman Empire.

OSTEOLYTIC METAPHYSEAL LESIONS AND A CALCIFIED CYST IN A PRE-FARMING (6700-6200 BP) SKELETAL ASSEMBLAGE FROM NORTHERN VIETNAM: POSSIBLE HYDATIDS DISEASE

Hallie Ruth BUCKLEY, Monica TROMP, Marc OXENHAM, Hiep Hoang TRINH, Kate DOMETT, Anna WILLIS

This paper presents a differential diagnosis of pathological skeletal lesions observed in a sample from the pre-Neolithic (6700- 6200BP) cemetery of Con Co Ngua, Northern Vietnam. This site is associated with the Da But culture who were sedentary 'complex' hunter-gatherers that lived in large open air settlements and is very similar to the pre-farming Dingsishan culture of southern China. Their diet was based on broad-spectrum exploitation of wild plants and animals, with possible management of wild herds of large ungulates including water buffalo. During this period rice agriculture (with domesticated animals) was becoming increasingly relied upon in China. Osteolytic lesions of the metaphyses of the appendicular bones, primarily of the upper limb, were observed in 22.2% (n=22/99) of individuals. Macroscopically many of the lesions had small external openings with remodelled margins but radiography revealed a narrow canal of osteolysis with sclerotic walls tracking to the metaphysis and loculated destruction of this region. In some cases no external lesion was observed and the metaphyseal changes were only revealed with radiography. In one individual with osteolytic lesions an ellipsoid shaped calcified cyst was also found. Differential diagnosis of the skeletal lesions includes carcinoma, tuberculosis, a haemoglobinopathy associated osteomyelitis, and *Echinococcus granulosus* (cystic *Echinococcus*). Based on the type and pattern of skeletal lesions, and the presence of the calcified cyst, a possible cause is *Echinococcus granulosus* or hydatids disease. The implications of the presence of this disease which is usually associated with pastoralism in a pre-farming prehistoric Asian context is discussed.

THE FRUIT OF THE LOOM. PALEOPATHOLOGICAL RESULTS ABOUT ACTIVITIES RELATED TO SPINNING AND WEAVING IN ROMAN TIME

Allesandro CANCI, Anita RADINI, Cecilia ROSSI

Textile production in Roman times was an economic activity of paramount importance in many regions. The ancient Venetia (North-Eastern Italy), in particular, was one of the best cloth suppliers in the empire. From the late Republican age onwards, the large scale of production was ensured by workshops where both male and female workers were employed. From the first treatment of raw materials to the manufacturing of finished cloths, each step of the production chain was carried out manually, with a great expenditure of time. Posture, gesture and working conditions, including air quality, were comparable to those still existing in some parts of the modern world, and can seriously impact health. Prolonged and strenuous physical activities can cause modifications recognizable on bones, known as musculoskeletal stress markers or entheseal changes. In addition, the prevalence of injuries secondary to biomechanical stress resulting in trauma/degenerative diseases of the vertebral column is a useful tool to reconstruct working activities in the past. Repeated inhalation of dust containing textile fibres at the workplace, joined with poor hygiene and scarce ventilation, exposes the workers to severe impairment of respiratory breathing. The resulting pulmonary disease can be recognized in the skeletal remains, providing further indications about the health conditions of workers involved in textile manufacturing. Microscopic particles of dust generated by such activity can accidentally become entombed in tartar (mineralised dental plaque). The analysis of such particulate matter can also provide important evidence of the quality of the environment as well as potentially support the 'identification' of textile workers in the archaeological record, where populations are available for analysis. By combining palaeopathological evidence with preliminary results of the analysis of tartar, this paper proposes a novel integrated bioarchaeological approach to the study of textile manufacturing in Roman North-Eastern Italy and its impact on health.

THREE BRONZE AGE TREPANATIONS FROM CROATIA
Mario CARIĆ, Dinko TRESIĆ PAVIČIĆ, Ilija MIKIĆ, Ivor JANKOVIĆ, Mislav ČAVKA, Mario NOVAK

Trepanation is probably one of the most interesting intentional interventions observed on human skeletal remains. Cases of trepanation are documented in the archaeological record since Neolithic times and from all around the world. Here we present possible cases of trepanation recorded on crania from three Bronze Age (BA) sites in Croatia. We performed a comprehensive macroscopic analysis as well as radiographic imaging (X-ray and CT scanning) of the skulls. The first case is that of an adult male from the Cetina site dated to the Early BA culture. The second case is found on a juvenile from the Jagodnjak site, a biritual necropolis dated to the transition between the Early and the Middle BA and to the Middle BA Encrusted Pottery culture. The third trepanation is observed on an adult female from Bezdanjača Cave, dated to the Middle and the transition to the Late BA. All three cases exhibit numerous similarities: (i) all are located on the right side of the frontal bone; (ii) all three are oval or round-shaped with an approximate diameter of 10 mm; (iii) in all cases all three layers of *calvarium* were breached and the edges around the openings are smooth, remodeled and of uniform thickness. Our analysis suggest that in all three cases the procedure was most likely conducted by scraping technique.

INTRABONE STABLE ISOTOPE VARIATION IN SKELETONS WITH PATHOLOGICAL LESIONS
Ana CURTO, Patrick MAHONEY, Anne-France MAURER, Cristina BARROCAS-DIAS, Teresa FERNANDES, Geraldine FAHY

Pathologies can significantly change isotopic compositions of human tissues and diseases that affect the metabolism may affect stable isotope ratios and not necessarily be linked to diet. While isotopic data have been compared between bone sites with fracture traumas, periostitis and osteomielytis, and without such lesions, stable isotope ratios have not yet been evaluated on lesions with different healing stages (active and healed). Carbon (δ13C) and nitrogen (δ15N) data from 31 individuals (11th–17th centuries, Portugal) with skeletal lesions compatible with infectious diseases and/or healed fractures were analysed. Samples were collected from the same bone (intrabone): cortical bone (non-lesion) to estimate the individuals' average diet and pathological bone growth (lesions) to estimate diet and/or metabolism during the disease. Lesion samples included: active lesions (long bones n=14; ribs n=4), healed lesions (long bones n=10; ribs n=9) and fracture callus (long bones n=9; ribs n=3). In long bones the correlation between non-lesion and lesion sites is statistically significant for δ15N in active lesions (0.78, p<0.00) and δ13C in healed lesions (0.79, p<0.01). Bone segments with active lesions (δ15N=11.1±0.9‰) had higher δ15N than those without lesions (δ15N=10.7±0.7‰); a statistically significant increase of 0.4‰, t(13)=-2.58, p=0.02. In ribs the correlation between non-lesion and lesion is statistically significant for δ13C in healed lesions (0.91, p0.05). The increase in δ15N seen in long bones with active lesions, when compared with δ15N from non-lesion sites, are compatible with data from patients suffering from starvation. The δ15N decrease in long bones with healed lesions is compatible with data from individuals recovering from starvation. This study suggests that isotopic data can help better understand diseases in the past, as well as the individuals' response to diseases in the absence of modern medicine.

SKELETAL DEVELOPMENTAL ANOMALIES ACROSS THE GENEALOGICALLY DOCUMENTED SAMPLE (BOHEMIA, 19TH TO 20TH CENTURIES)
Jan CVRČEK, Vítězslav KUŽELKA, Ondřej NAŇKA, Sylva KAUPOVÁ, Jaroslav BRŮŽEK, Petr VELEMÍNSKÝ

Familial occurrence of some skeletal developmental anomalies was observed already in the second half of the 19th century. In the first half of the 20th century, it was suggested their potential use for the detection of biological relatives in the skeletal remains. The research, however, is

conditioned by the existence of reference samples with known genealogical data, but these are very rare on a global scale. We had the opportunity to study skeletal remains of 45 individuals with all known biographical data, members of one family over four generations (19th to 20th centuries, Bohemia, Czech Republic), including inbred individuals. There are increased frequencies of e.g. congenital blocks of cervical vertebrae, vertebral borders shift (with cervical ribs, lumbar ribs, or ribs hypoplasia), defects of sacral neural arches, or hamate hamulus hypoplasia and aplasia between biological relatives (e.g. first cousins, father-son or daughter, uncle-nephew). Some of them even occur in multiple generations. We also recorded incidence of very unusual defects, e.g. expressive incomplete acetabular synostosis (with trace expression in another two generations), or aplasia of superior cornu of thyroid cartilage. In addition, we found several cases of multiple osteoma on the skull or enosteoma between close relatives (e.g. mother and her first cousin with their sons and another descendants). The occurrence of some anomalies supports the close biological kinship of the studied individuals.
Grant sponsorship: Grant Agency of Charles University (Grant Number: GAUK 1276217); Ministry of Culture of the Czech Republic (DKRVO 2018/18, National Museum, 00023272); The National Agency for the Agricultural Research grant NAZV QJ1510141.

MICROBIOLOGICAL ANALYSIS OF A CHILD MUMMY FROM ZAGREB CATHEDRAL
Mislav ČAVKA, Andrea JANEŠ, Katarina DUJMOVIĆ, Jasenka ŠKRLIN

Introduction: Paleoradiological analysis of a Christian mummified child relic, kept in Zagreb Cathedral, was planned in University Hospital "Dubrava". As X-ray unit, CT and MRI scanner are used in clinical settings, microbiological analysis was necessary prior to scans in hospital.
Methods and materials: Swabs were taken from the skull, orbital cavity, teeth, ear, neck, arm, thoracic and pelvic cavity and from the surrounding fabric. The standard microbiological analysis (cultivation, isolation and identification) was done at Department for Clinical Microbiology and Hospital Infections at the University Hospital Dubrava. Samples were inoculated on different nutrient media; Blood agar bases supplemented with 5–10% sheep blood; Mac-Conkey agar; Brain Heart Infusion Agar with vitamin K and hemin for the enrichment of anaerobes and Sabouraud glucose agar with chloramphenicol for fungal isolation.
Results and conclusion: Bacterial organisms found belong to the Bacillus genera (we excluded B. anthracis) which all are saprophytic and therefore all radiological analysis were possible to be carried on in hospital settings. These results correspond to our other investigations on ancient mummified samples, which always have to be checked for pathogenic potential as they could be dangerous for medical staff later on for hospital patients.

PALEORADIOLOGICAL ANALYSIS OF A CHILD MUMMY FROM ZAGREB CATHEDRAL
Mislav ČAVKA, Mladen TOMORAD, Ivana ŠTIMAC, Ivor JANKOVIĆ, Mario NOVAK, Frank RÜHLI, Patrick EPPENBERGER

Although the scientific investigation of mummies is an established field of research, paleoradiology is still rarely used for the analysis of mummified Christian relics for various reasons. In this study we present the results of the radiographic analysis of a child-mummy housed in the Cathedral of Zagreb, which is revered as an innocent child from the biblical massacre of Herod. According to the legend, the child-mummy of a boy was brought to Zagreb by the Croatian-Hungarian king Andrew II after his campaign in the Holy Land during the 5th crusade, after 1218, but it is only mentioned in records from the end of 14th century onwards. The mummy was scanned at the University Hospital "Dubrava", Zagreb, Croatia. Digital planar radiographs of the body (in two parts) were done in two projections (RadSpeed Saphire, Shimadzu Europa GmbH, Duisburg, Germany). CT slices were obtained using 64x0.6 collimation with "dual energy" scanning parameters; 80 kV and 140 kV respectively (Somatom AS+, Siemens Healthcare, Erlangen, Germany). Three-dimensional (3D), spoiled gradient echo based UTE images were

acquired on a 1.5-T scanner (Magnetom Avanto, Siemens Healthcare, Erlangen, Germany) employing manufacturer's head and spine array coils Contrast-determining parameters echo time, repetition time and flip angle of 0.07 ms, 15 ms and 60° were chosen, respectively. 60000 radial projections were used to reconstruct 256 slices of 1.3x1.3x1.3 mm3 isotropic resolution. Findings indicate artificial mummification including evisceration. A large defect of the abdominal wall including the genital region does not allow sex determination. Skeletal maturity (assuming a boy), based on the Tanner-Whitehouse method, indicates 5 years (+- 0.8 years). Complete deciduous dentition with completed roots can be observed (some teeth probably lost post mortem), which indicates a minimal age of 3 years The crowns of the following permanent teeth are already mineralized indicating 5-6 years of age. Occipito-atlantal dislocation with fractures of the 1st and 2nd cervical vertebrae without any signs of major cervical dislocation were interpreted as postmortem alterations.

INSIGHTS FROM MOLECULAR EVIDENCE OF *MYCOBACTERIUM LEPRAE* FROM 15TH CENTURY NORMANDY, FRANCE

Helen D. DONOGHUE, Lauren OVEREND, Mark SPIGELMAN, Joël BLONDIAUX, Cecile Chapelain DE SERÉVILLE-NIEL

Leprosy was widespread in Mediaeval Europe but molecular evidence indicates geographical differences in the *Mycobacterium leprae* genotypes found at different times and locations. *M. leprae* requires a living host, and different human populations are associated with different lineages. Data are available from the UK and Scandinavia, Central, Southern and Eastern Europe, but little is known of the molecular characteristics of leprosy from Northern France. The paleopathology of leprosy is distinctive, so enables recognition of the disease in established cases. Therefore, nasal scrapings, and samples from ribs, femurs and toes, were taken from 15 individuals with typical paleopathology at the leprosarium of Saint Thomas d'Aizier (1350-1450 CE). After grinding to a powder, samples were demineralised in EDTA/Proteinase K at 56oC, mixed on a bead beater then split into 2 aliquots. One was treated with 0.1M PTB to break any covalent cross-links then both aliquots were incubated in lysis buffer containing guanidium thiocyanate. DNA was captured by silica or precipitated from the silica supernatants. Real-time PCR was used, with primers and probes for the *M. leprae* repetitive sequences RLEP (37 copies/cell) and RepLep (15 copies/cell). Eleven individuals were strongly positive for *M. leprae* DNA, two were weakly positive and two were negative. The stronger positive samples were genotyped. Unlike *M. leprae* ancient DNA from central and southern Europe, these Norman strains were of genotype 3I. However, in two individuals a variant *M. leprae* 3I-1 type was also found that has only once been reported previously, from 800-900 years earlier. This was in a skeleton from Great Chesterfield, East Anglia, UK, dated to 600 CE. This variant appears to be intermediate between sub-type 2F and 3I.

DENTAL DISEASE IN ABORIGINAL SOCIETIES FROM THE DULCE RIVER BASIN IN NORTHWESTERN ARGENTINA

Hilton DRUBE, Susana MARTÍNEZ, Elina SILVERA, Guillermo LAMENZA

The anatomical and pathological analysis of the oral cavity in the skeleton can provide relevant information about general health, diet and nutritional status of past populations. Evaluation of dental conditions in archaeologically derived skeletal series also allows inferring main subsistence patterns of the ancient populations from which they are derived. The objective of this presentation is to evaluate dental diseases and their frequencies in aboriginal societies from the middle Dulce river basin in northwestern Argentina. The human skeletal sample evaluated in this study comprises 56 skeletons that were exhumed from the archaeological sites of Beltrán, Bocatoma and Cheej-San Felix, corresponding to the cultural complex named Sunchituyoj. The chronology of this ancient society spans between 11th century and the time of contact and it

occupied most of the area in the province of Santiago del Estero, expanding to adjacent regions of Tucumán and Catamarca. All skeletons with alveolar arcades and teeth present were macroscopically examined for antemortem tooth loss, cariogenic processes, and hypoplastic defects on the dental enamel surface. The results indicate that the low prevalence of caries coincides with the frequency range for populations with mixed forms of subsistence strategies, in which the diet did not depend exclusively on agriculture. On the other hand, the percentage of defects on the dental enamel surface of teeth denote relatively low frequencies of dental hypoplasia, which differ markedly with the proportions observed in current populations with low food resources, as in the case of some communities affected by conditions of drought, social conflicts and widespread famine, or in archaeological populations with a basically agricultural economy, with low protein intake of animal origin. These findings may suggest perdurability over time of mixed subsistence strategies in the use of resources, which was adequate to the ecological potential of the surrounding environment in the Argentine northwest.

THE CASE OF HIP DYSPLASIA OF THE ADULT FROM THE LATE ANTIQUITY SITE OF VELEBIT (SERBIA)

Ksenija ĐUKIĆ, Tamara PAVLOVIĆ, Petar MILENKOVIĆ, Đurđa BRACANOVIĆ, Marija ĐURIĆ

Archaeological site Velebit is located near the city of Kanjiza (North Serbia). The necropolis of Velebit is dated between 3rd and 4th century AD, attributed to the Sarmatians. Among excavated graves, grave No 24 differs from others in unusual position of skeletal remains in situ. The skeleton in situ was in extended supine position; however, the position of the lower extremities was unusual. Both legs were bent in the zone of the knees, the right leg was bent more than left and leaning over the left. Anthropological analyses revealed that the male individual buried in this grave was 40 to 55 years of age at the moment of death. During the anthropological analyses we noted two deformities of the pelvic bones, each on the outer surface located posteriorly and superiorly of acetabular area. The observed lesions were characterised as type 3 of developmental dysplasia of the hip. The stated type of developmental hip dysplasia is in accordance with schematic diagram of hip dysplasia patterns provided in Resnick. The disease is featured with subluxation and high dislocation of the developing hip in the period of gestation. If untreated, the disease is progressive, leading to abnormal development of false acetabulum. Further, this condition cause delayed ossification of femoral head, presence of *coxa valga* and femoral anteversion as well as early osteoarthritis. Also, sharp lesion was observed in the right-posterior region of squama of the occipital bone. The finding was described as linear fracture with diastatic, sharp margins followed inferiorly by tangential defect in outer lamina possible repercussion of loose fragment. Surface of the skull revealed diminished signs of healing what was in favour of perimortal trauma delivered by some sharp, long weapon. The aim of this study is to discuss the differential diagnosis of hip dysplasia, development of disease during this person's life, and also to analyse possible circumstances in which the perimortem skull trauma occurred.

EVIDENCE OF VIOLENCE IN BURNED HUMAN REMAINS OF THE 3RD CENTURY AD FOUND IN THE ROMAN VILLA OF ELS MUNTS (TARRAGONA, SPAIN)

Andrea FERNÁNDEZ-VILELA, Josep Anton REMOLÀ, Maria Eulàlia SUBIRÀ

The site of Els Munts is an exceptional residential villa located in Altafulla (Tarragonès), about 12 km away from the ancient city of Tarraco, Catalonia, Spain. The origin of the villa dates from the beginning of the first century AD. Several phases of restructuring of the building occurred before it was abandoned in the 3rd century. The archaeological interventions carried out at this site in the 1990's discovered evidence of a large fire that affected some rooms of the cryptoportico. This fire was accurately dated to around 260 AD due to the discovery of a monetary group composed of 16 sestertii and a lucerna (both found in close proximity to an individual who died in one of the

rooms). At the beginning of the 5th century the villa was re-occupied, and activity in this complex continued until the end of the Late Antique period.
During the excavation of the levels associated with the fire, the burned remains of an adult male were found among the rubble. These remains show evidence for a large number of bone fractures due to the collapse of the structure during the fire. The cranium presents two chopmarks produced by a heavy bladed weapon (a sword or axe) that were produced before the fire. Different degrees and patterns of burning were found in the human remains, which suggest that the bones were covered with flesh when burned and that the fire occurred close to the time of death of this individual.
Although some historians do not believe that this fire was intentional, the evidence for perimortem injuries demonstrates the existence of a violent incident in this villa that could possibly have been related to the Barbarian Invasions that devastated the area in the 3rd century.

THE SYPHILIS OF MARIA SALVIATI (1499-1543), WIFE OF GIOVANNI DE' MEDICI NAMED "OF THE BLACK BANDS"
Antonio FORNACIARI, Raffaele GAETA, Simona MINOZZI, Luca VENTURA, Angelica VITIELLO, Gino FORNACIARI, Valentina GIUFFRA

The well-preserved skeleton of Maria Salviati (1499-1543), wife of Giovanni de' Medici, named "of the Black Bands", has been exhumed in 2012. Maria was buried beneath the floor of the Medici Chapels in Florence, together with the other members of this famous family, so important for the Italian Renaissance Many lytic lesions were detected on the Maria's skull. On the left antero-mesial portion of the frontal bone, on the squama and medially to the orbit, there are two evident circumvallate cavitations, irregularly elliptical in shape, with a central destructive focus and a reactive bone formation on the margins, as the CT examination also confirms. The cranial vault shows, on the parietal bones, several osteolytic lesions in form of circumvallate cavitations and fine, radial scars from the centre of the shallow depressed areas. The CT verifies the nature of the lesions, which morphologically are inter-nodular stellate depressions. The combination of a crater-like lesions as circumvallate cavitations on the frontal bone (phase 4 in the *caries sicca* sequence of Hackett) and of circumvallate cavitations with radial scars on the parietal bones (phase 5 in the *caries sicca* sequence of Hackett) is pathognomonic for syphilis. The present study discusses the syphilitic lesions observed in the skeletal remains of this important member of the Medici family, reconstructs the nosography of Maria Salviati by the written and iconographic sources, and analyses the gender social impact of the venereal syphilis in the aristocratic groups of the Renaissance.

THE FEMORAL SHAFT: WHAT DO WE DO WITH ALL THOSE CYLINDERS?
Samuel FRANCIS, Ruth PELLEG-KALLEVAG, Hadas Leah AVNI, Victoria ROUL, Hila MAY

The femoral bone is commonly used to gain insight on the physical burden and mobility of ancient populations. The information is mainly retrieved from the analysis of diaphyseal cross-sectional geometry, including thickness of the cortex, areas, second moments of area, and section moduli. This methodology is based on the accepted notion that bones are developmentally plastic, changing their morphology in response to mechanical demands placed on the bones throughout life. Nevertheless, direct inference from bone geometry on the type of daily life activities the individuals were engaged in, is not without risk, as different factors (e.g., total body weight) may be involved with these mechanical demands. The aim of this study was to reveal the association between muscle strength and femoral shaft architecture. The current study was carried out on 40 CT scans of young males. Images of cross-sections of the femur were obtained via the Philips Portal software, and the cross-sectional geometry parameters were measured using dedicated programs. The cross-sectional area of the quadriceps and hamstring muscles were also measured

via the Philips Portal. The results of the current study will enable anthropologists to provide a better interpretation of the metric data obtained from the femoral shaft.

THE FIRST COMPLETE DESCRIPTION OF ACROMEGALY IN BOLOGNA IN 1809: A JOURNEY THROUGH PALAEOENDOCRINOLOGY

Francesco Maria GALASSI, Emanuele ARMOCIDA, Mirko TRAVERSARI, Luisa LEONARDI, Christian MANCINI, Nicolò Nicoli ALDINI, Roberta BALLESTRIERO, Maciej HENNEBERG, Frank RÜHLI, Alessandro RUGGERI

Acromegaly is an endocrine and metabolic nosological entity caused by a tumourous growth of the pituitary gland resulting in GH incretion. Modern historical research has shown how from the 16th century on several informative reports on the disease have been produced. In this paper, after summarizing the history and palaeopathological record of acromegaly, especially in the light of recent discoveries, most prominently the study on the alleged remains of Egyptian Pharaoh Sa Nakht (the 3rd Dynasty, Old Kingdom, ca. 2700 BC), we focus on a rather unique case. The "Luigi Cattaneo" Anatomical Wax Model Museum in Bologna, Italy, displays the skull, wax bust and dry stomach preparation once belonging to Luigi Marchetti, known as Bottaro (he was a barrel maker, from which his name). This case of acromegaly is known in the medical literature through a publication by Cesare Taruffi (1821-1902) in 1877. This case is also very important because it stimulated even Rudolph Virchow's (1821-1902) interest. For a long time it was thought that this case dated back to Taruffi's day. On the contrary, Taruffi's reasearches are the result of his study of the anatomical specimens prepared at the beginning of the 19th century, following the dispositions of anatomist Alessandro Moreschi (1771-1826). A refined museological, archival and paleopathological research yields considerable results:
a. a full morphological and palaeopathological assessment of this case confirming the diagnosis;
b. it is highlighted how the association between visceromegaly and acromegaly was already made at the time;
c. the implementation of facial superimposition allowed us to investigate the accuracy of the wax model.
As a final consideration we highlight the role of silenced molecular pathways in the genesis of acromegaly in the modern world and its emerging epidemiology.

SEARCHING FOR MALARIA IN THE ARCHAEOLOGICAL RECORD: BIOMOLECULAR APPROACHES AND ISSUES OF PRESERVATION

Michelle GAMBLE, Alvie LOUFOUMA-MBOUAKA, Frank MAIXNER, Albert ZINK, Michaela BINDER

Malaria is currently recorded in the archaeological record almost exclusively through the osteological changes (such as *cribra orbitalia*, porotic hyperstosis, linear enamel hypoplasia, and more recently, *cribra humeri* and *cribra femora*) associated with the secondary responses to the disease and genetic mutations developed to confer resistance to the parasitic infection. However this approach is problematic because of the unspecific nature of the observed changes, thus unambiguous identification and analysis of the disease's epidemiology in the past is still impossible via macroscopic analyses. Research currently being undertaken at the Austrian Archaeological Institute aims to provide more concrete methods of identification of malaria in the past through biomolecular techniques. The possibility of developing a reliable method of identifying malaria in the past would not only provide important new insights into morbidity and mortality in the past but also be a significant step towards a better understanding of the evolution and spread of the disease. Moreover, this would ultimately provide the opportunity to conclusively establish if there are any consistent macroscopic morphological changes to the human skeleton caused by malaria and thus enable researchers to avoid these destructive methods. This paper will present some of the recent findings from the biomolecular analyses carried out within the framework of this project and discuss the challenges and issues in the

search for malaria in the past. Using samples, dated between the 2nd century BC to the 6th century AD, from Cyprus, Lebanon, and Egypt, we will also discuss aspects of preservation and curation, specifically as it relates to sample selection and we will include suggestions for future work.

PREVALENCE OF LARGE-JOINT AND EXTREMITIES OSTEOARTHRITIS IN A MEDIEVAL (13TH-16TH) URBAN POPULATION FROM LEIRIA (PORTUGAL)

Susana J. GARCIA

A sample of 94 adults excavated from the urban medieval cemetery (13th to 16th century) of São Martinho in Leiria (central Portugal) was studied. Overall, the skeletal material was very well preserved, which provided excellent conditions to estimate sex and age at death in mostly of the adults and to perform a systematic study of the articulations. Osteoarthritis prevalence was investigated following Rogers and Waldron (1995) to identify sex differences. In this population, osteoarthritis was common in males and females, but it was more prevalent in almost all sites among males. The exceptions are the elbow (humerus and radius), knee (patellar and lateral), tarsometatarsal and proximal interphalangeal joints. Cases of osteoarthritis with eburnation were only observed in the hip among females. However, significant sex differences ($p<0.05$) were observed only in the sternoclavicular joint, shoulder and hand (metacarpophalangeal), being males more affected. A possible explanation for this difference is that males were more engaged in strenuous activities, particularly those involving the upper limb. We observed that facet remodelling was more severe among males which corroborates the hypothesis of a more demanding physical activity in males. But, osteoarthritis is a complex disease with aetiologies as diverse as hormonal, genetic, weight, dynamic mechanical stress or joint injury, which limits the strength of the comparison by gender. Age may have also play a key role in the osteoarthritis prevalence and distribution by site on this population as 27% of the individuals had an age estimation of more than 50 years old. Paleopathological analysis suggests that life was difficult in this medieval urban community, but survival until old ages was not uncommon with the concomitant diseases in elderly individuals like tooth loss, osteoporosis or hip and knee osteoarthritis.

OSTEOLOGICAL EVIDENCE OF DISPROPORTIONATE GROWTH ON A JUVENILE INDIVIDUAL FROM THE 13TH CENTURY AD (LEIRIA, PORTUGAL)

Susana J. GARCIA, Ana Luisa SANTOS

Hundreds of conditions may cause short stature (e.g. achondroplasia, hypochondroplasia, or idiopathic short stature). This study aims to describe a medieval individual exhumed from Leiria (Portugal) with disproportionate bone growth. The individual was buried in decubitus dorsalis, oriented northwest-southeast, as the majority of the 157 skeletons exhumed from this church graveyard. During the excavation, seven stratigraphic units were identified and this individual was buried in the oldest one, dating from the 13th century AD. The skeleton is well preserved with the exception of the sternum, patellae and right lower limb, and some bones of the hands and feet are missing. The near-complete skeleton (85%) has the cortical bone well preserved. The pelvic morphology indicates a male. The cranium presents *cribra orbitalia*, the 28 preserved teeth have no enamel hypoplasia or caries and the left tibia has Harris lines. Two right ribs (out of 24 ribs) have new bone formation on the visceral shaft. The intriguing features of this individual are the discrepancy between the dental and skeletal age and the robusticity of the long bones. From the third molar length an aged at death of 17.7 years was estimated while the length of the long bones suggest an age-at-death between 9 and 12 years old, despite that a few bones have the epiphyses already fused. Additionally, the long bones are very robust, with rugose attachment sites, particularly in the upper limbs and clavicles. The distinctive features of the skull, limbs, hand phalanges and vertebrae are going to be described. The differential diagnosis point to a mild form

of skeletal dysplasia, possibly hypochondroplasia. It is interesting that this individual, despite his characteristics, was buried together with the other members of the population.

TREPANATION IN ITALY: A REVIEW OF THE LITERATURE AND A NEW CASE
Valentina GIUFFRA, Giulia RICCOMI, Gino FORNACIARI

We present a review of skull trepanation in ancient Italy, on the basis of the literature. A total of 54 cases are documented from 43 Italian archaeological sites, with particular abundancy from central Italy and prehistoric Sardinia. Evidences cover a time span of approximately 7000 years, with the most ancient cases dating back to the 5th millennium BC and the most recent to the 18-19th centuries AD. The analysis of the archaeological context reveals that in general there are no differences between individuals submitted to the practice of trepanation and other skeletons found in the same necropolis. The majority of individuals show a single trepanation, whereas others present skulls with multiple holes. The surgical intervention was reserved to adult individuals, with a prevalence of males. Considering the localization of trepanation, the parietals are the most preferred skull bones for trepanation, followed in decreasing incidence by the frontal and the occipital bone. The most diffused technique is scraping, whereas cutting and drilling are less attested. In some cases trepanation was performed to treat head wounds, but in several specimens it was not possible to determine the reasons for intervention. The percentage of survival in the Italian sample is very high, reaching 89% of the trepanned patients.
The new case is represented by a trepanation practiced on an adult male coming from 13th century Tuscany in order to treat a bone injury; the intervention was carried out through the incision technique with the replacement of the bone rondella, but was unsuccessful and the patient died soon after.

THE BATTLE OF WAGRAM 1809 - PALAEOPATHOLOGICAL EVIDENCE OF LIFE AND DEATH DURING THE NAPOLEONIC WARS
Hannah GRABMAYER, Michaela BINDER

On July 5th and 6th 1809, the French and Austrian armies met at Wagram to the northeast of Vienna in one of the largest battles of the Napoleonic Wars (1803-1815), leading to the loss of up to 78,000 soldiers. Prior to construction works for the S8 new motorway to Marchfeldschnellstraße,* in 2017, salvage excavations revealed 13 battle-related burial sites at Pabersdorf and Deutsch Wagram. The burials were in amorphous pits containing up to six individuals, with a total of 44 skeletons recovered to date. All 44 individuals were studied as part of a systematic bioarchaeological assessment in order to elucidate living conditions of soldiers of the Napoleonic era, but also death on the battlefield. We considered demographic parameters, markers of poor health during life (dental enamel hypoplasia, dental pathologies, new bone formation, osteoarthritis and trauma), as well as evidence of perimortem trauma attesting to death on the battlefield. All of the skeletons were male and had mostly died before the age of 35. The results of the palaeopathological analysis show signs of heavy physical activity, osteoarthritis and overuse despite their young age-at-death. Scurvy, pneumonia, meningitis, and chronic sinusitis, both healed and still active at the time of death, were common and indicate the harsh living conditions of soldiers during long field campaigns. Perimortem trauma was largely confined to ballistic head trauma of the head, conforming to standard Napoleonic warfare, with its heavy reliance on infantry.
*The project was funded by ASFINAG.

CRANIOFACIAL DYSPLASTIC BONE DISEASE IN PALEOPATHOLOGICAL INVESTIGATIONS
Julia GRESKY

This paper discusses multiple small pitted lesions in the facial skeleton in a well preserved skeleton of a mature male of the Hunno-Sarmatian Period from Kazakhstan.
These and similar lesions of other skeletons from different periods and geographic areas were examined by digital microscopy, plain radiography, and plain and polarizing microscopy. Possible differential diagnoses of inflammatory, metabolic, neoplastic, and dysplastic entities are discussed. Its microscopic characteristics, particularly the presence of woven bone within the lesions, point to a fibro-osseous process. Due to its localization and distribution in the facial skeleton, craniofacial fibrous dysplasia is discussed as the most likely diagnosis. Macroscopic and radiographic features seemed to be of less diagnostic value.
In the paleopathological record, small porous lesions of the facial skeleton occur but are rarely addressed in diagnosis. Localized dysplastic bone diseases should be taken into consideration.

OSTEOPETROSIS AND ACCOMPANIED SKELETAL CHANGES IN A SKELETON FROM ALBANIA
Julia GRESKY, Emmanuele PETITI

Osteopetrosis or marbel bone disease is a very rare inherited disorder leading to severe osteosclerosis of the bone, combined with deformity and elevated fracture rate. With this poster we present an adult skeleton of which only both humeri, the left femur, and the distal half of the left radius are available for investigation. The analysed specimens show hyper density of the bone tissues, accompanied by very well healed fractures of both the proximal shaft of the right humerus and the distal shaft of the left radius. Furthermore, a localised swelling of the distal metaphysis of the left femur will be discussed as a symptom of the disease or as a possible additional disease. Digital microscopy, plain radiography and computer tomography, and plain and polarizing microscopy aided in diagnosis. Differential diagnoses will be discussed. The case presented in this poster is of outmost interest, as it is one of the few archaeological evidences for osteopetrosisis.

EVIDENCE FOR ADAPTATION TO MALARIA IN A 2.58-MILLION-YEAR-OLD PROXIMAL *AUSTRALOPITHECUS AFRICANUS* FEMUR FROM MAKAPANSGAT, SOUTH AFRICA
Martin HAEUSLER, Sabine LANDIS, Bernhard ZIPFEL, Viktoria A. KRENN, Cinzia FORNAI

The 2.58-million-year-old MLD 46 proximal femur (*Australopithecus africanus*) from Makapansgat, South Africa, represents the earliest case of hip osteoarthritis in the human fossil record – the second oldest known fossil with hip osteoarthritis is a 50,000-year-old Neanderthal. Being one of the largest *A. africanus* femora, MLD 46 was probably male, and it belonged to a young adult based on the generally low life expectancy in the Plio-Pleistocene. The ovaloid femoral head of MLD 46 shows extensive marginal and medial osteophyte formation, but is not flattened. This suggests acetabular protrusion as the reason for the severe hip osteoarthritis, which often results from marrow expansion in young adults with haemoglobinopathies such as sickle-cell disease and thalassemia. A large flake of bone was broken off from the femoral head anteriorly, revealing various subchondral cysts and a large cone-shaped sclerotic zone in the medial sector of the head, which was confirmed by micro-CT examination. It is unlikely that this sclerotic zone represents a bone island or tumour metastasis. Rather, it is suggestive of osteonecrosis that represents a common complication of sickle-cell disease, whereas other aetiologies including corticosteroid medication and alcoholism can be excluded in prehistoric times. Moreover, the micro-CT images show clogging of the fine branches of the medial femoral circumflex artery at the tip of the osteonecrotic zone. Osteonecrosis due to infarction of the proximal femoral epiphysis is characteristic of sickle-cell disease. Because sickle-cell disease offers protection against malaria tropica, the earliest human ancestors must already have evolved adaptations against *Plasmodium falciparum* infections. So far, malaria tropica was thought to have originated in humans as the

result of a cross-species transmission of *Plasmodium* parasites from gorillas following deforestation at the agricultural transition. Yet, our findings suggest that the origin of malaria dates back to the earliest times of human evolution.
Financial support: Swiss National Science Foundation grants No 31003A_156299/1 and 31003A_176319, South African National Science Foundation, Mäxi Foundation, A.H. Schultz Foundation.

POSSIBLE CASE OF LEPROSY AND TUBERCULOSIS CO-INFECTION FROM THE SARMATIAN PERIOD (2ND-5TH AD)

Tamás HAJDU, Antónia MARCSIK, Lucia HLAVENKOVÁ, Ivett KŐVÁRI, Kinga KARLINGER, Zsuzsanna MÉSZÁROS KIS, Enikő SZVÁK, Antal SKLÁNITZ, Lénárd SZABÓ, Olivia CHERONET, Kendra SIRAK, Tamás SZENICZEY, Tadeusz KRASSOWSKI, Ron PINHASI

In a settlement pit (feature number: 978) the well-preserved remains of an adult female were uncovered (inventory number: 2008.7.116.). During the preliminary paleopathological analysis of these human bones, serious alterations were observed with two main regions, namely the skull and the lumbar spine.
The cranial alterations included the resorption of the anterior nasal spine, the smoothing and enlargement of the margins of piriform aperture, the deformation of the left and atrophisation of the right nasal bones, and the resorption of alveolar process of maxilla between premolars with premortem tooth loss.
In the lumbar spine, the following was observed: vertebral collapse between L1 and L5, resorption of whole body of L4 and the main part of L3 body, the partial collapse of L2 body, active periosteal reaction between the anterior surface of the bodies of L2 and L5.
The typical bone changes on the viscerocranium (rhinomaxillary syndrome) of this Sarmatian adult female suggested the presence of a serious leprosy infection. The observed spinal lesions revealed possible foci of an osteomyelitic process (with a probable tuberculotic origin) between the vertebral bodies of L3 and L4. Our paper presents the results of the multidisciplinary (macro, microscopic, archaeogenetic and radiologic) analysis of this unique case.
This research was supported by the ELTE Talent Management Council, the János Bolyai Research Fellowship of the Hungarian Academy of Sciences, the National Research and Innovation Office (Croatian-Hungarian bilateral research project: TÉT_16-1- 2016-0020 and NKFI 124944) and Continental Automotive Hungary Ltd.

DISH AND DIET: STABLE LIGHT ISOTOPIC ANALYSIS ACROSS THREE SOUTH AFRICAN SKELETAL POPULATIONS

Rachel L.V. HOLGATE, Gabrielle C. KRUGER, Charlotte E.G. THEYE, Ericka N. L'ABBE, Maryna STEYN

Stable light isotope ratio analysis (δ15N and δ13C) was conducted on individuals diagnosed with diffuse idiopathic skeletal hyperostosis (DISH) from three South African skeletal collections, to test for a possible dietary aetiology (high consumption of animal protein). Bone samples were taken from the rib and femur of individuals diagnosed with DISH (n=127) and compared to those of a control group (n=108). Individuals in the control group were chosen to match the biological profile of the DISH group as closely as possible, to control for differences in dietary habits that could be linked to the biological profile. There was no significant difference in the δ13C or δ15N values between the rib and femur samples within the DISH group or within the control group or between individuals diagnosed with DISH and the control group. A statistically significant difference in δ13C and δ15N values were found between black and white South Africans ($p < 0.001$). The white group were more enriched in δ15N suggesting a diet higher in protein than that of the black group. A statically significant difference was also found between the isotopic values of black and coloured South Africans ($p < 0.01$). A significant difference ($p < 0.05$) existed

in the δ13C femur values between underweight and overweight DISH individuals. A significant difference ($p < 0.05$) existed in the δ15N rib values between underweight and overweight DISH individuals. There was a significant difference found in the δ13C and δ15N values of rib and femur samples of individuals within the DISH and control groups between underweight black and underweight white South Africans. This excluded the δ15N rib from both the control and DISH groups. These results suggest that the social and economic circumstances unique to South Africa may be responsible for the observed differences, rather than DISH.

A BIOARCHAEOLOGICAL ANALYSIS OF THE ISLAMIC CEMETERY OF EL QUEZ, ALBERITE DE SAN JUAN, ZARAGOZA, SPAIN

Tina JAKOB, Joe Wallace WALSER III

Although excavated in 1990, the skeletons from the Islamic cemetery of El Quez (11th-12th centuries) have only been analysed recently and here we are presenting the first results of our study. Only a few Islamic cemeteries are known from the Iberian Peninsula and this bioarchaeological analysis will add to a growing body of research that has largely concentrated on southern Spain. A total of 75 individuals from El Quez have been macroscopically analysed, with adults of all ages (25 females, 35 males and two adults of undetermined sex) and few non-adults (n=13) being present. Of the 12 non-adults with preserved teeth, only two (16.7%) had evidence for caries, while 66.7% (n=8) had linear enamel hypoplasia (LEH). All 18 female individuals with dentitions present had LEH, while 7 (38.9%) had caries lesions. Male individuals also showed high prevalence rates of LEH (80.0%, 24 out of 30 individuals with teeth preserved), but had a higher caries rate (60.0%, 18 out of 30 individuals) compared to females. These results indicate differences in the diet of males and females at El Quez and stable isotopic ratios (carbon and nitrogen) seem to confirm this assumption. Few other pathological lesions were observable, although this might be due to the moderate to poor preservation of the skeletons. Minor congenital anomalies such as cleft neural arches and transitional vertebrae were present and three individuals (two females and one male) had healed rib fractures. In addition, two males had spondylolysis. The high rates of LEH as well as the presence of multiple hypoplastic lines on the same tooth indicate recurrent stress episodes and attest to potential health problems during childhood, but few other non-specific stress indicators were found. Our results will be interpreted within the cultural context of the time period and compared to other Islamic cemeteries in Spain.

PALEOPATHOLOGICAL PIECES: EVALUATING HEALTH FROM COMMINGLED BYZANTINE MONASTIC SKELETAL REMAINS AT MOUNT NEBO, JORDAN

Margaret JUDD

The communal nature of Early Christian monasticism was transferred to funerary practices, so that individual identity remained blurred in death as in life by commingled and broken bodies. Some early monasteries were believed to serve as hospitals to travelers traversing the pilgrimage highway as well as locals who might require extensive care. Here, the hypothesis is tested that the monastery at Mount Nebo (ca. AD 491-640) was a destination for healing the mind and soul, offering long term or permanent care in comparison to the other contemporary monastic sites. The commingled skeletal remains from Mount Nebo (n=73 adults) were assessed with: 1) the commingled skeletal remains from Khan-el-Ahmar (n=117) in the Judean Desert, and 2) the predominantly single interments from the Sanctuary of Agios Lot at Deir ‘Ain ‘Abata (n=27) near the Dead Sea. With few exceptions, all were male; most individuals were estimated to be 35-50 years old. Data were available for trauma, dental and joint disease, osteoperiostitis, *cribra orbitalia* and porotic hyperostosis. Dental disease was prevalent at Abata and Ahmar when compared to Mount Nebo, while injury was significantly greater at Mount Nebo. Overall, less pathology was observed among the Ahmar group, while the disease profile was similar for Mount Nebo and Abata. No evidence of infectious disease patterning (e.g., leprosy or tuberculosis) was

observed among any groups. The infrequent paleopathology at Ahmar suggests that the Judean Desert monastery did not attract individuals with long-term health care needs. In contrast, Jordanian monasteries associated with scriptural events or personalities, notably Moses at Mount Nebo, suggests that these locations facilitated more permanent physical healing processes, in addition to spiritual quests.

ČERINA-JOSIPOVAC CEMETERY - BIOARCHAEOLOGICAL ANALYSIS OF NEWLY FOUND CEMETERY NEXT TO OSIJEK, EASTERN CROATIA

Marijana JUKIĆ

Site of Čerina-Josipovac is located next to city of Osijek in eastern part of Croatia and it was excavated as part of rescue excavation during initial phase of eastern European C-5 motorway corridor construction. During that excavation just one third of total size of cemetery was excavated with total of 291 graves with human osteological remains. Aim of this work is to reconstruct life conditions, health, sicknesses and death of the individuals occupying this medieval site. According to the information provided by excavators, occupation of the cemetery can be dated form beginning of the 13th century to the middle or the end of 16the century. Archeological finds witness about domestic people living in that area without mixing with Ottoman invaders. Analysis of osteological material will give information about everyday life, health status and death of the newly found population which lived in continental Croatia during its occupation by the Ottoman Empire which lasted till middle of 16th century. Information about this site are particularly interesting because site of Čerina-Josipovac was unknown to Croatian archaeology till now and there is very little historical information about it in general.

I DON'T GET THIS HOLE-THING - AN ATTEMPT OF STATISTICAL ANALYSIS TO DECIPHER THE INDICATION OF SURGICAL TREPANATIONS

Kitty KIRÁLY, Gréta ELEKES, Mátyás BUKVA, Zoltán PINTÉR, Erika MOLNÁR, György PÁLFI, Zsolt BERECZKI

Surgical trepanation may have been applied for various reasons in ancient populations. This paper introduces an attempt to connect surgical trepanations and different pathological symptoms using a simple statistical approach in order to provide better understanding of the indications of cranial interventions.

Our preliminary observations were made in a composite sample of Bronze Age, Avar (6th-9th c. CE) and Conquest Period (9th-11th c. CE) skeletal series (127 individuals, no trepanation), and a sample of trephined individuals from the same periods (23 individuals). We have observed prevalence rates of certain pathological symptoms in both groups and performed statistical analysis of the data (χ2-tests, etc., IBM SPSS Statistics 21). We presume that trepanation is more frequent among individuals with more active lifestyle than their peers, therefore other activity-markers will also show higher prevalence in their remains besides cranial injuries. We also present a new case of trepanation found during the course of the investigation, showing a preparation method uncommon in the Hungarian material.

Our results imply that even though statistical analysis of pathological features may often be biased due the problems of observation issues and diagnostical difficulties, but this approach may still provide a useful insight into the indication of certain interventions. Trephined individuals seem to show more signs of activity-dependent features, thus they can be perceived as more active members of the community. This indirectly implies that trepanation might have been applied as a trauma-correction medical intervention in most cases, and was not a ritual intervention, or a measure taken against high intracranial pressure-related headaches. In the future we must make more efforts to standardize the observation scheme and enlarge the sample size as much as possible.

This research has been supported by the grant no. K 125561 of the National Research, Development and Innovation Office.

A POSSIBLE CASE OF METASTATIC CANCER FROM KEHIDA-FÖVENYES (7TH-8TH CENTURY A.D.)

Krisztián KISS, Tamás SZENICZEY, Kinga KARLINGER, Zsuzsanna MÉSZÁROS KIS, Enikő SZVÁK, Erika MOLNÁR, Antónia MARCSIK, Antal SKLÁNITZ, Lénárd SZABÓ, Zsolt DALLOS, Viktória KOVÁCS KIS, Krisztina BUCZKÓ, Tamás HAJDU

The examination of grave 9/B from Kehida-Fövenyes (Late Avar Period) site revealed the remains of a male *maturus* aged specimen (40-50y). The skull and postcranial bones (inventory number: 2017.4.9.) are poorly preserved and many of them (e.g. skull) are lack of cortical substant due to taphonomical processes. The remains show osteoblastic and osteolytic lesions in multiple locations. The pelvis, radius, and femoral head from the left side as well as almost every vertebrae and many rib fragments are highly affected by abnormal sclerotic remodeling and on some localizations (e.g. skull, acromion processes) lytic lesions can be observed. Further investigations were striven for a multidisciplinary approach. The remains underwent radiological investigations by clinical and industrial CT as well. Besides the sclerotic changes - which can be observed macroscopically- the scans revealed hidden lesions such as button *sequestra* in skull, and possible tumorous tissue in the midshaft of left radius as in the shaft of many ribs. We used scanning electron microscopy (SEM) for compare the microscopical features of the normal and abnormal bone structure. Mineralogical characterization including the size, structure and composition of the bone nanocrystals was carried out by transmission electron microscopic techniques (BF-DF, SAED and TEM-EDS). The atomic structure of nanocrystals from fragments showing abnormal sclerotic remodeling was studied by high resolution TEM. Comparison between pathological and normal bone nanocrystals was made. Based on the localisation and morphology of the pathological changes, the radiology and SEM results suggest that the analysed male suffered from metastatic cancer with possible prostate cancer as a primary soft tissue tumor. This research was supported by the ELTE Talent Management Council, the János Bolyai Research Fellowship of the Hungarian Academy of Sciences, the Croatian-Hungarian bilateral research project of the National Research and Innovation Office (TÉT_16-1-2016-0020), the Stephen W. Kuffler Research Foundation and the Bolyai College.

PREVALENCE OF HYPERCEMENTOSIS IN MIDDLE AND UPPER PALEOLITHIC HUMANS

Sarah Ashlyn LACY

Hypercementosis is excessive, though non-neoplastic, deposition of cementum on the roots of any tooth producing a thickened appearance and can be diagnosed via macroscopic inspection of loose teeth or via radiograph in situ. This condition may be in response to local inflammation from periodontal disease or alveolar lesions, systemic inflammation (i.e., arthritis, thyroid disease), occlusal forces, and/or continuous eruption, including supraeruption from high occlusal wear. Considering its proposed correlation with oral inflammation/ infection and dental wear, it is surprising that this condition is little studied in paleopathological analyses. Using a sample of photographs and radiographs of 79 Middle and Upper Paleolithic early modern humans and 43 Neandertals from Europe and Southwest Asia previously analysed for periodontal disease and periapical lesions, hypercementosis was scored per tooth as absent, mild, moderate, or severe expression. Periodontal disease and periapical lesions were already known to be positively correlated with one another from this sample. Hypercementosis severity was found to be positively correlated with periodontal disease severity (spearman's rho 0.3245, p-value<0.001) and periapical lesions prevalence (spearman's rho 0.2877, p-value<0.01). However, all three pathologies increase in incidence with the age category variable, which is approximated via dental wear scores. The co-occurrence of local inflammation via periodontal disease or periapical/

alveolar lesions, dental wear, and hypercementosis suggests that hypercementosis is a relatively common phenomenon in Paleolithic humans in response to occlusal forces and/ or inflammation. Further study of hypercementosis in samples with high wear and low alveolar pathology prevalence or vice versa may help elucidate the directionality of the association between the conditions. Where radiographs are taken, hypercementosis should be included in assessments of oral health in paleopathological analyses.

SMALL BUT HEALTHY? A CASE STUDY FROM PREHISTORIC COASTAL BRAZIL
Luis Pezo LANFRANCO, Sabine EGGERS

Small stature is often associated with mal nutrition. But what are the causes of small stature in a population living in a resource rich coastal environment, showing signs of incipient plant domestication, rare nutritional diseases, and almost no violent trauma?
The present project focuses on stature, health and disease in the shellmound Jabuticabeira II (1214–830 cal BC to 118–413 cal AD). We estimated stature according to Stock and Pomeroy (2012). Males were significantly taller than females in both phases of Jabuticabeira II (p=0,017; p=0,027 respectively), while mean stature increased slightly from the initial to the late phase in both sexes (males: 154.12 to 158.34 cm; females: 145.15 to 149.73 cm). According to Rodriguez (1994) mean stature in Jabuticabeira II, independent of sex and phase, is small to submedian. Since in other shellmound builders of Brazil and contemporary South-American societies mean stature is (in part significantly) higher we compared skeletal and dental palaeopathologies, isotopic data on palaeodiet and weaning habits, biodistance measures, as well as contextual information.
Using these data, we tested two models. First, we explored the classic bioarchaeological model according to which small stature is associated with nutritional deficiencies, higher morbidity, premature mortality and poor skeletal development. Then, we tested our data using the "small but healthy" model, according to which "smallness may not be associated with functional impairments…the mild to moderately malnourished people in the deprivation theory are simply 'small but healthy' people in the homeostasis theory".
Even in comparison to other contemporary societies in South America with either similar ways of life and/or morphology, the stature of the people from Jabuticabeira II is small. We discuss the implications thereof in a comparative way and shed new light on the adaptability of this shellmound group.

A POSSIBLE CASE OF PITUITARY DWARFISM FROM THEBES, EGYPT
Orsolya LÁSZLÓ

The team of the Hungarian Archaeological Mission of Egypt led by Zoltán Fábián Imre working in the Theban necropolis has been researching the upper section of the southern slope of el-Khokha hillock in Qurna since 1995. The excavation area comprises several mainly ruined tombs carved in the rock and other funerary sites which were constructed inside or between the ornate tombs. In the excavation season of 2004, commingled and disarticulated human bones had been found on the ground surface at the area of a funeral superstructure (TT 184/241). One individual could be identified from the skeletal material by the anthropological analysis due to the very special morphological characteristics of the bones. The skeleton was in a very poor condition because of the direct sunlight for a longer period and due to disturbance it was also incomplete. We could only find the bones of the pelvis, of the right leg and the left femur. These remains represent an approximately 40 year old female. The long bones were extremely shortened and the estimated stature was 130.6 cm. The joints were showing severe degenerative arthritic changes. Based on the altered morphology of the tarsals and metatarsals, the right foot was probably in an abnormal position during life. These pathological changes suggest a possible skeletal evidence of pituitary dwarfism from ancient Thebes.

"LONG-GONE CHILDREN" - COMPARATIVE PALEOPATHOLOGICAL ANALYSIS OF NON-ADULT HUMAN REMAINS FROM AVAR (7TH-8TH C.) AND MEDIEVAL HUNGARIAN (12TH-14TH C.) CEMETERIES

Orsolya LÁSZLÓ, Tamás SZENICZEY

The process of biological adaptation to a certain environment can be studied by human remains both from socio-cultural and biological perspectives. From a biological point of view, the skeletal remains of non-adults similarly to adult remains are suitable for acquiring valuable data and with their interpretation we can get a more complete picture of past lives. This research is the first to study children from Hungarian samples in order to draw conclusions regarding the life quality in different historical periods. The purpose of our work was to estimate the impact of stress factors on non-adults with comparative analysis of their mortality patterns and with the complex interpretation of pathological legions. The material of 681 children from three cemeteries represents the Avar Age (7-8th c.), the Arpadian Age (12-14th c.) and the Late medieval period (14-16th c.). Porotic hyperostosis, endocranial lesions and subperiosteal new bone formations were involved in the systematic pathological analyses. Regarding new bone formations on the long bones it was also a primary aim not only to provide the frequency data according to the number of affected individuals but also to give the ratio of the affected bone elements. We also gave the prevalence data of the lesions according to the different locations on the diaphyses. In this way the extent and severity of these bone depositions could also be examined which made it possible to distinguish the severe, systematic infections from mild forms. The mortality patterns and prevalence of the stress markers suggest differences in life quality among these populations. The subperiosteal new bone formations seemed to be a more specific indicator of varying stress levels and different causative factors of mortality in these non-adult groups. This research is a part of the project led by Dr. Tivadar Vida funded by the Hungarian Research Fund (OTKA 113157).

VITAMIN D DEFICIENCY AND THE ANTIQUITY OF MODERN TRENDS: SKELETAL EVIDENCE FROM THE ROMAN PERIOD SITE OF ISOLA SACRA

Laura LOCKAU, Stephanie ATKINSON, Simon MAYS, Tracy PROWSE, Michelle GEORGE, Luca BONDIOLI, Carolan WOOD, Marissa L. LEDGER, Megan BRICKLEY

Vitamin D deficiency, a condition that reflects individuals' access to both sunlight and dietary sources of vitamin D and calcium, has been linked to environmental changes associated with urbanization and industrialization in modern and historic populations. However, most paleopathological studies have concentrated on post-Medieval European assemblages, and it is unclear how far into the past modern patterns of occurrence extend. This paper examines skeletal evidence for vitamin D deficiency in both juvenile and adult human skeletal remains from Isola Sacra (1st-3rd centuries AD, n = 823), a Roman necropolis associated with *Portus Romae*, the settlement at the port serving Rome. Analysis of macroscopic, radiographic, and histological features revealed evidence for vitamin D deficiency in 44 out of 678 observable individuals from this site (6.5% overall prevalence, 7.5% of juveniles, 5.7% of adults). In accordance with modern data, patterns in skeletal lesion occurrence indicate that infancy, young childhood, and adolescence likely represented times of vulnerability to deficiency; there is also some indication that experiencing deficiency during childhood may have negatively impacted survival in adulthood. A lack of evidence for active osteomalacia in individuals who survived to old adulthood aligns well with isotopic evidence for increased access to marine resources in older adults, but contrasts with modern trends. In the context of a larger data set including other assemblages from the western Roman Empire, urban living appears to be a key contributor to the occurrence of deficiency at Isola Sacra. Skeletal evidence for vitamin D deficiency at this Roman period site demonstrates a pattern of occurrence that is similar to modern data in some ways but differs in others. Facilitated by the examination of evidence for deficiency throughout the entire life course, this study identified the earliest skeletal collection in which aspects of modern patterns have been observed.

HEALTH-RELATED STRESS AT AN EARLY URBAN CENTRE: TIMING AND FREQUENCY OF ACCENTUATED LINES IN HUMAN DENTAL ENAMEL IN 3RD MILLENNIUM BCE LARGE TRADING AND CRAFTS CENTRE IN SE IRAN

Kirsi O. LORENTZ, Simone LEMMERS, Wendy DIRKS, Donald REID, Patrick MAHONEY, Farzad FORUZANFAR, Mansoor SAJJADI

Physiological disturbances caused by stressful events can lead to the formation of accentuated lines in human dental enamel. Such accentuated lines are correlated with health related stress in clinical and anthropological literature. These can include illnesses and other pathological conditions, malnutrition, infection and social stressors. Since teeth do not remodel after formation, such accentuated lines remain observable. Accentuated line patterns give insight into the timing and amount of health-related stress an individual endured. In this paper, we present our findings on the accentuated line patterns from an Iranian Bronze Age population of Shahr-i Sokhta, a large urban site dated to the 3rd millennium BCE. We examined the timing and the frequency of accentuated line formation among individuals during the first years of life, to assess the amount and patterning of health-related stress. We sampled the first permanent mandibular molars of 10 individuals (n=10), thereby covering a developmental time period from birth till age 2.5-3 years. By analysing the enamel in longitudinal histological sections with transmitted light microscopy, we assessed the number and position of accentuated lines. We calculated the position of each accentuated line by calibrating its position to the neonatal line (age=0), thereby assigning ages to stress events. Analysis of the presence, timing and frequency of the accentuated lines allows us to identify periods of increased health-related stress, and contributes to interpretations relevant to the understanding of childhood health and disease patterns at this early, large, urban trading and crafts centre.

NEW BIOARCHAEOLOGICAL AND PALEOPATHOLOGICAL FINDINGS ABOUT THE MUMMIFIED SUBADULT FROM GRUTA DEL INDIO SITE (SAN RAFAEL, MENDOZA, ARGENTINA)

Leandro Hernán LUNA, Claudia Marcela ARANDA, Pablo RODRÍGUEZ, Luis BALLARINI

The results of the bioarchaeological and paleopathological analysis of a mummified subadult individual from the archeological site named Gruta del Indio (near San Rafael city, Southern Mendoza province, Argentina), dated 1910 ± 60 years BP, are presented. The body was wrapped in a complex package composed of sewing leather, and had been deposited on a fibrous vegetable mattress. A kind of cap was recovered completely covering the head. The only previous systematic research was fulfilled during the decade of 1970, when many current bioarchaeological techniques had not been yet developed. That research stated that the individual was a stillborn died as a result of a cranial trauma derived from the narrowness of the pelvis of the mother, which caused an overlapping of the parietals by compression. On January 2016, the mummy was translated to the Medical Diagnostic Institute of San Rafael, where a radiographic and tomographic study was carried out in order to estimate the sex and the age-at-death of the individual, and to identify the nature of the traumatic lesions. Age estimation was performed considering multiple methods and indicators; dental calcification, long bone lengths and the appearance of the centers of ossification were recorded. The data obtained indicate that this individual lived about 3 months after birth. Regrettably, it was not possible to accurately estimate sex because the morphological features of the ilia and the mandible could not be clearly assessed. Multiple incomplete fractures were detected in different bones of the skull (mainly affecting parietals, temporals and the occipital), which are compatible with a perimortem trauma, probably the cause of death of the individual.

KNEE ANKYLOSIS IN A FEMALE FROM THE LISBON SKELETAL COLLECTION
Giovanni MAGNO, Susana J. GARCIA

The individual number MB61-000017 of the Lisbon Identified Skeletal Collection (aka Luis Lopes Collection) housed at the National Museum of Natural History and Science, Lisbon (Portugal), a 40 years old female, presents an anomalous bone ossification of the right knee joint. The cause of death register for this individual is chronic myelitis. The individual was born in 1893 and died in 1933, before the antibiotics were available for the population. The distal epiphysis of the femur and the proximal epiphysis of the tibia were not yet fused when the ankylosis occurred, thus the individual suffered the pathological condition in young age and managed to survive with such condition until her death. Bony ankyloses may be due to several processes: trauma, neuroarthropathies (e.g. leprosy, tertiary syphilis), skeletal tuberculosis, chronic pyogenic osteomyelitis, rheumatoid arthritis, ankylosing spondylitis or degenerative osteoarthritis. On the studied individual this pathology brought also to the joint ankylosis and posterior subluxation of the tibia. The femur and the tibia were radiographed to assist on the differential diagnosis of the case.

GASTROINTESTINAL PARASITE MARKERS AS EVIDENCE FOR WASTE MANAGEMENT
Céline MAICHER, Antoni PALOMO, Christian HARB, Matthieu LE BAILLY

Neolithisation process is accompanied with several huge changes in human population lifestyle. The sedentarization intensifies in human societies; the proximity grows between human and animals, as well as between animals themselves. One of the consequences of these changes is the growing production of organic wastes, particularly fecal wastes, and the necessity to manage it. Paleoparasitology is able to access the presence and the importance of fecal matter in archaeological contexts. This research field studies ancient parasite throughout the markers they produce or let after burying. Mainly the eggs produced by some adult intestinal worms can be recovered by microscopic analysis. Paleoparasitology so provides information about the health status, hygiene and lifestyle of ancient populations. The question of the fecal waste management in ancient society is important because depending on the practices, it can more or less facilitated parasite disease transmission. Here we will show how paleoparasitological data coupled to spatial analysis can provide information about the location of fecal matter concentration areas, so answering the question of the waste management in two Neolithic archaeological settlements in Switzerland (Lake Zürich) and in Spain (Lake Banyoles).

LEPROSY AND PULMONARY TUBERCULOSIS IN MEDIEVAL/MODERN ODENSE, DENMARK: PALAEOPATHOLOGICAL ANALYSIS OF RIB LESIONS AND INFERENCES FOR THE CROSS-IMMUNITY AND CO-INFECTION HYPOTHESES
Vitor MATOS, Carina MARQUES, Daniela PACHECO, Ana Luisa SANTOS

The interplay between leprosy and tuberculosis in past human populations is still poorly understood and the debate on this subject has been centered mainly in two competing hypotheses: cross-immunity versus co-infection. This study aims at presenting new palaeopathological evidence regarding the prevalence of new bone formation on the visceral surface of ribs – a proxy to pulmonary pathological conditions, including tuberculosis infection – in two Danish medieval/modern (13th-17th centuries) cemeteries from Odense, and to discuss the relevance of these skeletal lesions to a better understanding of the palaeoepidemiology of leprosy and tuberculosis.
The skeletal material analysed consisted of 292 individuals – 235 adults from both sexes and 57 non-adults – housed at the University of Southern Denmark (ADBOU), namely: 191 from the St. Jørgen's leprosarium [SJG] and 101 from the Blackfriars monastery [BFM]. Ageing and sexing of skeletons, and macroscopic observation of ribs followed standard bioarchaeolological methods.

New bone formation on the visceral surface or ribs was found in 5.8% (10/173) and 7.3% (7/96) of the skeletons with well-preserved ribs from SJG and BFM, respectively (crude odds ratio=1.282; IC95%: 0.472-3.484). Among the 4150 ribs observed (59.2% of the total 7008 expected) few were affected on each cemetery: 0.9% (22/2504) for SJG and 1.5% (24/1646) for BFM (crude odds ratio=1.669; IC95%: 0.933-2.987). None of these proportions differed significantly between SJG and BFM ($p>0.05$).
Our findings suggest a low prevalence of pulmonary tuberculosis in the medieval/modern population of Odense, both in the leprosarium and regular cemeteries, and raises a reflection regarding the (dis)advantages of conventional palaeopathological approaches to understand leprosy and tuberculosis co-infection and co-evolution in past human populations.
Funding: This research was financed by national (POPH – Programa Operacional Potencial Humano) and European (European Social Fund) funds through the FCT – Fundação para a Ciência e Tecnologia: project references UID/ANT/00283/2013 and IF/00186/2014.

CAL: AN OSTEOLOGICAL TIMELINE FROM THE ROMAN AGE TO CONTEMPORARY TIMES
Mirko MATTIA, Daniel GAUDIO, Barbara BERTOGLIO, Debora MAZZARELLI, Emanuela SGUAZZA, Lucie BIEHLER-GOMEZ, Pasquale POPPA, Anna Maria FEDELI, Cristina CATTANEO

Human remains, belonging to archaeological contexts, can provide fundamental information for the reconstruction of lifestyle and disease. This presentation aims to illustrate the archaeological and historical component of CAL (Collezione Antropologica Labanof – Labanof Anthropological Collection) which counts over 5,000 skeletons, both archaeological and contemporary. The archaeological section includes ca. 3000 individuals from various contexts of the city of Milano (the Roman Mediolanum), from inhumations and cremations of the Roman Imperial Age and Late Antiquity (1st – 5th century AD), to the Middle Ages (5th – 15th century AD), the Renaissance (15th – 16th century AD) as well as the Modern Age (16th -19th century AD). These skeletons have already revealed interesting changes in the population of Milano over 2000 years from a demographic and ethnic point of view, as well as from the perspective of mortality, morbidity and disease – for example the first appearance of tuberculosis, syphilis and other infectious diseases, as well as the incidence of trauma – lethal or not. Interestingly the collection counts one of the first testimonies of torture with "the wheel". The collection also includes remains of skeletons from some of the largest burial sites in the city, such as the Roman necropolis of la Cattolica (600 individuals) and cremation site of Policlinico; the commingled remains of the first hospital in Milano founded in the 15th century, as well as mass graves of the victims of the 17th century plague. This presentation illustrates through a series of examples how the collection provides an interesting opportunity for diachronic and synchronic demographic and pathological comparisons, as well as a perspective of the evolution within the city of Milano of violence over 2000 years through the study of skeletal trauma.

RECOVERY OF SKELETAL REMAINS FROM ARCHAEOLOGICAL BURIAL SITE: WHAT IS THE RATE OF MISSING BONES?
Mirko MATTIA, Emanuela MADERNA, Debora MAZZARELLI, Emanuela SGUAZZA, Cristina CATTANEO

The study of human skeletons in archaeology is useful for understanding the demography and pathology of ancient populations. Incomplete recovery can severely compromise this reconstruction. The loss of a single phalanx, for example, can hinder the diagnosis of diseases such as leprosy or sharp force injury, and compromise the anthropological and pathological study. But how much of the skeleton is really lost at excavation? Very little literature exists on this. For this reason we set out to verify the recovery rate of the skeleton (in other words the percentage of bones lost) during different archaeological excavations, through the study of 150 skeletons (75 adults and 75 subadults) from three north Italian necropolis: the Roman site of "Milano Cattolica"

(1st – 4th c. AD) a didactic excavation; "Lodi Vecchio, via Fregoni" a Longobard cemetery (7th c. AD) excavated by a private archaeological company and "Milano, via Monte Napoleone" (used between 1478 e 1547 AD), an emergency excavation.
Results showed a maximum recovery rate of 82% (Milano Cattolica) and a minimal of 17% (Milano, via Monte Napoleone). Hands and feet were the area's most severely affected, losing up to 60% of bones. Such loss was considered valid for the study only when the bone tissue of the skeleton was well preserved (with no or very little destructions or weathering) and the tomb had not been cut or disturbed. Even though it is obvious how important the presence of an osteologist is for the recovery of human remains, this research reveals how great, even with experienced archaeologists, the risk is of losing important material and how fundamental it is to verify the number and type of bones recovered for every single burial before concluding the excavation.

FOOD PRESERVATION AND HUMAN HEALTH: THE CASE OF THE YOUNG EGYPTIAN PRIEST "IRET-HOR-R-U"
Hila MAY

Acquiring the knowledge of food preservation was a major step forward in human evolution; it allowed for more efficient management of food resources and assisted in overcoming periods of food shortage. Food preservation, however, has its price, as it may affect human health.
One of the oldest riddles in human biological history relates to the high prevalence of parietal thinning (PTh), a severe manifestation of osteoporosis in modern populations, among ancient Egyptians. Here, we examine the hypothesis that this is due to high consumption of preserved food. Our hypothesis is based on the reconstruction of the life history of a mummy of an Egyptian priest named "Iret-hor-r-u". His age was approximately 40 years, and according to our CT scan analysis, he suffered, despite his relatively young age, from diseases normally associated with the elderly, i.e. severe osteoporosis, and atherosclerosis. Data on the prevalence of these morbidities among ancient Egyptian populations was gathered from the literature. To test the notion that PTh is more prevalent in the Egyptian population compared to other populations, data on PTh was collected from CT scans of 348 individuals. The major differences between these two populations were the much higher rate and earlier onset of PTh among the ancient Egyptian population. Further inquiry into ancient Egyptian lifestyle and dietary habits pointed to high consumption of salty food, wheat, and beer, all affecting calcium metabolism and its bioavailability. This type of diet could probably triggered the process of bone loss (osteoporosis) at a relatively young age among ancient Egyptians.

LONGER LEGS, FEWER LEH, BUT SHORTER ADULT LIVES: A SIGNATURE OF IMMUNOLOGICALLY NAIVE MIGRANTS IN LONDON DURING THE INDUSTRIAL REVOLUTION?
Gina Patricia MCFARLANE

During the Industrial Revolution, much of London's population growth was fuelled by rural migrants moving to the city for employment. In addition, some diseases were endemic in London at this time but not in the rural hinterland where many migrants originated. As a result, adult migrants experienced a heighten risk of certain infectious diseases compared to native Londoners. This suggests that adult migrants might be detectable in the skeletal record as individuals who experienced relatively fewer childhood health insults but were at greater risk of death in early adulthood, the typical age of labour migrants. This research considers survival risks associated with linear enamel hypoplasia (LEH) and femoral/tibial lengths in the skeletal remains of 195 adults who died in London between 1750 and 1850. Skeletal data is supplemented by St. Bride's parish burial records (n = 8179) to identify mortality drivers, revealing a relative increase in smallpox burials (used as a marker of migrants) amongst adults aged 20-35 years. Results suggest that adults with two or more LEH were less likely to die before 35 years of age compared to those

with fewer LEH (risk ratio = 0.53, 95% CI = 0.29-0.97). In addition, this younger group of adults had significantly longer femurs (mean difference: Z score=0.55, S.E.=0.26, t= 2.08, df=88, p=0.04), marking them as likely having experienced less stressful developmental environments compared to the rest of the sample. I suggest the most likely explanation for the association between fewer LEH, longer femurs, and younger adult age at death is that this group lacked acquired immunity gained by native Londoners, marking them as migrants from rural regions with low levels of endemicity.

HISTOPATHOLOGY OF THE GREAT HUNGER: INCORPORATING HISTOLOGICAL METHODS TO EXAMINE THE HUMAN BIOLOGICAL RESPONSE TO FAMINE AND POVERTY IN MID-19TH CENTURY IRELAND

Lauren A. MECKEL, Jonny GEBER, Hallie Ruth BUCKLEY

In 2005, a mass burial ground was discovered during a redevelopment project adjacent to the former union workhouse in Kilkenny City, Ireland. The burial ground, which dates to between August 1847 and March 1851, contained the remains of a minimum of 970 individuals who died as a consequence of the notorious Great Irish Famine (1845–1852). The assemblage is unique in the field of bioarchaeology as it can be contextualised to the most well-recorded historical famine in the world, it spans a short period of time, and the remains derive from a socially homogenous population group. These characteristics provide an opportunity to explore questions related to ever-current issues in bioarchaeology, such as mortality analysis and untangling the so-called 'osteological paradox.' Additionally, the skeletons of famine victims from Kilkenny—all of impoverished inmates that were confined into in a large and overcrowded institution and subjugated by negative contemporaneous social attitudes towards the poor—display an array of physical evidence of structural violence. While the suffering of these people has been illuminated from biological and palaeopathological profiles on both an individual and population level (Geber 2015), the research presented here is employing a novel biocultural methodology to explore and understand the effects of malnutrition, poverty, and structural violence on human rib microstructure. By quantifying the histological reaction of bone to physiological and psychosocial stress, it is possible to gain further insight into which groups were most at risk of death due to their pre-Famine health. Overall, this research seeks to contribute to the field of paleopathology by interpreting the results of histological analysis of ribs through the holistic use of historical, archaeological, and bioarchaeological data to further elucidate how inequality is reflected in human skeletal tissue.

ABOUT A NEW CASE OF LEPROSY FROM AMIENS CITY (FRANCE), 10TH-11TH CENTURY: PALEOPATHOLOGICAL AND PALEOMICROBIOLOGICAL APPROACHES

Avril MEFFRAY, Eloïse HOURIEZ, Yann ARDAGNA, Carole FOSSURIER, Annick THUET, Philippe BIAGINI

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*, also known as Hansen's bacillus. This challenging pathogen experienced significant success and expansion from late antiquity and throughout Middle Ages, its presence being long-documented in Europe at these times. However, few published cases were subjected to both paleopathological and paleomicrobiological investigations. Our work aims to document the occurrence of this disease in the North of France, by fully studying one individual from the urban cemetery of Caudron street (Amiens city, Nord), located in the immediate vicinity of one of the city gates of the medieval town. This skeleton SP20076, fairly incomplete, dated from the 10th-11th century, is a mature individual of undetermined sex displaying skeletal lesions suggestive of leprosy, according to the paleopathological literature. Paleopathological study suggested the presence of recurrent bone markers for leprosy, i.e. concentric atrophies, erosive damages of phalanges and metatarsals and periosteal apposition. Therefore, a second approach was performed to diagnose this disease by

using paleomicrobiological methods (DNA extraction, PCR amplifications, cloning and sequencing) on the study of several molecular markers (18kDa, ML1545, RLEP) and Hansen's bacillus specific SNPs, targeting short sequences (~ 150 nt max.) suitable for the study of ancient samples. Our diagnostic hypothesis was confirmed by our microbiological approaches, which allowed the identification of *Mycobacterium leprae* DNA, the SP20076 individual being positive for the three molecular markers tested, as well as for the three SNPs. This newly documented case of leprosy argues and completes our knowledge about the presence of this disease in northern France during the medieval period.

SURVIVAL OF A ONE-ARM WARRIOR IN PRE-ANTIBIOTIC ERA: A CASE STUDY FROM AN ITALIAN LONGOBARD NECROPOLIS (6TH-8TH CENTURIES AD)

Ileana MICARELLI, Robert R. PAINE, Caterina GIOSTRA, Mary Anne TAFURI, Antonio PROFICO, Marco BOGGIONI, Fabio DI VINCENZO, Andrea PAPINI, Danilo MASSANI, Giorgio MANZI

The Longobard necropolis of Povegliano Veronese located in Veneto (Northern Italy) was discovered in 1985. Archaeological evidence tells us the necropolis was used during the VI-VIII centuries AD, and over 240 skeletons were recovered. The skeleton of an older Longobard male (aged 40-50 years), an individual of the first generation of Longobards arrived at Povegliano Veronese, shows a unique well-healed amputated right forearm. The focus of this presentation is to discuss the trauma and healing of his right forelimb. The orientation of the forearm fracture suggests an angled cut to the ulna and radius by a single blow. There are several reasons why a forearm from this period might be amputated, loss due to fighting and/or loss due to judicial punishment. As with other amputation cases cited in bioarchaeological literature, this example exhibits both healing of the fracture and osteophytic growth specific to biomechanical loading. We argue that the osteophytes of this individual come from the use of a prosthesis. The healing includes a semi-fusion (ankyloses) of the forearm bones and well-healed end-caps for both bones. Additionally, dental modification of right upper second incisor tooth (RI2) shows considerable wear and smoothing of the occlusal surface. We suggest that this dental defect occurred by non-masticatory processes as he tightened the prosthesis in place. Other indications of how this individual adjusted to his amputated condition include a change in orientation of the right glenoid fossa surface, showing a c-shaped ridge approximately 38.5 mm in length. CT-scans of the right humeral diaphysis show that this bone underwent cortical bone loss from the proximal to the distal end, which often happens with the presence of a prosthesis.

ANALYSIS OF THE SKELETONS FROM THE MUSLIM CEMETERY OF SONGO MNARA (TANZANIA). INTEGRATING OSTEOLOGICAL DATA WITH THE STUDY OF MALARIA aDNA

Francesca Bianca Maria MIGLIACCIO, Katharine ROBSON-BROWN, Jeffrey FLEISCHER, Stephanie WYNNE-JONES

The UNESCO world heritage site of Songo Mnara is located on a small island situated in the Kilwa archipelago on the southern coast of Tanzania. This small merchant settlement was intensely occupied from the end of the 14th to the beginning of the 16th century and then abandoned. A test excavation of 2 of the 3 separate cemeteries present on the island was conducted in 2011, during which 14 individual skeletons were recovered, 50% of which were juveniles. Four of these were aged between perinatal and 5 and one was aged between 9 and 10 years old. Full osteological analysis was performed on site before reburial. Pathology presented primarily as Osteoarthritis and degenerative disease to the spine, while *cribra orbitalia* was found in the only female skeleton. Dental samples belonging to both adults and juveniles from 8 of the 14 individuals were collected, brought back to the Istituto Superiore di Sanità (Italy) and tested for four strains of plasmodium parasite (*p. Falciparum*, *p. Malariae*, *p. Vivax* and *p. Ovale*). A juvenile that was aged at about 4-5 years old resulted positive for *p. Falciparum*. The age at death of the individual is consistent with the age range that in modern times is considered most vulnerable to death from malaria. This

bring us to believe that, not only was malaria present on the site during time of occupation, but that it can be successfully identified by using dental samples. This paper will discuss the osteological analysis of the skeletons excavated on the site of Songo Mnara, (Tanzania), the aDNA analysis that resulted from the osteological findings; and how more data on how demographical information may be used to identify potential samples when attempting aDNA analysis of malaria may lead to an alternative to established sampling criteria.

OSTEOMYELITIS IN A MEDIEVAL BURIAL FROM SMEDEREVO FORTRESS, SERBIA

Nataša MILADINOVIĆ-RADMILOVIĆ, Vesna BIKIĆ, Ksenija ĐUKIĆ, Petar MILENKOVIĆ, Dragana VULOVIĆ

Smederevo was built as a fortified rulers' residence and the new capital for the state of the Serbian despots after the sudden death of despot Stefan Lazarević in 1427 and the loss of Belgrade, which was restored to the Hungarians, according to a previous agreement. On the orders of the new ruler, despot Đurađ Branković, it was built from 1428 until 1439, with severe toils and in constant and immediate danger from Turkish attack. The triangular basis of the fort, similar in shape to Constantinople, was determined by the topography of the banks of the rivers Jezava and Danube. At the very confluence, a castle was built with the ruler's court, while a fortified urban settlement took up the rest of the space. In the eastern part of the fortified city, remains of a small court church were discovered. Inside and around the church, medieval burials were discovered, among others, from the first half of the 15th century. During the analysis of skeletons from this sacral complex, a skeleton of a young man, aged 20–25, drew our attention. Namely, anthropological analyses revealed thickened cortex in the proximal femoral region on the left side. Further analyses were conducted by computed tomography (CT) and they confirmed the findings of circumferentially thickened cortex, followed by ossified periosteal reaction and bone bridging. Similar findings were discovered on both tibias and were more expressed in proximal regions, with fistulas observed on both sides. The left fibula was also present, with circumferentially thickened cortex and ossified periosteal reaction. The observed lesions indicate the presence of a massive inflammation in the surrounding soft tissues, which occurred during his lifetime. The overall anthropological and radiological findings imply osteomyelitis as the diagnosis and, due to the occurrence of it at multiple sites, haematological spread as the most possible.

ENAMEL HYPOPLASIA AND HEALTH CONDITION THROUGH SOCIAL STATUS IN THE ROMAN IMPERIAL AGE

Simona MINOZZI, Walter Benedetto PANTANO, Carla CALDARINI, Valentina GIUFFRA, Paola CATALANO

Dental enamel hypoplasia is a deficit in enamel matrix formation occurring in childhood and resulting from nutritional deficiency or diseases. Examination of hypoplastic lesions in ancient skeletal remains provides an excellent index of developmental stress levels in the past. In this research, the incidence and distribution of Linear Enamel Hypoplasia (LEH) were detected to investigate whether the social status had affected the health and nutritional conditions of the Romans during the Imperial Age. Dental enamel hypoplasia was observed in the teeth of 200 human skeletal remains found in two large necropoles from the Imperial Age in Rome (Italy). Both necropoles, dated back to (1st-2nd centuries A.D.), are located near the ancient centre of Rome and the presence of different typologies of graves, with monumental mausoleums and simple tombs, testifies that the cemeteries were used by diversified social classes. The availability of two sub-samples with different subsistence patterns in the same population permitted to evaluate the distribution of the dental stress markers evidencing the differences between the social classes. Enamel hypoplasia was collected in the whole dentition and differences were found between anterior and posterior teeth, male and female samples, upper and lower social classes. The results will be discussed taking into account other skeletal and dental indicators of health and life

condition collected in the sample, and in relation to the economic and social life in Rome during the Imperial Age.

METASTATIC PROSTATE CARCINOMA FROM IMPERIAL ROME (1ST-2ND CENTURY A.D.)
Simona MINOZZI, Agata LUNARDINI, Carla CALDARINI, Davide CARAMELLA, Gino FORNACIARI, Paola CATALANO, Valentina GIUFFRA

This study describes and discusses a rare case of metastatic carcinoma affecting the skeleton of an adult male recovered in the necropolis of Casal Bertone in Rome (Italy). The necropolis, dated back to the Imperial Age (1st-2nd centuries A.D.), is placed close to some residential structures and a large manufacture identified as a fullery (fullonica). The anthropological examination of 70 skeletal remains found in the necropolis has allowed to identify various alterations attributable to the work activities of the fullonica, such as traumas, osteoarthritis and enthesopathies, so that also the pathological individual is likely to have been a worker of the fullery.
The complete skeleton was very well preserved and the anthropological and paleopathological studies were performed through a careful macroscopic, microscopic, radiological (X-ray and CT scan) and histological investigation. Bone alterations are represented by osteoclastic and osteoblastic lesions mainly involving the axial bones, in particular the sternum, ribs, spine, scapular and pelvic girdles. The anatomical distribution of the changes and the destructive and proliferative nature of the lesions suggest that the osseous changes were the result of metastases from a soft tissue primary cancer. The age and sex of the individual, as well as the radiographic and histological pictures, favour a diagnosis of advanced prostate cancer with extensively diffused bone metastases. The aetiology of prostate carcinoma is not clear and it is not possible to verify the impact of environmental conditions on the tumour of this individual, and we can only leave as an open-question whether the use of dyes and alkaline detergents such as soda or urine, sulphur and clay to treat fabrics might have favoured the onset of the pathology. At present, this is the only case of prostate cancer from the Imperial Age recovered in Rome.

A CASE OF SYSTEMATIC UNILATERAL DEGENERATIVE JOINT DISEASE (UDJD) IN 14TH-17TH CENTURY TRANSYLVANIA, AND ITS IMPLICATIONS FOR THE EFFECT OF MINING ON POPULATION HEALTH
Priscilla MOLLARD

The Piaţă Cetăţii skeletal collection is comprised of a hitherto unstudied assemblage of over 800 individuals from 14th-17th century Transylvania. Located in the mining town of Baia Mare, the Piaţă Cetăţii cemetery represents an unprecedented opportunity to study the impact of mining on population health during this critical historical period, defined not only by social and political upheaval but also by rapidly accelerating advances in metallurgical technology. This paper summarizes osteological analysis of Complex 761, an adult male presenting systematic unilateral degenerative joint disease (UDJD) throughout the bony elements of the right side of the body. Withering of the bony elements of the left side of the body is not observed, thus suggesting that asymmetrical wear on the joints was neither the result of paralysis nor stroke. The biological profile of Complex 761 is summarized, as is a survey of pathology in comparison with the larger subsample of the Piaţă Cetăţii collection analyzed thus far (n=20). These are presented in the context of late medieval mining practices and metallurgical technologies. This study was made possible by a grant from the National Science Foundation (IIA-1261172). Full analysis of the Piaţă Cetăţii cemetery is supported by collaborations among the University of Massachusetts Amherst, the Institut de Antropologie "Francisc J. Rainer", and the Muzeo Judeţean de Istorie şi Arheologie Maramureş.

DIAPHYSOMETAPHYSEAL PATHOLOGICAL DEFORMATIONS AND EXTRACORTICAL POROSITY IN INFANTS FROM THE DISCALCED TRINITARIAN CONVENT, MADRID

Álvaro Manuel MONGE CALLEJA, Berta MARTÍNEZ, Luis RÍOS, Maria Paz DE MIGUEL, Francisco ETXEBARRIA, Almudena GARCÍA-RUBIO, Ana Luisa SANTOS

Ascribe the causes of infant mortality in the past is a multidisciplinary research topic in which paleopathology could play a decisive role. This work aims to study pathological lesions in infant skeletons accidentally discovered in 2015 during the bioarchaeological prospection performed in the crypt of the Discalced Trinitarian Church in Madrid.
From 111 infants (<1 y.o) found, 12 (10.8%) showed uncommon and exuberant lesions making them the subject of this discussion. The age at death was estimated by long bones length and dental development. After the macroscopic characterization of the lesions (type, location, and measurement), the bones were analyzed microscopically, radiologically, tomographically, and chemically (EDX, XRF). This interdisciplinary analysis will allowed to connect the changes observed on the extracortical porosity with the increases of thickening and to evaluate compositional differences possibly associated with therapeutic procedures.
These infants show three main groups of lesions: Erlenmeyer-flask bone deformities (n=4, 33.3%); cortical thickening due to neoformed bone (n=9, 75.0%); and bilateral fraying and flaring of the metaphysis (n=3; 25.0%). The skeletal ages have a maximum delay of ~4 months in relation to dental development. *Cribra orbitalia* (n=4, 33.3%) and, either ectocranial or endocranial porotic hyperostosis, appeared in half of the individuals.
Despite the large number of skeletons with lesions compatible with rickets in the older children found in this crypt, this could not be conclusively confirmed for the infants under analysis. So, nutritional deficiencies, infectious diseases and comorbidity will be considered in the differential diagnosis. Historiographic data refer to a severe epidemiological situation in the 18-19th century Europe, boosted by the lack of birth control, poor living conditions and hygiene, and overcrowding. Individuals in this crypt appear to be the victims of these environmental and social conditions in Madrid, formerly named “City of death”.
Fellowship FCT – 'Fundação para a Ciência e Tecnologia' SFRH/BD/115691/2016

FIRST RESULTS ON THE STABLE ISOTOPIC ANALYSIS OF THE INDIVIDUALS UNEARTHED NEAR THE LEPROSARIUM OF BARCELONA, SPAIN (12TH-14TH CENTURIES)

Núria MONTES, Clara JÁUREGUI, Maria Eulàlia SUBIRÀ

The hospital of Sant Llàtzer belonged to the assistance network of Barcelona since the Middle Ages until the 20th century. The hospital was established in the 12th century on the verge of the city in order to shelter those suffering from leprosy, but it was rapidly absorbed inside the city grid and a whole neighbourhood grew around it. The archaeological tasks around the chapel of Sant Llàtzer allowed the location of part of the cemetery of the hospital (12th-18th centuries). Most burials belong to the late 13th-14th centuries (52 skeletons), even though according to the documentary sources there were only small groups of patients in the hospital in this period. Both individual and collective burials belonging to the late 13th-14th centuries were located and excavated, in contrast to the individual burials belonging to the former years of activity of the hospital. A preliminary osteological analysis of 66 individuals recovered from this site was carried out (12th-14th centuries). For the diagnosis of leprosy, the criteria established by Boldsen and Freund (2006), Andersen and Manchester (1992), Ortner (2008) and Matos (2009) were used. In addition, bone samples were taken from 31 individuals and 7 animals from the same cemetery for the analysis of stable isotope composition of carbon and nitrogen (δ13C, δ15N). There are significant differences among the δ15N values of the individuals buried in individual graves of the 14th century and the individuals buried in collective graves, suggesting a distinct intake of animal protein. There are also significant differences among the δ15N values of the individuals buried in individual graves of the 14th century and the individuals of the 12th century. The fact that some

parishioners of the chapel of Sant Llàtzer might have been buried in the cemetery of the hospital during the 14th century may explain these results.

FOUR SIMULTANEOUS SHARP FORCE INJURIES WITH SIGNS OF HEALING IN A SKULL FROM THE MIDDLE BRONZE AGE SITE OF AL-ADDEISEH, PALESTINE

Lucia MUÑOZ UGARTE, Nataša ŠARKIĆ, Miriam SAQQA CARAZO

Al-Addeiseh site is a burial cave located in the province of Hebron (Palestine) dating from the Middle Bronze Age where a collective inhumation with prolonged use over time was found. Among the remains recovered stands out a cranium with unmistakable signs of violence over the right parietal and sagittal suture in form of at least four simultaneous sharp force injuries with radiating fractures – two chop marks and two slot fractures - made from behind with a thick-bladed instrument like an axe or a sword. The presence of bone remodelling indicates the survival of the individual to the violent attack. Since no cases of interpersonal violence in the Middle Bronze Age in Palestine have been published so far, finding a skull with signs of intentional trauma is of great importance. However, the fact that this individual survived an attack despite the severe injuries appears to be even more significant, as it reveals some care and treatment from the community.

THE MASS GRAVE IN THE SCHOTTENSTIFT, VIENNA, AUSTRIA - PALAEOPATHOLOGICAL PERSPECTIVES ON A MEDIEVAL MYSTERY

Christina MUSALEK, Michaela BINDER, Karin WILTSCHKE-SCHROTTA, Elfriede Hannelore HUBER

During construction works in the courtyard of the monastery Schottenstift in central Vienna in 2002, the well preserved skeletal remains of 388 adults and children were discovered buried in a mass grave. While the limited number of grave goods indicates an approximate date around 1500AD, the historical background or reason for this mass interment remains unknown due to the apparent absence of any written records pertaining to this event. Using a detailed, systematic palaeopathological analysis including the assessment of evidence of physiological stress, chronic infectious diseases, trauma, and osteoarthritis on a randomly selected sample of 100 individuals (due to financial constraints), this presentation will demonstrate how the osteological data in combination with new research on the historic and archaeological sources is used to shed first light on the identity of the people buried in this mass grave.

DENTAL HEALTH AND DIET OF THE IRON AGE NORTH PONTIC PASTORALISTS

Irina NECHAYEV, Svetlana ANDRUKH, Robert JURMAIN

In the early Iron Age, the steppes toward the North from the Black Sea were occupied by highly mobile pastoral groups, known as the Scythians. Archaeological evidence suggests that by the end of the 5th century BC, at the peak of the economic and political achievements of their society, many of the Pontic pastoral nomads turned to a more settled life. Through the analysis of caries and other dental pathologies, this research investigates how a transition to a more sedentary lifestyle influenced the traditional diet of the steppe population. Our results show an overall fair dental health with low rate of caries, suggesting that Pontic groups continued to have a diet high in protein. At the same time, the presence of large carious lesions in deciduous and permanent dentition, as well as an elevated rate of other dental pathologies, indicates that some social groups within this pastoral community had greater reliance on fermentable carbohydrates.

AN UNUSUAL BI-RITUAL BURIAL OF THE URNFIELD CULTURE IN LOWER AUSTRIA
Friederike NOVOTNY, Ute Michaela SPANNAGL-STEINER, Alexandra C.J. VON MILLER

In the course of a rescue excavation in 2008, an isolated grave containing a cremation and an inhumation were found at Winklarn, Parz 124, Lower Austria. The formal characteristics of the urn fragments and the North-South orientation of the grave suggest a chronological date into the middle Danube Urnfield culture, Hallstatt A1 period (c. 1200-1100 BC). The anthropological examination revealed a sex undetermined adult individual for the cremation and a 18-25 years-old female for the inhumation (von Miller et al. forthcoming).
In addition to different pathological alterations on the skeletal remains of the young female - such as a general shortness of the bones and a bride and wide root of the nose - the absence of the dens axis and a traumatic injury on the cranium are of particular interest. The absence of the dens axis together with intense and porotic altered muscle insertions at the upper limb, which is a possible sign of an atlantoaxial instability, as well as the short stature may be related to a congenital disorder like Down syndrome or Morquio syndrome (Ali et al. 2006, Jain et al. 2016). The traumatic injury located at the frontal bone shows several radiating fracture lines with flaking of the inner table of the cranium. This indicates a trauma at or around the time of death and might be a result of inter/intrapersonal violence.
In summary, this very interesting bi-ritual burial at Winklarn, Parz. 124, stands out from the usual burial customs of the middle Danube Urnfield culture (Wiesner 2009) and raises questions about the state of health of the young woman and her social status within the Urnfield culture society.

VITAMIN DEFICIENCY IN EARLY MEDIEVAL SUB-ADULTS: INDICATIONS FOR METABOLIC DISORDERS IN THE EASTERN ITALIAN ALPS
Alice PALADIN, Daniela TUMLER, Albert ZINK

The diagnosis of vitamin deficiencies, such as scurvy and rickets, in skeletal human remains is still challenging, especially when both nutritional diseases co-occur in a single individual. However, metabolic diseases are of great interest in paleopathology, as they can provide important insights into different factors of past human life, e.g. nutrition, subsistence strategies, and environmental conditions. In a previous study, we were able to present first probable sub-adults scurvy cases from the archaeological site of Castel Tirolo in South Tyrol, Italy, that provided new insights into the health status of the infants living in the Early Medieval Italian Alps. In this work, additional vitamin deficiency cases in sub-adult individuals found in South Tyrol are presented. The studied material derived from the church of Säben-Sabiona (400-700 AD) in the Isarco Valley, in which scattered immature bones were mingled together with adult remains in a crypt (D). Standard anthropological methods were applied to estimate the minimum number of individuals, to evaluate the state of bone preservation as well as the skeletal completeness, and to estimate the age at death. The paleopathological analysis showed that some cranial and post-cranial bones displayed pathological changes, such as abnormal porosity, periosteal new bone formation, and slight distortion of weight bearing bone elements. A differential diagnosis and the direct macroscopic comparison of the observed lesions with the already recorded cases in Castel Tirolo, was performed. In total, at least three infants (6 months-1 year old) showed indications for a possible co-occurrence of scurvy and rickets. These cases further support our previous observation on the presence on vitamin deficiencies in the Early Middle Ages, highlighting a general underestimation of metabolic diseases in Italian paleopathological studies.

PROBABLE SYPHILIS-TUBERCULOSIS COINFECTION IN PARTIALLY MUMMIFIED HUMAN REMAINS - PALEOPATHOLOGICAL STUDY OF AN 18TH CENTURY MIDWIFE'S MUMMY

György PÁLFI, Ildikó SZIKOSSY, Orsolya VÁRADI, András SZEKERES, Kinga KARLINGER, Mark SPIGELMAN, Helen D. DONOGHUE, Frank MAIXNER, Albert ZINK, Olivier DUTOUR, Erika MOLNÁR, Ildikó PAP

Introduction: The Vác Mummy Collection (VMC) stored in the Department of Anthropology, Hungarian Natural History Museum, Budapest, contains large series of well documented, naturally mummified individuals that came to light during reconstruction work at the Dominican Church in Vác, Hungary, in 1994-1995. The VMC contains the remains of 265 individuals, in different state of preservation.
Objectives: To complete morphological and molecular biological studies of a specimen from VMC, in which preliminary studies suggested coinfection of two specific infectious diseases.
Materials & methods: The subject of this research are the partially mummified remains of the late Szabina Orlich midwife (Body 210, Inventory No: 2009.19.133.) from Vác, died in 1755 at the age of 62. She was the wife (and widow) of Antal Fischer chirurg; their naturally mummified bodies are stored in the VMC. Preliminary, PCR-based palaeomicrobiological studies indicated possible TB-infection. In 2018, morphological and paleoradiological re-examination of the remains were carried out. Metagenomic and lipid biomarker studies complete the complex paleomicrobiological research.
Results: Macroscopic morphological studies of the non-mummified bony elements of the lower limbs revealed advanced stage osteo-periosteal lesions and typical osteitis, corresponding to Hackett's criteria in treponematosis. The thickened and deformed tibiae were involved most severely. Less developed alterations were detected in the long bones of the upper limbs. Clustered pits - as earliest phase of *caries sicca* – are visible on the outer surface of the skull vault. Macromorphological studies and medical imaging analyses showed bone alterations due to treponematosis (probable syphilis). Molecular biological analyses indicate the coinfection by *Mycobacterium tuberculosis* complex bacteria.
Conclusion: Multidisciplinary studies of Szabina Orlich' remains confirmed TB infection and bone lesions due to probable syphilis. Both diseases might be related to her and her chirurg husband's profession as well.
Acknowledgement: The support of the Hungarian NKFIH K125561 Grant is acknowledged.

EXTRACTING OBSTETRICAL HISTORIES FROM PELVIC FEATURES

Doris PANY-KUCERA, Ute Michaela SPANNAGL-STEINER, Katharina REBAY-SALISBURY

In the context of the ERC (European Research Council) project 'The value of mothers to society' (VAMOS), we are investigating motherhood in prehistory (Late Neolithic to Late Iron Age, c. 3000–15 BC) through a combined archaeological and anthropological approach. To shed light on prehistoric women's obstetric histories, we assess physical alterations at pelvic bones. In addition, male skeletons are analysed for comparison. In this study, we focus on seven selected structural alterations at pelvic bones: 1. the preauricular sulcus, 2. marginal exostoses at the auricular surface of the sacroiliac joint, 3. the auriculate extension at the sacrum, 4. an extended pubic tubercle at the pubic bone, 5. pitting at the dorsal surface of the pubis, 6. lesions and exostoses at the ventral pubic surface and 7. the *margo auricularis* groove at the sacrum. These alterations may be associated with prolonged stress during pregnancy and/or the spontaneous strain of childbirth. Different expressions of the features are systematically recorded, and pathological conditions possibly influencing the features are noted. Based on 250 adult males and females from several Bronze Age sites in Austria, it became evident that the combination of all features only occurred in females. However, due to the partially fragmentary state of preservation of the pelvic bones, in many cases not all features were present for evaluation. Therefore, we attempt to create a formula to standardise the variables and weigh the features in order to assign each individual a

'parity value' that can subsequently be compared with other skeletal samples and the archaeological record.
ERC-Starting Grant Project No. 676828, VAMOS, PI Katharina Rebay-Salisbury

A TUMOUR SUPPRESSOR GENE VARIANT PREDISPOSING TO COLORECTAL CANCER FOUND IN A MUMMY FROM THE PRE-INDUSTRIALIZED ERA OF HUNGARY

Ildikó PAP, Israel HERSHKOVITZ, Ella H. SKLAN, Gila Kahila BAR-GAL, Ildikó SZIKOSSY, Rina ROSIN-ARBESFELD, Michal FELDMAN

Mutations of the Adenomatous polyposis coli (APC) gene are associated with the development of colorectal adenomas and carcinomas. While extensively studied in modern populations, reports on visceral tumours in ancient populations are rare. To the best of our knowledge, genetic characterization of mutations associated with colorectal cancer in ancient specimens has not yet been described. We have obtained a total of 51 samples from 20 naturally mummies come from the pre-industrialized era Hungary. The Vác Mummy Collection (VMC) is stored and curated in the Department of Anthropology of the Hungarian Natural History Museum, in Budapest, Hungary. The collection contains 265 naturally mummified, partially mummified and skeletal specimens excavated from forgotten crypts in the Dominican church in Vác, Hungary in 1994 and 1995. The crypts were used continuously for burials of several middle-class families and clerics, from 1731 until 1838. Our aim was to find evidence of the existence of genetic predisposition to colorectal cancer in the pre-industrialization era by sequencing of "hot spots" in the APC gene. Three such sequences were amplified and sequenced from 3 different mummies from the VMC. In two cases wild type APC sequences were found, and a colorectal cancer predisposing mutation (E1317Q missense mutation) was discovered in a sample of an adult female. Our data suggests that this genetic predisposition to cancer already existed in the pre-industrialization era. This pioneer study opens gates for further investigations from different periods and geographical locations to obtain a more accurate picture of past cancer epidemiology and cancer evolution.
Research was supported by: Dan David Foundation; The Tassia and Dr. Joseph Meychan Chair of the History and Philosophy of Medicine. Feldman M, Hershkovitz I, Sklan EH, Kahila Bar-Gal G, Pap I, et al. (2016): PLOS ONE 11(2): e0147217. https://doi.org/10.1371/journal.pone.0147217

THE TIME BEFORE LORDOSIS: WHAT IMMATURE VERTEBRA CAN TELL US ABOUT CHILDREN IN HISTORICAL TIMES?

Ruth PELLEG-KALLEVAG, Hadas Leah AVNI, Samuel FRANCIS, Hila MAY

Studying the skeletal remains of children is a frustrating task. This is not just because the bones and skulls are in most cases fragmented, but also because the information that can be deduced from the better-preserved bones is meager. The aim of the current study was to reveal the association between lumbar vertebrae characteristics and spinal curves in children. This may provide insight to growth and development issues in past populations never possible before, such as: the age children gained the ability to walk. Computed tomography (CT) scans of the spine of 100 children, ages 0-18 years were included in the study. Three-dimensional models of the spine were created via Amira (v.6.0). Measurements of the lumbar vertebrae included width, height, and length and were carried out in Philips portal. The shape of the lumbar curvature was captured by 12 landmarks, placed in the middle of the spinal canal. Two-block partial least squares analysis was carried out to examine the association between the shape of the curvature and vertebral characteristics.

STRESS MARKERS IN TEETH - SIGNALS OF PREHISTORIC LIFESTYLES?
Kristina PENEZIĆ, Marko PORČIĆ, Jelena JOVANOVIĆ, Petra Kathrin URBAN, Ursula WITTWER-BACKOFEN, Sofija STEFANOVIĆ

New research into the Neolithic way of life in the Central Balkan area shows that this period showed an increase in various forms of physiological stress (e.g. disease, malnutrition). By using the method of tooth cementum annulation (TCA) analysis we want to widen this knowledge by adding the microscopic line of evidence.
Many studies employing the TCA method noted lines that differed from the others in width and appearance. These unusual bands formed as a response to episodes of physiological stress most probably related to calcium metabolism, and are referred to as stress-bands. Given the changes in health between the Mesolithic and the Neolithic communities in the Central Balkan area, we are looking into the difference in the frequency of physiological stress bands between these two populations. The TCA method is applied to a sample of Mesolithic (9000 - 6400 calBC) and Neolithic (6200 - 5300 calBC) individuals from the Central Balkans. Preliminary results are showing that the patterns of stress layers conform to the expectations - the average number of stress layers is higher in the Neolithic group. In this way, the tooth as sometimes most durable osteological material can provide insight into the physiological state of the individual.

CONE-BEAM COMPUTED TOMOGRAPHY IN PALEODONTOLOGY AND BIOARCHAEOLOGY
Bojan PETROVIĆ, Kristina PENEZIĆ, Marko PORČIĆ, Jugoslav PENDIĆ, Sanja KOJIĆ, Jelena JOVANOVIĆ, Sofija STEFANOVIĆ

Cone-beam computed tomography (CBCT) is a new technology in the field of intraoral imaging which allows 3D visualization of the areas scanned. The aim of our study was to assess the capabilities of CBCT in assessment of dental status, crown and root morphology, dental pathologies, tooth wear and enamel hypoplasia in a sample of 117 teeth from Mesolithic (9000 - 6400 calBC) and Neolithic (6200 - 5300 calBC) individuals from the Central Balkans. The study was carried by CBCT imaging of one root teeth placed in wax rim and stone cast to obtain digital images and 3D reconstructions for odontological assessment. All of the 117 teeth examined showed morphological similarity, similar color, shape, mesio-distal ratio and the presence of significant tooth wear. A few specimens displayed signs of radicular and apical pathology and infractions. In 17 teeth the presence of multiple root canals has been confirmed. Enamel hypoplastic defects were clearly observed and accurate measurements performed in order to evaluate the severity of hypoplasia. The use of CBCT supports the information obtained from archaeological, anthropological and DNA investigations. It would seem that there is potential for significant development to be made in the research of paleodontological material using noninvasive techniques such as CBCT that could play a crucial role in the investigation of bioarchaeological remains.

RECONSTRUCTION OF NEW ANCIENT *MYCOBACTERIUM LEPRAE* GENOMES FROM EUROPE
Saskia PFRENGLE, Judith NEUKAMM, Sarah INSKIP, Rezeda TUKHBATOVA, Nataliya BEREZINA, Alexandra BUZHILOVA, Stian SUPPERSBERGER HAMRE, Vitor MATOS, Maria Teresa FERREIRA, Ella REITER, Johannes KRAUSE, Verena SCHUENEMANN

Leprosy is one of the oldest known diseases in human history with the so far oldest recorded osteoarchaeological possible cases around 3650 BC. Molecular biological approaches, such as ancient DNA research focusing on the causative agent, *Mycobacterium leprae*, can greatly contribute towards understanding the evolutionary history of the disease. Previous genetic studies of ancient *M. leprae* genomes and their comparison with modern ones has identified genomic continuity over the last 1000 years and the existence of at least two lineages in medieval Europe. However, the ancient genomes published so far are restricted to the region of North-

Western Europe. Current data may not reflect the diversity potentially present in other parts of medieval Europe. In this study, we address this bias through the genetic examination of several medieval and post medieval samples from regions that have not yet been studied. Up to now three new ancient *M. leprae* genomes from these regions have been reconstructed: two medieval genomes from Portugal (1340 ± 48 AD) and Norway (1328 ± 60 AD) and a genome from Russia dated to the 19th-20th centuries. The phylogenetic analysis of these genomes, including previously published modern and ancient genomes, reveals that the genomes from Portugal and Norway are falling on branch 3. The genome from Russia falls on branch 2F and clustering with modern Ethiopian strains. Overall, our results contribute to a better understanding of the past diversity of leprosy in Europe by adding genomic data from so far unstudied regions.

PALEOPATHOLOGICAL INVESTIGATION OF HUMAN MUMMIES FROM GANGI, SICILY
Dario PIOMBINO-MASCALI, Mark VINER, Gerald CONLOGUE, Ronald BECKETT

The historical town of Gangi is located on the Madonie Mountains of Sicily, Italy, 1.011 meters above sea level. There, the mother church, dedicated to Saint Nicholas of Bari, holds an assemblage of mummified remains of religious dignitaries dating from the 18th and 19th centuries AD. These bodies are located in two large rooms adjacent to the crypts of the building. Access to them is granted by a stair located on the right-hand side of the church, in the proximity of the main altar. Past an entrance hall, a first room contains mummies, mostly located inside wall niches. There, two passageways lead to a back room, where an additional number of bodies are displayed. The large majority of such mummies are seen in an upright stance; two mummies, in contrast, are located inside wooden coffins. An additional six coffins that could not be inspected are located along the high ledges that are situated above the niches. Interestingly, at least 41 of these mummies show a peculiar treatment of the face, mostly consisting of its overmodeling with wax. This was at times roughly made in the form of partial reconstruction of the features. However, some specimens showed a proper wax mask, at times colored to obtain a more realistic appearance. Within the framework of the Sicily Mummy Project, 36 out of the visible 60 mummies were radiographed in January 2015. This revealed a large number of pathological conditions. This paper is aimed at describing those findings within the historical and cultural context of late modern Sicily.

CONTINUITY OR DISCONTINUITY OF THE LIFE-STYLE IN CENTRAL EUROPE DURING THE LATE ANTIQUITY AND EARLY MIDDLE AGES TRANSITION: HEALTH, DIET, AND BIOLOGICAL ADAPTATION
Janusz Andrzej PIONTEK

The aim of the research is to describe the biological status of human populations inhabiting the Odra and Vistula basin since the late antiquity to the Middle Ages, and the reconstruction of their living conditions. The research is supposed to contribute to the positive/ or negative verification of the hypothesis put forward by some historians and archaeologists, saying that the low level of economy and general living conditions could be considered a distinctive feature of the Slavic culture, regardless of the time and place of its development. The research concerned the following tasks: (a) an analysis of the prevalence of determinants of environmental stress in populations inhabiting the Odra and Vistula basins since the late antiquity to the Middle Ages, (b) a comparative data analysis of the frequency of stress determinants in European populations, (c) an attempt to reconstruct living conditions and biological condition in the period of deep socio-economic and cultural transformation in the late antiquity and the early Middle Ages. On the basis of the following biological survey: (a) inter-population diversity, (b) paleodemographic analysis, (c) individual reactions to living conditions, (d) physical activity, (e) sexual dimorphism, (f) paleopathological analysis, and (g) analysis of paleodiet, etc., it was found the similar level of adaptation of human groups to living conditions in Central Europe of the late antiquity and early

Middle Ages. Our findings are consistent with the results obtained by other anthropologists, who had compared biological characteristics of human communities living in the late antiquity and the early Middle Ages on the territories of the present-day Poland, the Czech Republic and Croatia, at the individual and population level.

"BRING OUT YOUR DEAD!": DIFFERENTIAL STRATEGIES FOR DEALING WITH THE DEAD AT MEDIEVAL THORNTON ABBEY

Caterina RAFFONE, Katie HEMER, Hugh WILLMOTT

Thornton Abbey, Lincolnshire, UK was founded by the Augustinian order during the early 12th century AD. Excavation at the Abbey since 2011 has revealed two burial areas which were in use during the 14th century; one area was associated with the Abbey's medieval hospital, whilst a second burial area unusually consists of a mass grave containing the remains of a mixed population (n=48), all of whom were buried simultaneously. The number of individuals interred in the mass grave suggests that burial arose as the result of a single catastrophic event. Indeed, historical accounts from the mid-14th century report that the Black Death had a devastating impact upon the rural population of Lincolnshire at that time suggesting that this mass grave might represent the remains of those who died from the plague. In seeking to identify diagenetic evidence from the immediate post-mortem period indicative of different strategies for dealing with the plague-dead in comparison to the hospital-dead, we undertook a histological analysis of 30 femoral diaphyses (15 samples from the medieval hospital/15 samples from the plague pit) and compared the degree of bacterial bioerosion between the two burial populations. This paper presents the results of our analyses which demonstrate that the Oxford Histological Index scores assigned to the two burial populations were significantly different and variable (Hedges et al. 1995; Millard 2001). The results indicate that different strategies were employed for dealing with those who died during the catastrophic plague in comparison to those who died as inmates of the hospital.

HYDROCEPHALUS IN A CHILD FROM NUŠTAR

Petra RAJIĆ ŠIKANJIĆ, Dejana NIKITOVIĆ, Anita RAPAN PAPEŠA

A case of a hydrocephalus was identified in early modern age cemetery located around the chapel of St. Anna in Nuštar, eastern Croatia. Skeletal remains belong to a child younger than 1 year. Abnormal and enlarged morphology and increased cranial capacity are indicative of the hydrocephalus. Along with enlarged cranium, macroscopic analysis of the remains revealed set of lesions both on the skull and the long bones. In our study we focus on changes on both cranial and postcranial remains in order to better understand anatomical and behavioural consequences of hydrocephalus. We will include a thorough differential diagnosis of pathological features in order to establish their relationship to hydrocephalus. Furthermore, the observed case will provide additional information about the health conditions in the community from Nuštar, given that despite its condition, the child was buried along other members of the community.

POSTMORTEM MEDICAL PROCEDURES IN INDIVIDUALS FROM A PORTUGUESE IDENTIFIED SKULL COLLECTION (1895-1902 AD): FIRST EVIDENCE OF POSSIBLE TEACHING OF MODERN DACRYOCYSTORHINOSTOMY

Rosa RAMOS GASPAR, Ana Luisa SANTOS, Inês LEANDRO, Inês OLIVEIRA-SANTOS, Bruno Miguel MAGALHÃES

An increasing number of skeletal individuals with signs of ante-, peri- and postmortem medical procedures were reported during the past two decades mainly in Europe and USA. This study aims to identify and distinguish these procedures in individuals who died in Portuguese hospitals

(1895-1902AD). The Medical Schools Skull Collection comprises 585 identified individuals (343 from Lisbon, 95 from Porto, and 147 from Coimbra), 220 (37.6%) from females (aged 14-95y.o., $\bar{x}$=49.23) and 365 (62.4%) from males (aged 11-92y.o., $\bar{x}$=48.83). Skulls were macroscopic observed and the doubtful cases were evaluated radiologically (CT scan and conventional radiology). Eleven individuals (1.9%) show evidence of postmortem medical procedures. Circumferential craniotomy was performed in eight adults (six males, two females), whose cause of death was pulmonary tuberculosis (n=3), diffuse inflammation of the left hand (n=1), cardiac lesion (n=1), cerebral apoplexy (n=1), and two undetermined. As these individuals died in university hospitals, it is difficult to understand whether the postmortem examination was part of medico-legal autopsy, medical teaching, or both. Signs of dissection/prosection are observable in three other males: a quadrangular hole in the nasolacrimal duct of a 69-year-old (cause of death-senile cachexia), part of the frontal bone was removed and the left maxillary sinus was cut open in a 56-year-old (cause of death-cerebral apoplexy), and the zygomatic process of the left temporal bone was removed in a 82-year-old (undetermined cause of death). Dissection of the sinuses and zygomatics for anatomical teaching is rarely found in skeletal remains. This work presents the first known evidence of possible teaching of modern dacryocystorhinostomy, a surgery to drain the lacrimal sac which evolved at least from Celsus recommendations in the 1st century AD to the modern techniques of the 20th century. Recent studies have greatly contributed to the knowledge of surgery and medical teaching since the birth of modern medicine.

ANCIENT PARASITES IN THE MEDITERRANEAN BASIN: REVIEW AND NEW DATA

Kévin ROCHE, Matthieu LE BAILLY, Isabelle JOUFFROY-BAPICOT, Olivier DUTOUR, Alain BOUET

Paleoparasitology is the study of parasitic remains in ancient materials, be they soil samples, paleofeces, mummies... Those studies have mainly leaded on the recovery of microscopic eggs of helminths. Since the very first observation of such remains in 1910, a number of studies have completed our understanding of parasitosis in ancient human societies, despite a lack of human remains or pathological signs on bones. A very small number of infectious pathologies are able to let osteological lesions, and parasitic infestations are not seen among them. Therefore, paleoparasitology allows us to take into account those virtually invisible pathologies in the fossil record.

In the Mediterranean basin, paleoparasitological studies were mainly conducted in Cyprus, Israel, and France, and more slightly in Italy, Portugal and Spain. After having quickly reviewed data currently avaliable in the published literature regarding the ancient Mediterranean Basin, this talk will evoke our unpublished microscopic observations of helminthiases in 4 ancient urban centers: Baelo Claudia (Mainland Spain), Pollentia (Mallorca island), Kardamena (Kos island) and Delos (Delos island). We show how common parasites seem to have worldwide plagued such ancient settlements, despite what appears to be high sanitary standards, from one side of the graeco-roman empire to the other.

We finally present our preliminary results outside the previous kind of highly anthropic context. We searched for parasitic eggs in a peatbog core from Asi Gonia, Crete. Understanding past and current environmental changes caused by natural or human process are of crucial interest. We show how the observed parasitic biodiversity can be used here to track past environmental changes combined with previous high-resolution multiproxy analyses.

PHYSICAL BURDEN AND LOWER LIMB BONE STRUCTURE FROM THE TERMINAL PLEISTOCENE TO HOLOCENE, LEVANT

Victoria ROUL, Hadas Leah AVNI, Samuel FRANCIS, Hila MAY

It has long been suggested that the transition to a sedentary mode of life (ca. 15,000 years ago) impacted human physical characteristics due to changes in occupation, mobility, nutrition and health. How much of this notion is evidence based? In the current study we aimed to follow

changes in femoral geometric properties (i.e., cross-sectional geometry of the femoral diaphysis) throughout the Holocene Levant. For this purpose, we studied 185 femora of the following populations: 32 Natufian hunter-gatherers, 67 Pre-pottery early farmers, 45 Chalcolithic farmers, 18 Byzantine individuals, and 23 Late Arab individuals. Cross-sectional images of the midshaft were obtained from CT scans and the geometric properties were measured using dedicated software. Our results suggest two trends: a decline in the relative amount of bone tissue as a result of medullary cavity expansion, and an increase in the circularity of the bone. These geometric modifications can be linked to an ongoing reduction in physical burden during the Holocene Levant. Interestingly, based on changes in femoral midshaft relative to cortical thickness, a reduction in nutrition quality may be suggested.

GROWING UP BETWEEN WARS AND EPIDEMICS: TEETH ALTERATIONS IN AN INDIVIDUAL FROM THE S. FRANCISCO CONVENT OF COIMBRA (19TH CENTURY, PORTUGAL)

Ana Isabel RUFINO, Maria Teresa FERREIRA, Sofia WASTERLAIN

An excavation conducted in 2011 in the surroundings of the Convent of São Francisco (Coimbra, Portugal) allowed the recovery of 601 skeletons of adults and non-adults of both sexes. These probably belong to individuals that died during the first decades of the 19th century, a period of intense mortality in the region due to several wars (Napoleonic invasions and Portuguese civil war) and epidemics (such as cholera morbus and typhus). This presentation describes and makes the differential diagnosis of the unusual dental alterations observed in a young adult male. Twenty-four teeth (13 upper, 11 lower) are present and observable. The two first molars were lost ante-mortem. The left lower central incisor was absent due to possible agenesis. Teeth alterations include marked hypoplastic lesions in the occlusal surface of the first molars, and incisal notches in the two upper central incisors. Eleven anterior teeth present linear enamel hypoplasia. Periapical x-rays revealed normal pulp chambers both in incisors and molars although radicular alterations were found, such as shortened lateral incisors – also observed macroscopically – and bulbous roots in the first molar. Differential diagnosis includes amelogenesis imperfecta, dentinogenesis imperfecta and enamel hypoplasia due to metabolic disorders. Since no abnormalities in the pulp chambers or skeletal lesions were observed, dentinogenesis imperfecta does not seem a probable diagnosis. The remaining hypotheses can be considered for this individual: either a genetic or a metabolic origin may explain the observed alterations in the teeth morphology. This case study highlights the complexity of working with human remains from archaeological contexts, since no clinical records are available and postmortem alterations can impair a correct observation of the pathology.

SLAVES' DIET: DENTAL CARIES AND WEAR IN A SAMPLE OF AFRICAN INDIVIDUALS FROM VALLE DA GAFARIA (15TH - 17TH CENTURIES, LAGOS - PORTUGAL)

Ana Isabel RUFINO, Maria Teresa FERREIRA, Sofia WASTERLAIN

The study of human remains from archaeological context is a source of invaluable information to infer cultural and social behaviours of past populations. This investigation analyses the oral pathology – namely dental caries, ante-mortem tooth loss and tooth wear – in a skeletal sample from the Valle da Gafaria in Lagos, Portugal (15th-17th centuries). The context of inhumation and archaeological artefacts, their morphometric traits, along with the presence of intentionally modified teeth suggests they were African slaves. Eighty-one adult individuals of both sexes were analysed (19 males, 49 females and 13 of unknown sex), in a total of 2285 alveoli and 2063 teeth. Dental caries and ante-mortem tooth loss was recorded following Hillson (2001) whereas dental wear was registered according to Smith (1984). Dental caries affected 52.0% of the teeth, although only 31.9% were cavitated lesions. In all, 78 individuals presented at least one cariogenic lesion. Tooth loss during life occurred in 31 individuals, totalizing 2.0% of the dental sample. Occlusal dental wear was moderate, with a mean grade of 3.01. These findings suggest that these

individuals might have had a dietary pattern of mild to moderate consistency and abrasiveness, with some degree of cariogenicity. The contextualization of the results with historical sources allows a unique appraisal of the subsistence patterns and living conditions of these witnesses of the early north Atlantic slave trade. However, one must emphasize that the non-specific nature of some of these alterations are important limitations to such paleopathological studies.

A LUNG NODULE AS A RICH SOURCE OF HOST AND PATHOGEN DNA: ANALYSIS OF A 17TH CENTURY *MYCOBACTERIUM TUBERCULOSIS* GENOME FROM LUND, SWEDEN

Susanna Jacey SABIN, Alexander HERBIG, Åshild J. VÅGENE, Torbjörn AHLSTRÖM, Gracijela BOZOVIC, Elizabeth A. NELSON, Caroline ARCINI, Kirsten I. BOS

Questions persist regarding the origin of tuberculosis as a human pathogen. Based on analysis of modern *Mycobacterium tuberculosis* complex (MTBC) genomes, one hypothesis suggests their most recent common ancestor (MRCA) followed human Pleistocene migrations out of Africa ~70,000 years ago. However, studies using ancient genomes to calibrate the molecular clock have indicated a much younger MRCA date of less than 6,000 years. The difference in estimated ages is complicated by evidence for tuberculosis from paleopathology and PCR-based paleogenetics that pre-dates 6,000 ya. Collecting more ancient genome data to address this problem is complicated by the stochastic nature of pathogen DNA preservation and the abundance of closely related, non-pathogenic mycobacterial species in burial environments. These microbes can obfuscate genetic traces of *Mycobacterium tuberculosis* in ancient remains and complicate downstream analysis, making reliable genomic reconstruction difficult. Here we aim to help resolve the discrepancy between the proposed ages of the MTBC by analyzing a calcified lung nodule from the mummified remains of Bishop Peder Winstrup of Lund (b. 1605 – d. 1697), which offered a unique opportunity to generate a high-quality, high-coverage *Mycobacterium tuberculosis* genome free of substantial contamination by environmental mycobacteria. The lack of genetic noise from closely related species makes this genome an optimal calibration point for the historical phylogenetic reconstruction of the MTBC. The shotgun sequenced data demonstrated robust preservation of human DNA, which made up 64.16% of the total metagenomic reads after quality filtering. Reads aligned to the reconstructed ancestral genome of all extant tuberculosis strains made up 0.041% of the reads after quality filtering. A custom-designed in-solution capture method allowed us to reconstruct a 141-fold coverage genome of *Mycobacterium tuberculosis*. This study shows the promise of lung nodules as a source for MTBC DNA, and contributes a new, high-quality calibration point for the dating of the MTBC.

BIOMECHANIC OF FOOT WITH BIPARTITE MEDIAL CUNEIFORM IN MEDITERRANEAN SERIES

Eduardo SALDIAS, Assumpció MALGOSA, Albert ISIDRO

Bipartite medial cuneiform (BMC) is a very rare anatomical variant, which have been described in the clinical, anatomical and paleopathological bibliography, with a low incidence of cases. In our study, we analyzed the presence of BMC in 445 pairs of feet from 13 bioarchaeological collections from the Western Mediterranean area (dated between the II to XVII century AD) localized in Spain and Italy; we also added one series from the Sultanate of Oman (3700-3400 BC). Besides, 32 individuals belonged to a contemporary collection from Granollers, located in the province of Barcelona, Spain, were observed. We found two cases, which developed partial and complete bipartition of the cuneiform, one of them, with an unusual vertical segmentation which is not previously registered in the literature.
The different degrees of segmentation of the medial cuneiform were interpreted under descriptive and biomechanical parameters in the gait, contrasting with similar reported cases previously documented, included associated pathologies observed in our morphological analysis. According to the clinical bibliography, the bipartite medial cuneiform diagnosis mainly is related

with high sport stress and incidental findings, which make difficult to know the real frequency in the population. Therefore, in live individuals and depending of its bone separation degrees and physical activity involved, BMC could affect the normal gait, producing an alteration on the joint configuration and structure of the adjacent foot bones.

INVESTIGATING HEALTH AND DIETARY PATTERNS BETWEEN INLAND AND COASTAL 17TH AND 18TH CENTURY POPULATIONS FROM FINLAND

Kati Hannele SALO, Dimitra Ermioni MICHAEL, Elissavet DOTSIKA

The palaeopathological record (i.e. dental diseases, hematopoietic conditions) combined with stable isotope technique, can be used in order to assess diet in past populations through a multi-disciplinary approach. Therefore, the present study aims to implement the above mentioned methodology to various populations (coastal vs. inland) from Finland dated mainly between the 17th and 18th centuries A.D. The basic aims of the present study are: 1) to infer possible dietary differences between coastal and inland sites, 2) to assess possible dietary differentiations between the two sexes, and to 3) combine the isotopic results with the previous palaeopathological research results and collected data on dental disease, metabolic conditions etc. Until now 22 human samples have been isotopically analyzed, 12 deriving from inland sites (Renko) and 10 from coastal ones (Porvoo and Hamina). Interestingly, human collagen values between coastal and inland populations differ significantly for both δ13C coll and δ15N isotopes; (inland: δ13C coll : -19.4 ± 0.5‰; coastal: δ13C coll : -18.6 ± 0.9 ‰; t-test: -2.335; p-value: 0.030; inland: δ15N : 9.8 ± 0.9‰; coastal: δ15N : 11.9 ± 0.8 ‰; t-test: -5.761; p-value: 0.00); possibly suggesting that individuals in coastal sites actually consumed more marine items in relation to the ones deriving from inland territories. Moreover, males present more positive carbon values in relation to females and the difference is almost statistically significant, even though the same differentiation is not observed in the nitrogen results. However, safe conclusions cannot be reached without the completion of the isotopic analysis; which is expected to be finished in the summer and thus presented at the conference; allowing us to combine the palaeopathological data with the stable isotope ones.

SINES ON THE ROUTE BETWEEN AFRICA AND THE AMERICAS: SKELETAL AND DOCUMENTAL EVIDENCE

Ana Luisa SANTOS, Sónia SOARES, Sónia FERRO, Paula ALVES PEREIRA

During the requalification of the historical center of Sines (Alentejo, Portugal), in 2013, an excavation was carried out in an area between the Castle and S. Salvador Church, built in the Medieval period. Thirty-nine primary burials and commingled bones, dating between the 13th-17th centuries AD, were excavated. This work aims to analyses the 24 adult skeletons, from both sexes, in terms of pathology, intentional dental modifications by type of burials and grave goods.
The individuals were observed macroscopically and the differential diagnoses of the lesions are discussed. Among the pathological conditions are congenital and joint problems, and trauma. Historical documents revealed that after the 13th century AD, Sines became an important national and international shipping port and was part of the transatlantic trade. Moreover, there are records about the existence of both slaves and freedmen and freedwomen in the region. This fact could explain the intentional modified teeth in a male individual. The presence of individuals of African origin has been demonstrated in other parts of Portugal. Coins from Mexico, Peru, Portugal, and Spain were found associated with burials, confirming the international maritime voyages. Furthermore, parish registers of births and deaths and notarial records mentioned foreigners in Sines.
The body position and orientation of the individuals are according to Christian practices. However, two female individuals were buried in atypical positions, one with stones over the head and the other with feet bent.

These preliminary results had shown the multiculturalism of Sines during the period of Portuguese maritime expansion, with persons from different origins and religions living and/or being buried in the graveyard of S. Salvador Church.

MEDIAEVAL AND CONTEMPORARY CERVICAL SPINE - PALEOPATHOLOGICAL AND CLINICAL RESEARCH

Snježana SCHUSTER, Mario ŠLAUS, Matej MUSTAPIĆ

Contemporary scientific understanding of the distribution of specific degenerative changes identified in the skeletal remains of the human spine is based on paleopathological and biomedical analyses of the locomotor system, focusing mainly on clinical anthropological analysis of pathological changes of the function-anatomical and biomechanical relation on cervical spine for clinical assessment and intervention. The purpose of this research was to establish the frequency and distribution of pathological changes of the cervical human spine of mediaeval and contemporary Croatian population samples, as well as to observe the possible influences on the occurrence of these specific changes with respect to mediaeval and modern way of life. Indicators of such changes include Schmorl's nodes and osteophytes. Anthropological analyses (macro-morphological methods) were conducted at the Anthropological Centre of the Croatian Academy of Sciences and Arts. A total of 608 vertebrae, all dating from the 7th-9th century AD from 3 Dalmatian archaeological sites: Radašinovci-Vinogradine, Velim-Veliš̌tak i Nin-Ždrijac were included in the research. In addition to the previous, 600 vertebrae representative of the contemporary population were obtained from the Diagnostic and Intervention Radiology Department at University Hospital Centre "Sisters of Mercy " in Zagreb by means of radiological examination (CT scan). Statistical analysis was performed using descriptive and inferential methods (chi-square test, t-test), with statistical significance of $P < 0.05$. The results of the research in mediaeval samples show a total absence of Schmorl's nodes in cervical vertebrae, while the presence in contemporary Croatian cervical samples is 39%. In contemporary Croatian samples presences of osteophytes is 100% and in mediaeval samples 29.4%. This research leads to considering a new approach in clinical anthropology according to differences in cervical pathological changes on medieval and contemporary samples. It seems that changes on contemporary cervical vertebrae samples are results of modern - sedentary way of life.

RECONSIDERING PALEOEPIDEMIOLOGICAL INVESTIGATIONS IN PALEO-ONCOLOGY, WITH REFERENCE TO MEDIEVAL POLAND

Thomas SIEK

Paleo-oncology refers to the study of neoplasms and cancers in bioarchaeology. Using information gained from human skeletal remains, paleopathological research has established an antiquity for cancers and other neoplasms. However, paleoepidemiological investigations into neoplastic disease have been less frequent. At present there have been few studies, which have been performed with limited effectiveness. They remain independent entities of scholarship, differing in their methods and analysis. This presentation will reconsider paleoepidemiological, and by extension paleopathological, investigations into neoplastic disease and attempt to bring these lines of bioarchaeological scholarship together. This will be first accomplished with a systematic review of bioarchaeological scholarship in neoplastic disease. The systematic review will be a double-pronged endeavour in that, it will fill a gap in the bioarchaeological literature by examining how paleopathology has approached neoplastic research, and will filter out and scrutinise past paleoepidemiological studies. This will then lead to a paleoepidemiological investigation, which will be conducted with reference to Medieval Poland, and will be aimed at exemplifying and incorporating a more standardized paleoepidemiological investigation into paleo-oncology. The systematic review revealed that paleo-oncological scholarship is dominated by case reports and identified less than ten enquiries into neoplastic prevalence. It also showed that previous

paleoepidemiological studies did not often use proper methodology to interpret their results. As they did not provide enough detail regarding the assemblage's demographic profile, these studies preclude themselves from any in-depth comparison. The methodology used in the paleoepidemiological investigation proved effective when comparing urban and rural assemblage types, in regard to neoplastic prevalence. These methods will form the basis of proposed protocols for future paleo-oncological research regarding paleoepidemiological investigations and offer suggestions for future research venues into neoplastic disease.

THE CHALLENGES OF BIOMOLECULAR PALEOPATHOLOGY

Václav SMRČKA

The biomolecular paleopathology, examines skeletons of past populations for traits of diseases at the molecular level, where there are no macroscopic skeleton changes. It uses methods based on trace element, stable isotopes and DNA analysis. Development to that new field from my point of view is presented.
In terms of the study of trace elements in bone tissue, we were the first in the Czech Republic to work on diet reconstructions of prehistoric peoples using 33 trace elements, especially Zn, Sr and Pb. The study resulted in the detection of premature osteoporosis at the age range of 20-30 years, not only in women but also in men, in connection with developed agriculture due to excessive fiber intake from cereal bran. At the same time, a map of lead contamination in the Roman Empire was created.
Stable isotopes of C and N were used for further specification of the diet reconstructions of the first farmers in Vedrovice and Těšetice who came to South Moravia 5300 years BC. Migration waves of the Neolithic era to Moravia were documented by using stable strontium isotopes.
With analysis plague cemetery without macroscopic signatures, we participated in a Europe-wide study of population genetics of migrations based on the principles of genomic analyses proved the expansion to Europe and evolution of plague.
In conclusion, it can be said that the field paleopathology holds further significant potential for the future in the development of a new field - biomolecular paleopathology.

RARE MANIFESTATIONS OF SPINAL TUBERCULOSIS IN THE ROBERT J. TERRY ANATOMICAL SKELETAL COLLECTION (NATIONAL MUSEUM OF NATURAL HISTORY, SMITHSONIAN INSTITUTION, WASHINGTON, DC, USA)

Olga SPEKKER, David R. HUNT, Orsolya A. VÁRADI, William BERTHON, György PÁLFI, Erika MOLNÁR

Today, osteoarticular tuberculosis (TB) is a rare extra-pulmonary manifestation of TB, developing in about 1–3% of patients. Although any part of the skeleton can be affected by tuberculosis, the spine represents the most common site of involvement (~50%). Spinal TB or tuberculous spondylitis typically affects two or more contiguous vertebrae, predominantly in the lower thoracic (40–50%) and upper lumbar (35–40%) regions. In the minority of patients (less than 10%), multi-level non-contiguous involvement occurs. By the location of lesions in the vertebra, five main types of spinal TB can be distinguished: paradiscal, central, anterior subligamentous, posterior, and articular forms, with the first being the most common type (90–95%). In the palaeopathological literature, the majority of the described spinal TB cases represent the paradiscal form affecting two or more contiguous vertebrae in the thoracolumbar region. The aim of our paper is to provide three example cases of known age at death, sex, and cause of death from the Terry Collection that show vertebral alterations indicative of rare manifestations of tuberculous spondylitis, and to interpret the observed lesions with regard to their diagnostic value in the palaeopathological practice. Terry No. 468 (23-year-old, male, died of pulmonary and spinal TB) exhibited bony changes presumably attributed to the anterior subligamentous form, whereas Terry No. 902 (c. 36-year-old, male, died of pulmonary TB) very likely represents the

articular and anterior subligamentous types. The vertebral lesions recorded in the skeleton of Terry No. 1124R (49-year-old, female, died of pulmonary TB) are suggestive of the paradiscal form with multi-level non-contiguous involvement. Our paper provides palaeopathologists with a stronger basis for identifying tuberculosis in ancient human remains that reveal unusual vertebral alterations resembling that of our cases; and therefore, with a more sensitive means of assessing TB prevalence in past populations.
This research has been supported by the grant no. K 125561 of the National Research, Development and Innovation Office.

A ONE-EYED SOLDIER FROM EL-DETTI, SUDAN?
Magdalena T. SRIENC

The tumulus cemetery of el-Detti is located on the Nile 13 km downstream from Karima and 7km upstream from el-Zuma in Sudan and was excavated by the Polish Centre of Mediterranean Archaeology, University of Warsaw in cooperation with the National Corporation for Antiquities and Museums in Sudan from 2014 to 2015. The site is dated to the Early Makuria period (4th-6th century CE) and a total of seven tumuli were excavated. All tumuli had similar superstructures with one chamber containing grave offerings to the side of the burial shaft, and a characteristic depression at the top left by the looters' hole. There were only single burials present at the cemetery and contained both men and women, and the grave goods discovered in the tumuli suggest that these individuals are of noble status. A total of seven individuals could be analyzed osteologically. All tumuli were robbed and all skeletons were disarticulated. Within the skeletal collection, one male, with an age-at-death of 30-40 years, was observed with an isolated iron arrowhead fragment in the right orbital floor with signs of advanced healing. Set within his archaeological and historical background of medieval Sudan, the man provides important information about social interaction, care provided by the community, as well as insights into contemporary fighting techniques. Moreover, this rare example allows for unique perspectives on remodeling processes and biological responses of the skeleton to foreign objects.

NEW POSSIBLE CASE OF SPINAL TUBERCULOSIS IN AN OSTEOARCHEOLOGICAL SAMPLE FROM 6TH-7TH CENTURIES (AVAR AGE) IN HUNGARY (TRANSDANUBIA, KÖLKED FEKETEKAPU „A")
Tamás SZENICZEY, Kinga KARLINGER, Zsuzsanna MÉSZÁROS KIS, Enikő SZVÁK, Antal SKLÁNITZ, Lénárd SZABÓ, Krisztián KISS, István RÁCZ, Tamás HAJDU, Antónia MARCSIK

During the early Avar Period (late 6th – early 7th century), the East Transdanubian region was characterized by cultural and ethnic heterogeneity formed by the local Germanic, late antique and newly arrived Avar populations. This heterogeneity can also be observed at the early phase of the Kölked-Feketekapu „A" site (Baranya County, Hungary), which is one of the largest cemetery in this region. Altogether 635 individuals have been examined. In a preliminary analysis from skeletal material of this cemetery two possible tuberculosis cases have been already reported.
In the present study a new case of skeletal tuberculosis (grave 565, an adult male) is submitted. The diagnosis was estimated by macro- and microscopical, as well as radiological analysis. The T12 vertebra was collapsed, inflammation and syndesmophyte formation are noted on the anterior part of the body. Besides, serious inflammation can be seen on the anterior surface of L1 and L2 vertebral bodies as well. The inflammation also affected the zygaphophysial joints of these vertebrae, which resulted a bony ankylosis of the small joints on the right side. In the inner spongy bone of the body severe lytic lesions can be observed which destroyed almost the whole corpus.
This adult male displays a classic example of spinal tuberculosis, centered between T12, L1 and L2 vertebrae. This lesion may be in the early stages of development of tuberculosis, as there is no extensive angular kyphosis, often seen in more developed cases. The differential diagnosis is mostly against osteomyelitis and healed fracture.

The project was supported by the Hungarian National Scientific Research Fund (OTKA NN-113157), the Eötvös Loránd University Talent Management Council, the János Bolyai Research Fellowship of the Hungarian Academy of Sciences, Stephen W. Kuffler Research Foundation and the Croatian-Hungarian bilateral research project of the National Research and Innovation Office (TÉT_16-1- 2016-0020).

HYPEROSTOSIS FRONTALIS INTERNA IN ANCIENT POPULATIONS - A POSSIBLE NEW WAY TO THE LIFE-STYLE RECONSTRUCTION

Tamás SZENICZEY, Antónia MARCSIK, Zsófia ÁCS, Timea BALASSA, Zsolt BERNERT, Katalin BAKÓ, Tamás CZUPPON, Anna ENDRŐDI, Sándor ÉVINGER, Zoltán FARKAS, Lucia HLAVENKOVÁ, Krisztina HOPPÁL, Csaba Kálmán KISS, Krisztián KISS, Kinga KOCSIS, Loránd Olivér KOVÁCS, Péter F. KOVÁCS, Kitti KÖHLER, László KÖLTŐ, Ivett KŐVÁRI, Orsolya LÁSZLÓ, Gabriella LOVÁSZ, Júlia LOVRANITS, József LUKÁCS, Zsófia MASEK, Mónika MERCZI, Erika MOLNÁR, Csilla Emese NÉMETH, János ÓDOR, László PAJA, Ildikó PAP, Róbert PATAY, István RÁCZ, Zsófia RÁCZ, Ágnes RITOÓK, Gergely SZENTHE, Gábor SZILAS, Béla Miklós SZŐKE, Zoltán TÓTH, Tivadar VIDA, Katalin WOLFF, Michael FINNEGAN, Tamás HAJDU

Hyperostosis frontalis interna (HFI) is an idiopathic pathological condition characterized by bilateral thickening and accretion of bone on the inner table of the frontal bone. Although HFI does not cause any clinically significant symptoms, cases have been reported in association with diabetes, obesity and hormonal disturbances. In comparison to the modern era, HFI has been rarely documented in ancient populations, prior to the industrialization.
The economic consequences of industrialization resulted in change of lifestyle, in terms of fertility period, time of menarche and menopause too. The hormonal changes proposed to cause longer exposure to the estrogens was hypothesized to be the main factor in the emerging number of HFI. Lifestyle, however, went through considerable changes prior to the industrialization as well. Since diet, and common environmental factors could account for the manifestation of HFI, the changes and improvements of agriculture in different historical periods could have influenced the frequency of the disease as well. The characteristic lifestyle of past populations (e.g. nomadic pastoralism vs. sedentary farmers) could also have considerable impact on the access and variety of food.
The study sample consisted of 3489 skulls from the Carpathian Basin dated from 6th to 17th c. AD, in which the 5-8th centuries were characterized by former nomadic populations who became mobile pastoralist in the Carpathian Basin. While the population of 9-17th centuries were more consistent with sedentary farmer and stock raising communities.
In predominantly mobile pastoralist populations increased prevalence of HFI was found. We supposed that lifestyle and dietary habits are responsible for the increased number of HFI among these populations.
This research was supported by grant from the Hungarian Research, Development and Innovation Office: project number NN113157 and Croatian-Hungarian bilateral research cooperation (TÉT 16). This study was also supported by the ELTE Talent Management Council and János Bolyai Research Fellowship

TRACES OF GOUT IN THE MUMMY OF AN 18TH CENTURY TB INFECTED WOMAN, VÁC, HUNGARY

Ildikó SZIKOSSY, Ildikó PAP, Zsolt BERECZKI, Orsolya VÁRADI, András SZEKERES, Kinga KARLINGER, Mark SPIGELMAN, Helen D. DONOGHUE, Olivier DUTOUR, Frank MAIXNER, Albert ZINK, György PÁLFI

The Vác Mummy Collection (VMC) stored in the Department of Anthropology, Hungarian Natural History Museum Budapest contains the remains of 265 naturally mummified individuals explored in the Dominican Church in Vác, Hungary, in 1994-1995. Complex paleo-rheumatological and

palaeomicrobiological case study of a PCR-based TB-positive specimen from the 18th VMC. Preliminary anthropological studies revealed severe bilateral erosive lesions, especially in the feet and the ankles. The late Terézia Waitzenbach (2009.19.32.) died in 2nd October, 1787, at the age of 72. Her partially preserved mummy was examined macroscopically and submitted to medical imaging investigations, to better understand the macroscopically detectable superficial lesions and other potential ones in the soft-tissue covered (more mummified) areas of the body. Teeth and soft tissue samples were subjected to different analytical and palaeomicrobiological techniques (HPLC, mass spectrometry, PCR-based and metagenomic analyses).The macromorphological studies evidenced quasi-symmetrical erosive bony lesions, especially at the distal parts of the lower limbs. CT studies accomplished the macroscopic diagnosis and indicated severe bone damages, traces of typical tophi due to gout, a disease caused by abnormal uric acid accumulation. Paleo-microbiological analyses have indicated an infection by Mycobacterium tuberculosis complex bacteria in the chest and extrapulmonary regions. Terézia Waitzenbach died in Vác in 1787 and was buried in the Dominican crypt. The multidisciplinary studies of the VMC specimen confirmed disseminated TB infection and severe bone lesions due to gout.
The support of the Hungarian NKFIH K125561 Grant is acknowledged.

PATHOLOGICAL ALTERATIONS IN HUMAN MUMMIES OF THE GAMHUD CEMETERY
Enikő SZVÁK, Antal SKLÁNITZ, Lénárd SZABÓ, Áron BÉNI, István JÁNOS, Márta DOBRÓNÉ TÓTH, Zita SZIKSZAY, Zsófia KERTÉSZ, Mihály MOLNÁR, István MAJOR, Hedvig GYŐRY, Karola BIACSI, György PÁLFI, Erika MOLNÁR, Ildikó PAP, Tamás HAJDU, Tamás SZENICZEY, Edina BARANYAI, Virág PABESCHITZ, Ildikó SZIKOSSY

The Hungarian merchant – Fülöp Back – financed the exploration of the Ptolemaic Period cemetery of Gamhud. The Polish Egyptologist, T. Smolensky started the excavation, but he died in 1909. After his death Kamal finished this work. The human mummies were unwrapped in Museum of Fine Art in the 1930s by A. Dobrovits and L. Bartucz. During these work, the mummified remains were also examined. Due to the bad mummification methods and the unwrapping process, the mummies are in a very bad state. The bones are broken, burnt, and bitumen-covered heavily. In most cases we have only the skulls of the individuals. The clear majority of the material are skeletonised with some mummified remains. Traces of burning can be clearly identified on the surface of the bones. The aim of our project is to investigate this set of finds using invasive and non-invasive methods. We want the mummies of a series to be subjected to a complete multidisciplinary examination using the smallest possible amount of sample. Among the non-destructive procedures X-ray, CT and SEM were performed. Among the physical and chemical analyses (FAAS, ICP, FTIR) studies are in progress. As a first step of the project, we want to identify the exact mummification process and the materials used. We would like to reconstruct the health status of people living in ancient Egypt in Gamhud and want to show that their bodies have been damaged by the negative impact of any natural or artificial substance. From the 40 individuals have been identified. During the pathological investigation several types of abnormalities were detected: clearly identifiable endocranial changes (abnormal blood vessel impressions, *serpens endocrania symmetrica*), *poroticus hyperostosis* and *cribra orbitalia*, skull trauma.
Acknowledgements: The support of the Continental Automotive Hungary Ltd., NOVO-Lab Ltd., DE, ELTE, NYE, SZTE, and the ATOMKI is gratefully acknowledged.

THE STORY OF MY MISFORTUNES: A CASE STUDY OF INDIVIDUAL WITH SEVERAL SEVERE CONDITIONS INCLUDING SYPHILIS, RESIDUAL RICKETS AND FRACTURES (SPAIN, 16TH-18TH CENTURY)

Nataša ŠARKIĆ, Lucia MUÑOZ UGARTE, Goran ZEBIĆ, Rosa DINARÈS, Jesus HERRERÍN

The restoration work on a church of El Salvador in Toledo (Spain), carried out in 2008, brought to light a cemetery from 16th - 18th century. On one of individual buried there (female, aged 40-59 y.o) possible signs of venereal syphilis were noted. The periostic reaction in the postcranial skeleton was noted on the tibia and the clavicles, while lesions called *caries sicca*, typical for advanced stages of the disease, were noted on the skull. The analysis of the presence of mercury in bones was performed in order to discover if she was exposed to mercury treatment, which was at that time considered to be a cure for syphilis. The analysis confirmed that the concentration of mercury in the bones of this individual was much higher than for the other two buried next to her. This suggests that there was an attempt of curing, although it is hard to say if this had any effects, or (knowing that mercury is a very poisoning element) even a contra-effect. The same individual had various lines of enamel hypoplasia on teeth, *coxa valga*, bowing of long bones in lower extremities (suggesting rickets residual) and severe fractures of the sternum and the left arm with irregular alignment (the arm was shorter and curved). While *coxa valga* could be a congenital deformity, bowing of long bones and enamel hypoplasia suggested physiological stress in childhood. It is not very clear at which moment of her life the fracture of arm and sternum occurred but is obvious that she lived a long time with this condition as it alterated the complete morphology of the arm and created an important amount of secondary (posttraumatic) osteoarthrosis. The examples like this point out to synergistic effect of diseases and need for new, more comprehensive approach to paleopathology.

PALEOONCOLOGICAL STUDIES ON SKELETAL REMAINS OF HISTORICAL POPULATIONS FROM HUNGARY

Krisztina TAKÁCS-VELLAI, Tamás HAJDU, Antónia MARCSIK, György PÁLFI, Tamás SZENICZEY, Endre NEPARÁCZKI, Tibor TÖRÖK, Erika MOLNÁR

Nowadays, cancer is one of the greatest challenges facing mankind. However, there is still no consensus among researchers regarding the antiquity of cancer. Paleo-oncological studies may help to answer this question.

This study presents a short summary of the analysis, focusing on the occurrence and frequency change of malignant tumors in historic populations of Hungary. It was based on the examination of 11,000 skeletons dated from the Early Neolithic to the late medieval period using macromorphological, modern imaging and histological methods. Osteological evidences of malignant bone tumors were identified in 39 cases. Neoplastic bone diseases were present in all studied historical periods and there were no remarkable differences in their macromorphological appearance and frequency between the different archaeological periods.

We intend to characterize ancient bone tumors by molecular genetic methods as well. Previously molecular paleooncological studies were successfully performed on mummies. For example, a tumor suppressor variant predisposing to colorectal cancer in an 18th century Hungarian mummy was identified.

In our molecular studies allelic variations of known recent oncogenes and tumor suppressor genes will be examined in the archaic bone samples. For their well-known occurrence in osteosarcomas we will preferentially study p53 and Rb sequences. Our aim is to find mutation events, which might have occurred during tumor progression in ancient bone tumors. We are interested to see 1. whether similar mutation events compared to recent tumor progression processes occurred in historical times; 2. whether the same mutant alleles of oncogenes and tumor suppressors are present in archaic vs. recent samples.

As a major proportion of bone tumors are metastatic, in our samples we intend to examine metastasis related genes as well.

These studies will shed light on past cancer epidemiology and cancer evolution. Exact knowledge on mutational status might also contribute to paleopathological diagnosis and interpretation.
Acknowledgement: This research was supported by the ELTE Talent Management Council and the János Bolyai Research Fellowship of the Hungarian Academy of Sciences, the Croatian-Hungarian bilateral research project of the National Research and Innovation Office (TÉT_16-1-2016-0020). K. Takács-Vellai and E. Molnár were funded by the OTKA (Hungarian Scientific Research Fund) grants K115587 and NN 78696, respectively.

A PROBABLE CASE OF RHEUMATOID ARTHRITIS FROM MEDIEVAL NORTHERN ITALY (12TH-13TH CENTURIES)

Chiara TESI, Valentina GIUFFRA, Gino FORNACIARI, Omar LARENTIS, Monica Rita MOTTO, Marta LICATA

A case of erosive polyarthropathy has been discovered in a well preserved skeleton from the Medieval church of San Biagio in Cittiglio (Varese, northern Italy). Erosive marginal symmetrical lesions are present firstly in the metatarsophalangeal, metacarpophalangeal and interphalangeal joints of an adult male, aged 55-75 years. Osteolytic changes, in the form of pocketed erosions, surface resorptions and pseudocyst formations, are also macroscopically observed on some carpal and tarsal bones and on several large peripheral joints, such as shoulders, elbow and hip. X-ray examination revealed a picture of diffuse juxta-articular osteopenia, associated with localized periarticular osteolysis and cortical thinning. The differential diagnosis comprises degenerative osteoarthritis, gout, other erosive arthropathies, in particular those belonging to the group of seronegative spondyloarthropathies, and rheumatoid arthritis. The skeletal distribution of lesions and their macroscopical and radiological appearance are highly suggestive of a case of rheumatoid arthritis. We also suggest the hypothesis of a remission phase of the disease, as demonstrated by the frequent presence of smoothed borders and sclerosed margins on x-ray. The present case is very significant as it enters into the debate upon the antiquity of the disease, representing an adjunctive evidence of the existence of rheumatoid arthritis in the Old World prior to the discovery of the Americas.

DIFFERENTIAL SUBADULT HEALTH STATUS INFORMED BY ODONTOMETRIC, GENETIC, AND CULTURAL ESTIMATES FOR SEX

Lindsey Jo Helms THORSON, Vlasta VYROUBAL, Željka BEDIĆ, Mario ŠLAUS, Patrick J. GRAY

Examination of subadult sex is rarely attempted using skeletal remains. Usually subadults are simply lumped into a single indeterminate-sex category. However, the life experiences of young boys compared to young girls can vary greatly. In addition the age of social maturity often does not coincide with biological maturity. This study attempts to utilize multiple lines of evidence to estimate subadult sex, and then use the subadult sex estimates to examine the health status differences between boys and girls from three medieval and early modern sites in Croatia: Šibenik-Sv. Lovre, Drinovci-Greblje and Koprivno. Subadult sex estimates based off of permanent tooth odontometric logistic regressions, cultural grave goods that significantly correlate among adult females, and supplemented with a few sex evaluations determined using aDNA analysis, were used to inform sex estimates of subadults. Preliminary results have identified no significant difference in the health status of subadults between male and female subadults.

PERIODONTITIS IN THE HISTORICAL POPULATION OF RADOM (POLAND) FROM THE 11TH TO 19TH CENTURIES

Jacek TOMCZYK, Anna MYSZKA, Marta ZALEWSKA

Periodontitis can be an excellent indirect source of data on the general and oral health, dietary habits and hygiene of past populations. This study assessed periodontitis in the population of Radom from the 11th century up to the industrial revolution in the 19th century. The dental material was divided into three historical series: the Early Medieval (11th century, EMP), Late Medieval (14th–17th century, LMP), and Modern (18th–19th century, MP) periods. A total of 256 adult individuals of both sexes were examined with a total of 4579 teeth. Four diagnostic criteria were used to diagnose the disease. Periodontitis affected 54% of the individuals from the EMP, 71% of those from the LMP, and 74% of those from the MP. In all chronological periods the prevalence and severity of periodontitis were higher among males. The youngest (17–25 years) age class had the lowest prevalence of periodontitis. In subsequent age classes there are an increase the disease. The results indicate that the "environmental conditions" were different in these chronological periods. Possible differences could be related to diet, but oral hygiene, unhealthy habits, and psychological stress cannot be ruled out. Different levels of sex hormones could explain the difference in the prevalence of periodontitis between sexes.

LINEAR CUTTING TREPANATION IN ITALY: A UNIQUE CASE FROM HELLENISTIC SICILY (3RD CENTURY BC)

Giorgia TULUMELLO, Giulia RICCOMI, Simona MINOZZI, Valentina GIUFFRA

During archaeological excavations conducted in 2010 at the Hellenistic necropolis of Messina (Sicily, Italy) dated to the 3rd century BC, a young adult male with multiple head injuries and evidence of surgical intervention was found. One lesion is located on the frontal bone and forms a full thickness perforation produced by penetrating force trauma. A second lesion is a healed superficial depressed fracture of the frontal bone caused by blunt force trauma. Both lesions show signs of healing indicating an extended period of survival. The third injury is a linear cut located on the inferior portion of right parietal; absence of signs of bone remodelling suggests a perimortem sharp force lesion inflicted by a bladed instrument. Finally, the left parietal bone reveals a rectangular area of bone loss involving a full thickness perforation of the bone with well-delimited incised edges and absence of healing. This lesion can be interpreted as a surgical intervention involving trepanation achieved by the linear cutting technique, the purpose of which was probably therapeutic and correlated with the multiple head injuries suffered by the individual. The linear cutting technique is most often found in the New World, while in the Old World only sporadic evidence of this technique has been attested, mainly coming from the Near East. Therefore, the case study from Messina represents the first evidence of neurosurgical intervention performed through the linear cutting technique found to date in Italy and the second case in the entirety of Europe.

MARKERS OF DISEASE IN JUVENILE REMAINS FROM A SECOND ANGLO BOER WAR CONCENTRATION CAMP CEMETERY, SOUTH AFRICA

Stephany Yvonne VAN DER WALT, Willem Coenraad NIENABER, Anja MEYER, Maryna STEYN

The South African War (1899-1902) resulted in the deaths of more than 26 000 individuals, most of whom were children. Women, children and non-combatant men were kept in concentration camps, where malnutrition and infectious diseases were common. The Forensic Anthropology Research Centre at the University of Pretoria collaborated to relocate graves at the Magogwe cemetery, which were unnamed graves of individuals who died in the Mafeking concentration camp. After all legal and ethics permissions were obtained, 21 graves were exhumed and analysed. The aim of this study was to assess the health status of these individuals to determine whether

pre-war malnourishment and disease contributed to the high fatalities during the war. The 21 skeletons comprised of 12 infants, 5 children, 3 juveniles and 1 adolescent. Enamel hypoplasia (EH) was observed in 3 of the 12 individuals who had permanent teeth. All cases of EH were experienced as multiple events close to the time of death, attesting to several acute episodes of stress shortly before death. Five individuals presented one or more teeth with carious lesions. Three individuals between the ages of 6 and 15 years displayed shorter long bones relative to their age. Unfortunately, the sample size was small and many of the individuals were very young. More than half of the Magogwe individuals were probably born and died during the war. The Mafeking grave register indicated that many individuals succumbed to measles. These findings attest to the dire conditions of the individuals in the camps and the severe, repeated episodes of stress in the period immediately preceding death. No firm evidence of longer term stress or malnutrition could be found.

TOWARDS AN INTEGRATED ANALYSIS OF OSTEOPOROSIS: A NEW BIOARCHAEOLOGICAL APPROACH IN PALEOPATHOLOGY

Anne-Marijn VAN SPELDE, Anna KJELLSTRÖM, Hannes SCHROEDER, Kerstin LIDÉN

Osteoporosis is a degenerative and metabolic disease, characterised by a decrease in bone mineral content and structure. Osteoporotic fracture rates have increased markedly during the past decades leading to significant morbidity in Europe and America, contributing to the perception of osteoporosis as a modern lifestyle disease. Recent genome wide association studies (GWAS) have demonstrated a genetic predisposition to osteoporosis, in addition to previously known etiological factors such as diet, activity and life history events. Earlier paleopathological studies have analysed archaeological collections from different cultures and time periods to place the condition within a deeper historical perspective. Although a general trend of decreasing bone mineral density from hunter gatherers to the present has been observed, studies have also demonstrated that within archaeological collections mutual differences in age of onset and distribution between sex occur. However, there is no consensus on what methodology to apply, and most studies have focused solely on lifestyle or life history events as the main etiological factors. Existing approaches impede accurate comparison of results, and limit interpretations of how the condition has developed throughout time. This presentation discusses preliminary findings from a PhD project with a unique, holistic approach. The interaction between lifestyle (diet and activity), life history and genotype, in the development of osteoporosis has been analysed using two archaeological collections (the Ajvide hunter-gatherer collection 2700-2350 BC, and the urban Trondheim Public Library collection approximately 1100-1600 AD). Osteological, paleopathological, stable isotope, bone mineral density and ancient genomic data have been combined in a comprehensive bioarchaeological approach to improve our understanding of the development of osteoporosis from the past until the present.

A UNIQUE CASE OF MULTIPLE FRONTAL SINUS OSTEOMA FROM LATE ROMAN SICILY (CATANIA, 5TH-6TH CENTURY AD): MORPHOLOGICAL, RADIOLOGICAL AND HISTOLOGICAL ASSESSMENT

Elena VAROTTO, Rodolfo BRANCATO, Lorenzo MEMEO, Maria Teresa MAGRO

Frontal sinus osteoma represents a relatively common clinical finding in modern medical settings, while its antiquity and exact historical presentation are still being investigated. Here we present a morphologically unique case of multiple frontal sinus osteoma in a skull from late Roman-era Sicily. Archaeological excavations were carried out in the summer of 2014 at Contrada Pianotta di Calatabiano (Catania, Sicily), a Roman cemetery located on the Ionian Sicilian coast, by the Catania Superintendency and the University of Catania. The necropolis is located near a Roman villa excavated in 1996 and in the proximity of the *Via Consularis Pompeia*, the Roman road which connected Messina to Syracuse. The cemetery dates back to the Imperial period (2nd-3rd century

AD), whose tombs belong to two typologies, i.e. cist graves made of lime mortar and cappuccina burials: one of the cappuccina burials was characterized by the presence of numerous fragmented human bones. A set of morphological, radiological (including 3D virtual reconstructions) and paleo-histological analyses have been implemented in order to describe this case, which de facto represents one of the oldest in Europe. In a subsequent step, the data have been clinically interpreted and more broadly framed in the greater picture of the history of frontal sinus osteoma, thus helping paleopathology elucidate the evolutionary course of this otorhinolaryngological condition.

ÖTZI: NEW ANTHROPOLOGICAL ANALYSIS USING 3D VISUALIZATIONS FROM 2013 CT SCANS

Chiara VILLA, Kirstine BOYSEN, Mari BØKSET, Mathias SØDERLUND, Albert ZINK, Niels LYNNERUP

In January 2013, new CT scanning has been performed on the 5.000-year-old mummy from the Alps: Ötzi. The entire body was scanned in different sessions due to the complicated posture: whole-body CT from head to feet missing of the right leg and part of the right trunk; head to upper abdomen in left oblique position; and lower extremities from pelvis to feet. The new CT images has been re-analyzed using stat-of-the-art software to allow a full 3D reconstruction of the entire skeleton of the mummy. Traditional anthropological methods have been applied on the 3D models of the bones and CT images, in order to reassess the age-at-death, the stature and the pathological conditions. The age estimated from cranial sutures suggested that Otzi was a man around 40-50 years. The estimated age from the rib ends suggested a younger person around 30 years. The pelvis joints did not provide enough information to estimate a final age. Maximal length of the femora was 42 cm suggestion a stature of 155 using Bolsen (1990), 161 cm using Trotter and Gleser (1958) and 157 using Ruff et al. (2012). Fractures were re-analyzed and 3D visualized. In particular, the soft tissues and the bones surrounding the arrowhead in the left shoulder were accurately 3D segmented. Our results have been compared with those previous reported. In conclusion, we find that re-scanning as CT-equipment advances in resolution may be worthwhile and may yield more detailed documentation as well a better basis for further anthropological and paleopathological analyses.

A CONTRIBUTION TO THE HISTORY OF MEDICINE IN 19TH-CENTURY CROATIA

Vlasta VYROUBAL, Danijel LONČAR, Marija MIHALJEVIĆ, Marina MATKOVIĆ VRBAN, Mario ŠLAUS

This study presents the results of anthropological, archival, and historical research of skeletal evidence of a medical autopsy from the 19th century, a first such work on material from Croatia. Skeletal material presented here was unearthed during 2014 archaeological excavations in Prvča, southwest of Nova Gradiška. The remains were found in grave 7 located inside the Chapel of All Saints. Skeleton belongs to an adult male, aged 40-45 years at death. Even during excavation, the regular cut that circumscribes the skull was noticeable. The cut was made perimortem and completely separates the calotte from the rest of the skull. Further anthropological analysis revealed an active inflammatory process on the endocranium. Due to the position of the grave site in the vicinity of Nova Gradiška, and based on the results of radiocarbon dating, placing the remains to the 19th century, it can be (carefully) presumed that the individual in question was a patient of Nova Gradiška General Hospital founded in 1846. Even though paleopathological studies recognise skeletal evidence of medical post-mortem examination, not often are we presented with clear evidence of formal medical autopsy looking into a cause of death of an individual, evident in this case due to the presence of pathological lesions on the endocranium. Furthermore, analysis of the evidence of postmortem examination corresponds to the autopsy procedure steps described in contemporary 19th-century medical handbooks. As such, this study is a contribution to the history of medicine and its development in 19th-century Croatia.

THE VIENNA PATHOLOGICAL ANATOMICAL COLLECTION - A PARADISE FOR PALAEOPATHOLOGISTS

Karin WILTSCHKE-SCHROTTA, Eduard WINTER, Verena HOFECKER, Anatol PATZAK, Andreas WASSERSCHEID, Walter FEIGL

The pathological-anatomical collection in Vienna is housed in the Narrenturm and was incorporated to the anthropological department of the Natural History Museum in 2012. The collection was founded 1796 as a teaching collection for medical students. An imperial order existed since 1811 to collect unusual human specimen and deliver these to the pathological anatomical collection. This collection is today one of the largest of its kind and was already frequently used by palaeopathologists like Don Ortner and Walter Putschar (1981) or more recently by Robert Mann et al (2016).
Huge reconstruction works on the building necessitates a reorganization of the public display area. In a systematic manner, the first rooms deal with the history of the collection and the development of pathological investigations. The main people in power and their original historic specimen are displayed with a focus on the novelties of the sciences on pathology.
In the second sector, generalised pathology is the topic and single rooms will explain inflammation, neoplasia, exogenic and endogenic harms, tuberculosis and degenerative diseases. Where possible, wax replicas, wet specimen and bone specimen will be on display.
In the third part, different rooms will be dedicated to specific malfunction of different anatomical systems like the pathology of the cardiovascular, reproductive and urinary, digestive, musculoskeletal, neuro, pulmonary and dermatological systems.
This systematic layout of pathological conditions of the human being, fulfils the original intention of this collection as a teaching tool. Most of the objects were collected before the treatment with antibiotics. This is essential for palaeopathologists for comparing prehistoric or historic cases from archaeological finds with objects of known disease. In the osteological collection with 10.000 specimen, palaeopathologists find a vast comparison collection, which is accessible for researchers and it subjectively feels like paradise for scientific investigations of palaeopathological research.

RHINOMAXILLARY FEATURES OF TWO PROBABLE CASES OF LEPROSY IN A JOSEON PERIOD POPULATION OF SOUTH KOREA

Eun Jin WOO

According to documented sources, leprosy was a relatively common disease during the medieval period in Korea about 14-15th centuries AD. Although a nation-wide leprosy eradication program was enacted in the mid-fifteenth century, to date, leprosy cases have not been observed in archaeological skeletal collections in Korea. In the present study, 196 individuals from the Joseon period cemetery in Seoul were examined for skeletal lesions that are pathognostic of leprous infection. The facial bones of two individuals indicate pathological changes: anterior nasal spine, alveolar process in the maxillary region, and the palatine process. To further examine the rhinomaxillary features in the two affected individuals, macroscopic, radiographic, and CT analyses were carried out. All of the characteristics of the rhinomaxillary lesions are pathognomonic of lepromatous leprosy. In both individuals, the resorption of the alveolar process in the maxilla led to antemortem loss of the central incisor, the anterior nasal spines were resorbed which exposed cancellous bone, the lateral and inferior margins of the nasal cavity were remodeled bilaterally and symmetrically, and the palatine process of the maxilla exhibited generalized fine pitting. These skeletal lesions are undoubtedly indicative of leprosy and represent the first cases of leprosy in South Korea.

HEALTH STATUS OF SOLDIERS IN THE LIKA REGIMENT OF THE CROATIAN MILITARY FRONTIER BETWEEN 1788 AND 1850

Matea ZAJC PETRANOVIĆ, Alexander BUCZYNSKI, Petra RAJIĆ ŠIKANJIĆ, Vedran KLAUŽER, Juraj BALIĆ, Goran OVČARIČEK

The Lika Regiment was part of a unique military institution – the Austrian Military Frontier (Militärgrenze, Vojna krajina) – that existed along the entire boundary with the Ottoman Empire from the first quarter of the 16th century until 1881. The original purpose of this frontier establishment was to protect the Habsburgs from the Ottoman attacks. In the course of time, it became a reservoir of cheap and good soldiers governed by military officials and military law, without civil authority. All frontiersmen capable of bearing arms were part of an ever-ready military force who in return enjoyed special privileges as free peasant-soldiers (land fiefs and religious freedom).
In order to gain personal and bioanthropological data of all enlisted men from the Lika Regiment born between 1770 and 1830, we have collected and processed materials from the Croatian State Archives in Zagreb and Austrian State Archives in Vienna. In this study, the secular change in height and disease occurrence in 530 adult soldiers (17+ year-olds), who served in the Frontier administration, were analyzed in the context of natural hazards and war activities. The analysis showed a significant, non-linear increase in height. A decline in height detected in the 1790-1799 birth cohort correlates with the participation of the Lika Regiment in the Austro-Turkish War (1788-1791) and the War of the First Coalition (1792-1797), plus periods of hunger caused by long-term winters (1791). The health status of these soldiers was exceptional: only 6.4% had some health problems (the most frequent were respiratory tract problems, hernia and tuberculosis), 17.6% of which ended fatally (caused by oedema, typhus, dysentery and tuberculosis). This preliminary analysis will contribute to our knowledge on the life and health of men from the Lika Regiment soldiers.
This work has been supported in part by the Croatian Science Foundation under the project 3675 MLWICB

'STORIES FROM BONES' - THE POTENTIAL OF 3D SCANNING AND BIOMECHANICAL MODELLING IN PALAEOPATHOLOGY

Sonia Ruth ZAKRZEWSKI, Stephanie EVELYN-WRIGHT, Martin BROWNE, Christopher J. WOODS, Mark Noel MAVROGORDATO, Katy E. RANKIN, Oliver J. STOCKS, Alexander S. DICKINSON

This presentation outlines the aims and methods used in the interdisciplinary 'Stories from Bones' project, combining archaeological investigation and biomechanical modelling, at the University of Southampton. The team has found a number of applications for surface and volume imaging technologies, which enhance the research data we collect and the stories that we tell. This presentation will briefly describe two cases from the Stories from Bones project, including details of the methods used and the outcomes. Our first case describes analysis of a singular femur bone from a Christian cemetery in Kent, C.1250-1600. This pathological specimen curated at Bioarchaeology & Osteoarchaeology @ Southampton (BOS) had a displaced spiral fracture in the mid-shaft which partially healed with substantial malalignment. Finite Element Analysis performed from micro focus x-ray CT scans was used to predict the strain which would be generated by gait loads. Comparison to healthy physiological bone strain levels indicated the extent to which the subject would have been able to ambulate. The second case study discusses a young adult, female skeleton, from the Romano-British cemetery site of Alington Avenue, exhibiting a rare incidence of mesomelic dwarfism. Though the integration of clinical and palaeopathological data with archaeological and historical data, a biography was formed of the life of the individual within their specific Roman setting. In both cases, surface scanning and 3D printing were used to create models to enhance public engagement events and to help improve accessibility of material to the public, particularly to children, and individuals with visual impairments. This brief introduction intends to demonstrate some of the interdisciplinary benefits that 3D scanning and modelling technologies can contribute to paleopathology, whether

the specimens are an entire skeleton or just one element. This paper also highlights the potential of interdisciplinary research and public engagement impact.

MULTI-OMICS STUDY OF THE ICEMAN - INSIGHTS INTO HEALTH, DIET AND DISEASE EVOLUTION

Albert ZINK, Thomas RATTEI, Rudolph GRIMM, Frank MAIXNER

The Tyrolean Iceman, commonly known as Ötzi, is the world oldest glacier mummy. He was found in September 1991 on the Tisenjoch pass in the Italian part of the Ötztal Alps. Since his discovery a variety of morphological, radiological and molecular analyses have been performed that revealed detailed insights into his state of health. Amongst others, computed tomography (CT) analyses demonstrated the presence of healed rib fractures, degenerative arthritis, vascular calcification, oral pathologies and the presence of gallbladder stones. The introduction of next generation sequencing (NGS) technologies in the study of ancient human remains has allowed to further explore paleopathological changes in the Iceman. He was one of the first mummies in which this technology has been successfully applied and a detailed genetic study has shown that the Iceman had a genetic predisposition for an increased risk for coronary heart disease and, recently, genetic evidence for a virulent Helicobacter pylori strain was detected in his stomach. Thereby, comparative whole-genome analyses of the 5,300-year-old bacterium revealed new and important insights into the evolution of this pathogen. Furthermore, the detection of the Iceman´s stomach content provided the unique opportunity to fully reconstruct the main components of his last meal. Initial macro- and microscopic analysis revealed that the material is extraordinarily well preserved and contains large amounts of fat residues. By using a combined multi-omics approach targeting various biomolecules (ancient DNA, proteins, metabolites, and lipids), we obtained a molecular "fingerprint" of the Iceman's diet preceding his death. The analysis revealed a remarkably high proportion of fat in his diet, supplemented with dried wild meat, cereals and with traces of toxic bracken. Taken together, the multi-omics study provided new and important insights into health and living conditions during the Copper Age in the Alpine region.

LOCAL ORGANIZING COMMITTEE

President:

Mario Novak, Institute for Anthropological Research, Zagreb, Croatia

Secretaries:

Barbara Cvitkušić, Institute for Anthropological Research, Zagreb, Croatia

Morana Jarec, Institute for Anthropological Research, Zagreb, Croatia

Members:

Mislav Čavka, University Hospital Centre Zagreb, Croatia

Ivor Janković, Institute for Anthropological Research, Zagreb, Croatia

Saša Missoni, Institute for Anthropological Research, Zagreb, Croatia

Staff and volunteers:

Lucija Biličić, **Ivana Blagušević**, **Mario Carić**, **Sen Dobrić**, **Ivan Dolanc**, **Andrea Horvat**, **Ivona Jukičić**

TECHNICAL ORGANIZER:

Conventus Credo d.o.o.

Petrova 9, 10 000 Zagreb

MB: 2102510

OIB: 94766180676

ID: HR-AB-01-08057163

INTERNATIONAL SCIENTIFIC COMMITTEE

Jane Buikstra, Arizona State University, USA

Olivier Dutour, École Pratique des Hautes Études, France

Israel Hershkovitz, Tel Aviv University, Israel

Rimantas Jankauskas, Vilnius University, Lithuania

Christopher Knüsel, Université de Bordeaux, France

Mary Lewis, University of Reading, UK

Niels Lynnerup, University of Copenhagen, Denmark

Nataša Miladinović Radmilović, Institute of Archaeology, Serbia

Piers Mitchell, University of Cambridge, UK

Petra Rajić Šikanjić, Institute for Anthropological Research, Croatia

Frank Rühli, University of Zürich, Switzerland

Ana Luisa Santos, University of Coimbra, Portugal

Andrei Soficaru, "Francisc J. Rainer" Institute of Anthropology, Romania

ORGANIZERS

Paleopathology Association

LOCAL ORGANIZERS

INSTITUTE FOR ANTHROPOLOGICAL RESEARCH

SCIENTIFIC COUNCIL FOR ANTHROPOLOGICAL RESEARCH OF THE CROATIAN ACADEMY OF SCIENCES AND ARTS

GEACROATICA

PARTNERS - SPONSORS

Zagreb
THE CAPITAL OF CROATIA

MINISTARSTVO ZNANOSTI I OBRAZOVANJA
REPUBLIKE HRVATSKE

amz

KBC ZAGREB

DONORS

NOVA RUNDA
CRAFT BREWERY