PFC2024 PROGRAM BOOK

07-08.11.2024 | LA CHAUX-DE-FONDS - SWITZERLAND

haute école arc conservation restauration
neuchâtel berne jura
neuchâtel

MUZOO
LA CHAUX-DE-FONDS

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WELCOME

Dear attendees,

We would like to welcome you to PFC2024. After the successful edition of 2018 in Paris, we are delighted to host you in Switzerland for this second meeting of wet collections specialists.

We have chosen the "new ideas, new challenges" theme because the conservation practices and research around wet collections are constantly evolving, and it is fundamental to create occasions to exchange between professionals.

With 133 participants from 18 countries all around the globe, attending in presence and online, we expect enriching exchanges and discussions throughout the two days of the conference.

It is a pleasure to host you at MUZOO, a unique site opened in 2022, as a result of the fusion of 2 historical institutions, a natural history museum and a zoo. The biodiversity crisis is the main topic of the new permanent exhibition called "Plan B". Both the museum and the zoo are involved in the preservation of the biodiversity and all the threats it faces.

HE-Arc is training the natural history conservators of today and tomorrow and is leading research projects about natural history collections including specimens in fluid. Therefore, it was a natural step for MUZOO and HE-Arc to join forces and to organize such an event.

The Neuchâtel region is rich in history and knowledge, with great figures of natural history such as Louis Agassiz and Albert Monard. Moreover, you can benefit from the nature and landscape of the Jura mountains as well as of the cultural heritage, La Chaux-de-Fonds being part of the UNESCO heritage.

We hope these days will be fruitful and rewarding.

Laura Brambilla (HE-Arc) and **Marion Dangeon** (MUZOO)

THE LEGENDARY FUR-BEARING TROUT AS A SYMBOL OF PFC2024

"It is believed that the great depth and extreme penetrating coldness of the waters in which these fish live, has caused them to grow their dense coat of (usually) white fur."

Fur-bearing trout (*Salmo trutta dermopila*). Living in the great depths, it has developed abundant fur, white in winter and brown in summer, which helps it fight against the rigors of the cold.

A few years ago, a woman brought a trout covered in delicate white fur to the Royal Scottish Museum in Edinburgh. Pleasantly mounted on an oval wooden support, carrying the following inscription:

FUR BEARING TROUT – Very rare

Caught while trolling in Lake Superior off Gros Cap, near Sault Ste. Marie, district of Algoma. Mounted by Ross C. Jobe, taxidermist of Sault Ste. Marie Ont.

Coming to the museum to learn more about her unique fish, the woman was told that it was undoubtably a brown, or river trout, and that its delicate white fur was undeniably that of a rabbit. So, she immediately decided to offer her trout to the museum. She had confidently bought this fake, which would prove that the idea of a furry trout had not seemed at all strange to her.

In addition to the specimen in the Royal Scottish Museum in Edinburgh, a second one can be admired at the Muséum national d'histoire naturelle in Paris (where PFC2018 took place... is it a coincidence?). Its body, a polyester and resin mannequin, is covered with a coypu skin. Two trout fins were then added to it. This fish, made by the taxidermist Franz Jullien, was exhibited on April 1st 1998 at the Muséum national d'histoire naturelle in Paris. And you know where a third fur-bearing trout is conserved? Yes, at MUZOO.

Samantha Marx | https://commons.wikimedia.org/wiki/File:Fur_bearing_trout._Very_rare._(3793949065).jpg

The fur-bearing trout is a typical animal of the northern regions of Europe and its fur enables it to withstand the cold of the rivers. As the town of La Chaux de Fonds is located at an altitude of 1000 m, with a climate renowned for its harshness (La Brevine, also known as "Swiss Little Siberia" is only 25 km away), fur-bearing trouts may be found in nearby rivers. While you go around searching for this legendary fish, watch around because in the region you can hunt another mythical creature: the dahu. This animal is a close cousin of the chamois and the ibex, from a morphological point of view. Living permanently on steep mountain slopes, the dahu has the particularity of having legs on one side shorter than the other.

Since 1995, MUZOO has been home to the international "dahutology" laboratory. MUZOO's collections include specimens of dahus, jackalope and wolpertinger as well as the famous fur-bearing trout.

More legendary than the legend… does anyone have a fur-bearing trout in fluid?

If you want to read more about the fur-bearing trout, the dahu and other legendary creatures, here is some literature:

- https://muzoo.ch/plus-encore/partenaires/laboratoire-dahutologie/
- Dance Peter, *Faux animaux, escroqueries et mystifications*, Ed. Pierre Horay, Paris 1978, p. 114-115
- Civard-Racinais Alexandre, *Des animaux factices – La truite à fourrure*, in Sciences et Avenir, hors-série (no 123), juillet-août 2000. p. 32-33
- Gaullier Vincent, *Le dahu*, in Sciences et Avenir, hors-série (no 123), juillet-août 2000. p. 68-73
- Jacquat Marcel S., *Le Dahu,* Cahiers du MHN n. 2, Editions de la Girafe, 1995
- Leroy Patrick, *Le Dahu*, légende vivante des montagnes, Editions du mont, 2007
- Jacquat Marcel S., *Le Dahu, entre mythe et réalité ou comment l'esprit critique permet d'éviter un refroidissement…* in Actes des XVIIIes Journées internationales sur la communication, l'éducation et la culture scientifiques et techniques, 1996, p. 515-519
- Jacquat Marcel S., *De l'humour au musée… Oser vaut la peine!* in La lettre de l'OCIM (Office de Coopération et d'Information Muséographiques), Dijon, n° 54, novembre-décembre 1997, p. 28-31
- Jacquat Marcel S., *Petit précis de dahutologie* in L'Alpe, n° 8, Bestiaire. 2000, p. 20-25
- Albini Andrea (a cura di), *Animali del mistero*, I quaderni del CICAP, n. 6, 2005

CONTENT

MUZOO
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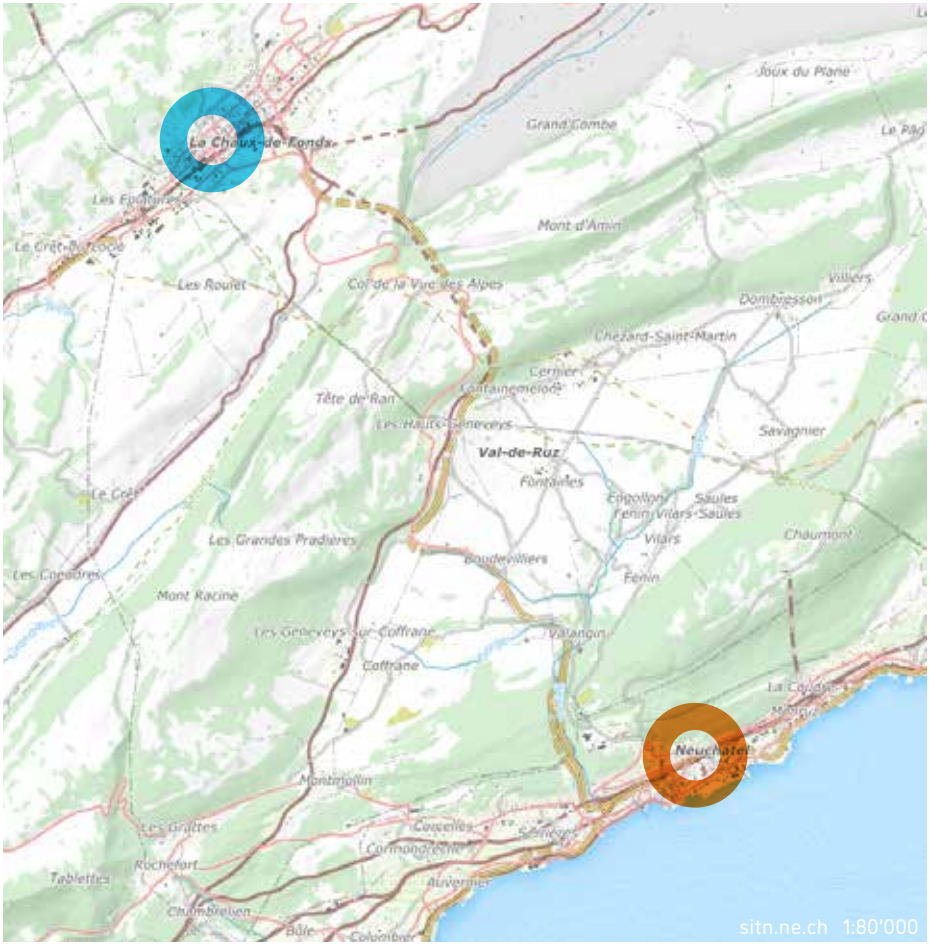

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MESSAGE FROM HE-ARC

The Haute Ecole Arc Conservation-Restauration is very pleased to welcome all the colleagues to the PFC2024 Conference. Such a large attendance, either in presence in the heart of the "Montagnes Neuchâteloises" or online, shows the importance of focusing our attention on this very specific heritage among the natural history collections.

These specimens, numbered by millions in most countries, require dedicated conservation specialists. For more than 20 years, the HE-Arc CR has offered a growing part of its bachelor and master programmes to the conservation of these collections.

Collaborating with heritage institutions of the 3 cantons of Bern, Jura and Neuchâtel is one of our missions and provides fruitful opportunities for integrating students in the professional networks during their higher education cursus.

It would not have been possible to organise this event without the active involvement of both Marion Dangeon and Laura Brambilla and the institutional collaboration between MUZOO and HE-Arc CR. We thank all of them for it.

We would like to thank also the students and staff that volunteered to help holding this important meeting and allowing our guest to enjoy their stay in La Chaux-de-Fonds.

Brigitte Bachelard
HE-Arc General Director

Régis Bertholon
HE-Arc Conservation-restoration Head of research and studies

MESSAGE FROM MUZOO

The collections of scientific specimens preserved in fluid represent a vital part of MUZOO's scientific heritage. Whether vertebrate or invertebrate, from a distant expedition or part of the educational collection, specimens in fluid convey the diversity of the living world preserved in tubes and jars.

The meticulous conservation of these collections, coupled with the proximity of the Haute École Arc Conservation-Restauration (HE-Arc), has fostered the development of unique skills in fluid preservation.

With this in mind, it seems only natural that La Chaux-de-Fonds should host this new edition of the PFC Conference, after a first meeting in Paris in 2018.

For this second edition, MUZOO is committed to creating a favourable environment to the exchange of best practices in fluid preservation. Our aim is to offer not only a platform for productive discussions, but also an opportunity to discover the exceptional legacy of our institution.

It is with great pleasure that we welcome this international conference. May this edition be marked by innovation, collaboration, and a resounding refusal of scientific "drought"! MUZOO wishes everyone a conference rich in discoveries and fruitful exchanges, with the hope that significant advances will emerge within its walls.

Bienvenue à La Chaux-de-Fonds, bienvenue à MUZOO
et vive PFC2024 !

Xavier Huther
MUZOO Director

Nicolas Margraf
MUZOO Curator

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SCHEDULE AT A GLANCE

THURSDAY NOVEMBER 7TH 2024

From	To	
08:00	09:00	REGISTRATION DESK
09:00	09:15	WELCOME REMARKS
09:15	10:10	**Session 1: "Collections" – part 1, Chair: Jacques Cuisin**
10:10	10:30	COFFEE BREAK
10:30	11:30	**Session 1: "Collections" – part 2, Chair: Jacques Cuisin**
11:30	12:00	**Session 1: "Anatomical specimens" – part 1, Chair: Andries Van Dam**
12:00	13:50	LUNCH
13:50	15:10	**Session 2: "Anatomical specimens" – part 2, Chair: Andries Van Dam**
15:10	15:30	COFFE BREAK
15:30	17:00	**Session 3: "Sealants", Chair: Julian Carter**
18:30	20:30	COCKTAIL PARTY

FRIDAY NOVEMBER 8TH 2024

From	To	
08:30	09:00	REGISTRATION DESK
09:00	10:25	**Session 4: "Jars" – part 1, Chair: Laura Brambilla**
10:25	10:45	COFFEE BREAK
10:45	11:45	**Session 4: "Jars" – part 2, Chair: Laura Brambilla**
11:45	12:10	**Session 5: "Analyses" – part 1, Chair: Elodie Granget**
12:10	14:00	LUNCH
14:00	15:30	**Session 5: "Analyses" – part 2 , Chair: Elodie Granget**
15:30	15:50	COFFE BREAK
15:50	16:20	**Session 5: "Analyses" – part 3 , Chair: Elodie Granget**
16:20	17:15	**Session 6: "Best practices" , Chair: Marion Dangeon**
17:15	17:30	FINAL REMARKS

Elaborated with AI by @boromir.scot

DAY BY DAY
THURSDAY NOVEMBER 7TH 2024

			SPEAKER	TITLE
MORNING	1	09:15	**Alexander Kocyan**	Restoration of botanical fluid collections: potential for research and public outreach
	2	09:45	**Mariana Marques**	250 years of Fluid Preservation in Portugal: Historical overview and present challenges
	COFFEE BREAK			
	3	10:30	**Sarah Marden**	A future for the ex-Marine Biological Association collection of spirit preserved marine invertebrates
	4	11:00	**Mariana Marques**	A Herpetological Hidden Gem – The Carnegie Museum of Natural History "Alcohol House"
	5	11:30	**Catarina Teixeira**	The Lisbon Medical School Museum: actors and fluid preservation practices (1836-1911)
LUNCH BREAK				
AFTERNOON	6	13:50	**Rozelle Greyling**	TREASURED BODIES: An examination of selected fluid-preserved pathology specimens, technical aspects and perspectives for conservation
	7	14:20	**Megan Malherbe**	Introducing Zurich's Wet Specimen Human Remains Collection
	8	14:50	**Liz Blanks**	Great Ormond Street Hospital historic wet specimen collection
	COFFEE BREAK			
	9	15:30	**Sophie Cersoy**	Systematic methodological monitoring of the performance of old and new sealants for fluid collections
	10	16:00	**Irena Grbac**	Testing different sealants for glass jars in the wet collections
	11	16h30	**Marc Herbin**	Performances of silicone sealants for wet collections

DAY BY DAY
FRIDAY NOVEMBER 8TH 2024

			SPEAKER	TITLE
MORNING	12	09:00	**Julian Carter**	Polyethylene degradation within the fluid collection environment
	13	09:30	**Esther Dondorp**	Getting rid of the plastic: conservation of larger specimens in alcohol collections
	14	10:00	**Ash Dupuis**	The Degradation of Glass Containers in Fluid Collections: The Case Study of the Ariens Kappers Brain Collection
			COFFEE BREAK	
	15	10:45	**Eloïse Quétel**	Dealing with broken glass, making brand new historical shaped glass jars to restore specimens. The case of the medical and pathological Dupuytren collections of Sorbonne Université
	16	11:15	**Miriam Hiebert**	Understanding the Role of Glass Deterioration in Fluid Storage of Natural History Collections at the Smithsonian Institution
	17	11:45	**Céline Stoffel**	Managing toxicity in historical wet collections: the role of formaldehyde detection
			LUNCH BREAK	
AFTERNOON	18	14:00	**Claire Smith**	Colour Retention in Fluid-Preserved Museum Specimens: A Practical Approach
	19	14:30	**Silvia Russo**	A moldy mystery turning into a soap opera
	20	15:00	**David Douw**	The application of handheld Raman spectrometry to the analysis of preservation fluid composition
			COFFEE BREAK	
	21	15:50	**Christoph Meier**	The negative pressure: a decisive parameter when sealing collection jars
	22	16:20	**Julianne Snider**	Planning for Fluid Collection and Exhibition Access and Safety: Lessons Learned
	23	16:45	**John Simmons**	Best Practices in the Preservation and Management of Fluid-Preserved Biological Collections – What's Next?

ABSTRACTS

RESTORATION OF BOTANICAL FLUID COLLECTIONS: POTENTIAL FOR RESEARCH AND PUBLIC OUTREACH

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With more than 800 specimens, the Natural History Museum of the University of Zurich houses the second largest collection of fluid preserved historical botanical objects in Switzerland. In its majority, it consists of preserved plant objects, but a substantial proportion is of the mushroom kingdom. In the last six years – also with substantial financial support of the Swiss Federal Government – the entire collection has been fully restored, databased and digitally documented. During this period a substantial number of research was conducted on historical preservation techniques – i.e. on historical preservation liquids – and protocols were developed to save dried out specimens. The collection now offers the opportunity to be used again in research and education – for which it was founded originally. Research opportunities are either in the field of plant morphology but also in further deepening preservation techniques in light of making these objects accessible for the public. In addition, this collection has remarkable potential in the field of 'historical botany' as some of the objects can be directly linked to historical expeditions in Java from 1905 to 1906 from which historical photographs are available of the ecological context in the field, the objects themselves and the publications coming out of these specimens. Therefore, we believe that such collections are not only simple collection of plant tissues, but they are rather natural history collections part of our cultural heritage that need the same strength of protection and valuation as high-ranking arts collections.

250 YEARS OF FLUID PRESERVATION IN PORTUGAL: HISTORICAL OVERVIEW AND PRESENT CHALLENGES

Fluid preservation has been used to preserve and conserve zoological specimens for more than 350 years. During this period, different methods and formulas have been suggested in "naturalist instructions" published and issued both by experts, scientific institutions and museums. In recent years it became obvious that the different methods and used fluid types influence the long-term stability and accessibility to the specimens, as well as its future uses. In this presentation we provide an overview of the instructions and methods used for fluid preservation of zoological specimens in Portugal since the 18th century. Reviewing all available natural history instructions issued by Portuguese scientific authorities and natural history institutions, we identified the different fixatives and preservatives, type of jars and sealants used in natural history collections in the last 250 years in Portugal. We also identified the extant collections/specimens that were prepared following these different instructions and methods and that are still extant in Portuguese institutions and present a detailed revision of their current conservation situation and challenges. Examples of recovery procedures in a few case-studies will also be presented.

Mariana Marques

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A FUTURE FOR THE EX-MARINE BIOLOGICAL ASSOCIATION COLLECTION OF SPIRIT PRESERVED MARINE INVERTEBRATES

This paper explores the rationale, significance and current challenges of the spirit preserved marine invertebrates at The Box, Plymouth. Numbering 4000 jars, they form the largest collection of this kind in the South West of the UK. Their collection as a marine fauna by the Marine Biological Association from 1888 was a global first, making them of inestimable historical and biological importance locally, nationally and internationally. Meeting the conservation needs of the collection, providing suitable storage facilities and increasing public access are key requirements we now seek to address. Increasing use in exhibition has expedited necessary conservation for one quarter of the collection. Around 1000 jars were conserved for inclusion in the 'Mammoth' natural history gallery. A small selection of specimens form part of a major new exhibition 'Planet Ocean' that tells the story of Plymouth's unique development as Britain's 'Ocean City'. Reawakening historic partnerships with the Marine Biological Association and the Marine Institute at the University of Plymouth will help us share expertise and resources. In 2024 a new survey and resultant documentation work undertaken by University staff and students has added new knowledge. Working with Plymouth Sound National Marine Park, the first of its kind in the UK, and use of 3d scanning technology will allow us to create an enhanced digital presence for the collection, improving public access and experience. It is hoped that this work will allow us to situate the collection as a 'jewel in the crown' of the museum.

Sarah Marden

The Box
Tavistock Place, Plymouth,
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A HERPETOLOGICAL HIDDEN GEM – THE CARNEGIE MUSEUM OF NATURAL HISTORY "ALCOHOL HOUSE"

Mariana Marques

Carnegie Museum of Natural History
4400 Forbes Ave, Pittsburgh, PA 15213 - United States of America

Usually unnoticed by the public who visit the Carnegie Museum of Natural History, the Alcohol House is one of the museum's oldest and most impressive treasures. Built in 1907 to house CM fluid collections, the Alcohol House host a scientifically important and unparallel collection that has been growing for more than 100 years, and actively being used by researchers, both locally and internationally. The herpetological collection is taxonomically and geographically organized in thousands of jars and tanks through the architectonically unique three-floored building, making this historical site an outstanding biodiversity library for the study of Herpetology. With more than 250,000 specimens waiting to be studied, although after 117 years of existence with minimal structural improvements, the Alcohol House faces today several challenges. In this presentation I aim to present the strengths and weaknesses of such an historical building in the light of the best practices of care and management of natural history collections to maximize the useful lifetime of specimens, while continuing promoting specimen-based research.

THE LISBON MEDICAL SCHOOL MUSEUM: ACTORS AND FLUID PRESERVATION PRACTICES (1836-1911)

🎙✉ **Catarina Teixeira**

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Laura Brambilla

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The Medical School of Lisbon in Portugal was established in 1836 following a major reorganisation of the public education. Within its regulatory (1840), the school would be provided with a Cabinet of Anatomy for teaching purposes. Years later, this cabinet assumes the relevance of an 'Anatomical Museum' with the collection's development for educational support. The museum lasted roughly until the 1910s, being the Institute of Anatomy of the Faculty of Medicine of the University of Lisbon the heir of its heritage since then. The study of the remaining collection enabled us to identify 47 fluid specimens belonging to the museum teratology section, described by the first conservator of the museum the physician José Joaquim da Silva Amado (1840-1925), between 1865 and 1873. In 1862, the museum had 1097 objects and in 1890 almost 2050 items in its collections, ranging from anatomical preparations to other types of artefacts, including several wet preparations. Very little is known particularly concerning the specimen's preparation and long-term conservation practices. More recently, and by means of an institutional collaboration protocol, twenty of the historical fluid specimens were selected with the aim of performing Raman spectroscopy and X-ray fluorescence analysis for fluids characterization and heavy metals detection, and thus improving the knowledge on the preservation of these specimens. In this paper we intend to unveil the visible and invisible actors and their practices, involving particularly the museum fluid specimen's preservation, throughout two axes of research. On the one hand, with the results from the systematic analysis of an extensive array of historical sources, including the collection; and on the other hand, with the results obtained from the specimen's fluid analysis, which combined, will contribute for the collections practices documentation, and ultimately, for planning proper conservation treatments.

TREASURED BODIES: AN EXAMINATION OF SELECTED FLUID-PRESERVED PATHOLOGY SPECIMENS, TECHNICAL ASPECTS AND PERSPECTIVES FOR CONSERVATION

Rozelle Greyling

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Maggi Loubser

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299 Clark St, Brooklyn, Pretoria, 0011 - South Africa

Jade Naicker

University of Pretoria
Department of Anatomy
Dr Savage Rd, Prinshof 349-Jr, Pretoria, 0084 - South Africa

Historically, fluid-preserved collections have been recognised as a valuable resource within the discourse of science and medicine. In clinical education and practice, fluid-preserved collections specifically pertaining to pathology have been invaluable in establishing the foundation for understanding disease pathogenesis, prognosis and treatment in medical practice. Medical institutions' recent shortage of cadavers necessitates the preservation of cadaveric collections, which include archaeological, anatomical, and pathological wet specimens, for effective teaching and clinical practice. However, as a result of inconsistent cycles of use and dormancy, and the lack of knowledge and preservation skills, many fluid-preserved collections have declined in quality. Therefore, the aim of this study was to examine the relevance, preservation, and long-term conservation of fluid-preserved anatomical collections. As a case study, a technical analysis of selected pathology specimens from the University of Pretoria's W.G. De Haas Anatomy Study Resource was performed. To better categorise the specimens and understand their materiality, this study examined and documented the specimens through various historical, imaging, and analytical techniques. These techniques included provenance research, observational examination, photography, and analytical techniques such as X-Ray fluorescence spectroscopy and microscopy. The results from these non-destructive methods have provided further insight into the educational and historical significance of the selected specimens and the study resource as a whole. Furthermore, the results have expanded on the limited knowledge available concerning fluid preservation in Africa and has contributed towards facilitating the continued preservation and conservation of fluid-preserved collections in the disciplines of Medicine, and Zoology within the field of heritage conservation.

INTRODUCING ZURICH'S WET SPECIMEN HUMAN REMAINS COLLECTION

Megan Malherbe

Institute of Evolutionary Medicine, University of Zurich, Winterthurerstrasse 190, 8057 Zurich - Switzerland

Human Evolution Research Institute, University of Cape Town
Rondebosch, Cape Town, 7700 - South Africa

Sabina Carraro

Institute of Evolutionary Medicine, University of Zurich, Winterthurerstrasse 190, 8057 Zurich - Switzerland

The University of Zurich's Institute of Evolutionary Medicine houses a unique collection of human remains wet specimens. The collection is divided into two areas: pathological and forensic. The forensic collection is comprised of roughly 200 specimens, placed at the early to mid-20th century and coming from the University of Zurich's Forensic Institute. The pathological collection is more extensive, with around 1600 specimens, all placed at around the late 19th to mid-20th century and coming from the University Hospital Zurich. The specimens are diverse in both the inflictions and pathologies that they display. They range from foetuses at various stages of development, organs with unique conditions, and appendages in an array of states. As a human remains collection, it is also crucial to consider the ethics around access to these specimens, following the guidelines of the IEM's Code of Ethics as well as international guidelines. As scientists, we must ensure that ethical compromises are not made for any purposes. Every specimen has a known provenance, and with over 95% coming directly from Zurich it is one of the most comprehensive human remains wet specimen collections in Switzerland. However, until recently the collection has not been available in any inclusive or digital format, resulting in it being little-known, understudied and under-published, despite its great scientific value. These wet specimens are an incredible resource for the study of ancient as well as modern pathologies and forensic cases, and we hope to encourage future research on this rich and unique collection.

GREAT ORMOND STREET HOSPITAL HISTORIC WET SPECIMEN COLLECTION

Liz Blanks

Royal Free Hospital Rowland Hill Street - United Kingdom

University College London Pathology Museum contains c.8000 specimens of human pathological tissue, including fluid preservations, dry bone and microscope slides. The museum consists of specimens from several different London hospital collections, the largest of which comes from the world-renowned Great Ormond Street Paediatric Hospital (GOSH), which is the oldest children's hospital in the UK. The GOSH hospital museum, established in the 1850s, was fundamental for the training of specialists in child healthcare. Specimens, plaster casts, foreign bodies, original clinical descriptions, and surgical notes were collected from this time, some from the first patients to be diagnosed with a particular condition. These pathological type specimens include Still's Disease and other discoveries made by celebrated doctors of the period. While several wet specimen preservations illustrate the foremost surgical procedure of its kind. The result is a unique and unrivalled collection illustrating paediatric pathology and surgery. The ways in which the collection is used and upheld will be discussed in order to consider how such important and irreplaceable collections can continue to feature in teaching and research today. How an extensive collection of medically and historically valuable material can gain greater recognition, vital for its continued care and conservation, and remain within the parameters of the UK legislation of the Human Tissue Authority (HTA).

SYSTEMATIC METHODOLOGICAL MONITORING OF THE PERFORMANCE OF OLD AND NEW SEALANTS FOR FLUID COLLECTIONS

🎙✉ **Sophie Cersoy***
Baptiste Zuber*
Véronique Rouchon*
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A key element in the proper conservation of specimens in fluids is the closure system for glass jars. These vary widely in both historical and modern collections. While every collection manager can see over the years that not all these solutions are equivalent and by no means infallible, few systematic scientific studies of the performance of old seals have been published. After studying the hermeticity of various sealants for flat glass lids on model jars, we have implemented a systematic methodological follow-up of their ageing when exposed to fluids. We have built up models of seals, deposited on glass slides, considering old sealants recipes (Lataste cement, Glaziers' putty, Bauer mixture) and modern silicon seals of various compositions, which we subjected for 130 days to vapors of (or immersion in) 10% formalin, 75% ethanol and modified Kaiserling III glycerol solution (plus water as control). Monitoring was aimed at characterizing visible changes (swelling, loss of adhesion), as well as accurately measuring changes in colour (using spectrophotometric measurements and hardness (Shore A). Possible chemical changes in the composition were also determined using infrared spectroscopy. This methodology was also applied on widely used gaskets (natural or synthetic rubber, polymer). In addition to the practical difficulties of implementing this systematic methodology for such different materials, our study shows the importance of the choice of silicones used, particularly in collections preserved in ethanol (more or less rapid loss of adhesion and hardness, swelling, yellowing, partial depolymerization of the seals, acidification of the fluid).

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TESTING DIFFERENT SEALANTS FOR GLASS JARS IN THE WET COLLECTIONS

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The Croatian Natural History Museum (CNHM) wet collections hold specimens preserved in ethanol or formalin and stored in glass jars. These jars are mostly closed with glass ground-stoppers, traditionally sealed with a mixture of wax and fat, and covered with bladder or plastic. The new permanent exhibition at the CNHM will include at least 150 fluid-preserved invertebrates and 100 reptiles, amphibians and fishes. The prerequisite for their display was the preservation of the specimen inside the jars according to museum standards for natural history collections. While preparing the new exhibits, we faced two major challenges regarding the jars: ensuring long-term air-tightness and meeting given aesthetic standards. Decision was made to use glass ground-stopper jars, as they meet both conditions above and the fact that the majority of the specimens were already in this jar type. Considering sealants from published papers and colleague's recommendations, we tested nine different types: beeswax (yellow and white), vaseline, beeswax-colophony mixture, Terostat-IX, Alsirol, Korasilon and two silicone greases (SIM-772 and Liqui Moly). We closed the test containers filled with 70% ethanol without samples, left them at room temperature and monitored the vaporization (level) of ethanol, consistency and viscosity of the sealants, as well as ease of their use. After two months of testing, we have decided in favor of the beeswax-colophony over other sealants. Long-term testing of air-tightness will provide additional data on the choice of best sealants in the future. Our contribution does not yet offer conclusive solutions to the long-lasting problem of sealants selection, but it will endeavour to give some advices and share our experience on the topic.

PERFORMANCES OF SILICONE SEALANTS FOR WET COLLECTIONS

One of the key element for the proper conservation of specimens in fluids is the sealing of glass jars. Aesthetic qualities are also essential when it comes to displaying these specimens. Every collection manager/curator can see over years that the news materials used to seal the jars, as silicones, do not react the same way depending on their composition and the containing fluids. Since thirty years, we use the silicones to seal the jars of our different wet collections, because they are easy to applicate, easy to cut to access to specimen, as well as quite discreet for the display. However, the appearance and permeability of these seals have deteriorated over the last fifteen years. To test airtightness, durability efficiency, and aesthetic, several types of silicone seals were applied in different ways to jars containing different conservative fluids frequently used in collections (10% formalin, 75% ethanol and modified Kaiserling III glycerol solution). To accelerate possible reactions between silicone and fluids, the jars were placed upside down. First results show that adhesiveness is not necessarily correlated with hermeticity or aesthetic aspects. Following these first results, a second series of experiments aiming at improving adhesiveness and aesthetics were carried out. In this way, we applied the silicone in two steps: firstly fine coat was applied on the mouth of jar, and secondly a thick layer as usual. This work does not only show the importance of the choice of silicone, but also of the gestures on performance and final visual result.

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POLYETHYLENE DEGRADATION WITHIN THE FLUID COLLECTION ENVIRONMENT

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Plastics such as polyethylene and polypropylene are very commonly used plastics regularly encountered in use with fluid preserved collections primarily as containers and lids within which fluid preserved specimens are stored. Common examples are lids to the 'Copenhagen' jar, foam seals, and to manufacture larger buckets or drums suitable for outsized specimens. These plastics have now been in use for a number of decades in collections across the world, primarily as they are readily available, cheap, and offer a wide range of storage sizes. However, whilst technically these plastics are stable and chemically resilient, they are regularly found to be failing through degradation processes that result in embrittlement and cracking. This presentation will report on work carried out at the National Museum Wales looking at the behaviour of such plastics within the fluid preserved collections utilising FTIR spectroscopy to explore the chemical changes affecting these materials in an attempt to better understand the factors affecting them and their potential lifespan in order to facilitate more sustainable decisions for collection care and storage in the future.

GETTING RID OF THE PLASTIC: CONSERVATION OF LARGER SPECIMENS IN ALCOHOL COLLECTIONS

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The collection of Naturalis Biodiversity Center is estimated at 43 million objects, of which approximately more than 1 million are fluid preserved. The majority of these specimens are preserved in 70-96% ethanol, a smaller amount is stored in formalin and other (mixtures of) preservatives containing formalin, acid and/or glycerine. Specimens ranging from 0 to about 60 cm are usually kept in a 4 to 32 OZ range of glass mason jars and larger glass cylinders. Larger specimens are stored in stainless steel tanks that can hold multiple specimens at once and have a volume of 270 L per tank. However, over the last decades, larger fluid specimens have often been stored in containers that are not durable in the long run: mostly wide neck polyethylene barrels. When filled with chemicals these will eventually deteriorate and crack open resulting in damage to the specimens and causing health and safety issues. In our large fluid specimen room we still had about 140 of such containers with collection material inside and recently we undertook the task of changing these specimens to stainless steel tanks and to make sure their contents are digitized, accessible and secured. This project gave us the opportunity to consider the challenges faced when managing large alcohol specimens, such as safety regulations, fluid identification, handling specimens, working with large amounts of ethanol, digitization and labeling of large specimens, and to set up a protocol for working with these tanks and to keep their contents available for future research.

THE DEGRADATION OF GLASS CONTAINERS IN FLUID COLLECTIONS: THE CASE STUDY OF THE ARIENS KAPPERS BRAIN COLLECTION

This paper will look at interactions between physical and chemical degradation mechanisms seen in rectangular glass containers of the Ariens Kappers Brain Collection (AKBC), assembled at the beginning of the 20th century and now kept at Museum Vrolik in Amsterdam. The AKBC is considered one of the oldest and most complete brain collections. Today, 55 of the 292 preserved containers show advanced glass degradation in the form of fractures, surface irisations, glass degradation layers, and precipitates. The origin of these degradations was investigated using accessible tools and techniques such as fractography and polarised light, as well as Scanning Electron Microscopy (SEM) imaging and Energy Dispersive Spectroscopy (EDS) analysis. From this study, the following degradation model was proposed: First, the glass walls are weakened and their alkalis are extracted by an aqueous preservation fluid, a process known as leaching. Eventually, the damaged containers which are already subject to residual stresses left over from manufacturing processes, can no longer withstand changes in negative inner pressure, and fracture. Then, water seeps into the breaks and begins to degrade their surfaces, leaching even more alkalis. Supposedly, some alkalis remain trapped between the two fracture planes, forming a localised environment with an ever increasing pH. When a pH of 9 is reached, the silica network starts dissolving and precipitates can form in the liquid. Although the deterioration of glass in fluid collections is not a new phenomenon, and parallels can be drawn with certain degradations seen in waterlogged archaeological glass, this is the first study to take an in depth look at a particular fluid collection, and identify a link between chemical alterations and fractures. Finally, materials used in the conservation-restoration of glass were also investigated as potential curative intervention materials with disappointing results, highlighting their inadequacy in the context of glass in fluid collections.

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DEALING WITH BROKEN GLASS, MAKING BRAND NEW HISTORICAL SHAPED GLASS JARS TO RESTORE SPECIMENS. THE CASE OF THE MEDICAL AND PATHOLOGICAL DUPUYTREN COLLECTIONS OF SORBONNE UNIVERSITÉ

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The anatomical and pathological Dupuytren collections count today approximatively 30 000 components, structured around several types of objects collected throughout the 19th and of the beginning of the 20th century and mainly focused on pathology and traumatology. Within this collection, the specimens in fluid count approximately 3800 pieces and present the typical characteristics of these collections, such as the various techniques of preparations (type of container, seals, preservation fluid, labels etc.) and different kinds of observed alterations (contamination, leaks, cracks etc.). During the last PFC meeting in 2018 we presented the history of these medical collections, and the fluid preserved specimens' restoration protocol. In the continuity of this study, this year we will present a very particular project: the need to make new jars, following pre-existing historical forms, in order to replace the broken ones. Indeed, many of the jars are showing alterations that no longer guarantee the tightness of the glass. After some inconclusive tests of glueing (using resins), the only solution appeared to be the replacement of the broken jars. We needed then to be able to find similar ones, or have new jars designed for this purpose. Since no company is still offering the variety of sizes and shapes we needed, we decided to contact several glass blowers, while jointly carrying out a study of our needs, investigating as well the way in which the historical jars of the collection were made, in order to be able to request almost identical reproductions. This project is still ongoing and the preliminary results will be presented during this talk.

UNDERSTANDING THE ROLE OF GLASS DETERIORATION IN FLUID STORAGE OF NATURAL HISTORY COLLECTIONS AT THE SMITHSONIAN INSTITUTION

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The collections at the Smithsonian Institution's National Museum of Natural History (NMNH) house millions of specimens stored in fluid inside of glass jars and vials. The effective preservation of these specimens is contingent on the preservation of the vessels that house them. The vessels used in most fluid collections can present a variety of potential failure mechanisms including the deterioration of the lids, clamps, or gaskets. However, the deterioration of the glass itself has also been observed to present a significant challenge in these collections. Severely deteriorated glass jars or vials are far more susceptible to breakage, leading to an increased risk of specimen loss, and the large number of vessels in the Smithsonian's collections makes effective monitoring of the glass condition difficult. The Glass Deterioration Working Group at the Smithsonian is currently undertaking a study of all glass and glass containing collection items across the Institution, including the glass used in the preservation and study of natural history specimens. This work includes a statistical sample survey of the current condition of glass jars and vials used in specimen storage at NMNH in order to estimate the population of these vessels which are being impacted by glass deterioration. In addition, the results of an accelerated aging study will be used to better understand how the contained preservation fluid may be impacting the deterioration rate of the glass. The results of this work will be used to inform collections care practices for the long-term preservation of these objects.

MANAGING TOXICITY IN HISTORICAL WET COLLECTIONS: THE ROLE OF FORMALDEHYDE DETECTION

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Scientists increasingly use museum specimens for research purposes, because of the advantages they offer over collecting specimens in nature. Studying or sampling museums collections helps preserve the environment and endangered species and is more convenient when live species are difficult to approach or geographically remote. Tissues from specimens preserved in wet collections are typically observed under a microscope or sampled for genetic analyses. In historical collections, specimens were often preserved in varying concentrations of formaldehyde, instead of ethanol which is standardly used today. Formaldehyde raises safety concerns, as it is considered carcinogenic and mutagenic. Additionally, it poses challenges for genetic analyses, as it degrades DNA. To ensure the safety of researchers and to predict the presence of potentially degraded DNA, we aimed to detect and quantify formaldehyde in jars from our historical wet collection. Following recommendations from a recent comparative study, we employed a commercial titration kit for this purpose. Through several tests across our collections, we found that it is impossible to predict with certainty the presence or concentration of formaldehyde in a given collection. Having this method at our disposal now raises the questions of the implementation of a systematic screening in our museum, and the management of jars containing formaldehyde, particularly those that are loaned or put on display. A strict procedure was established to ensure thorough testing and maintain safety standards.

COLOUR RETENTION IN FLUID-PRESERVED MUSEUM SPECIMENS: A PRACTICAL APPROACH

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Fluid-preserved zoological museum specimens are prone to colour loss over time, which is considered inevitable. The purpose of this research is to understand whether this loss of colour could be avoided or reversed. Zebrafish were used as a starting point, as they have both structural and pigmentary colouration. They were fixed in formalin and preserved in ethanol 70%, formalin 5%, liquid paraffin, glycerol 50%, and Steedman's post-fixation preservative. These represent widely used preservation methods, and those recorded in the Cole Museum's archives as having been used for colour retention. Each zebrafish was removed from its preservation fluid and photographed at regular intervals. The reflectance data from selected points was converted to CIELAB to obtain colorimetric values. Delta-E (ΔE) analysis shows that variations in colour change over time can be directly attributed to the different preservation methods used. Chemical analysis to determine the composition of the preservation fluids is also planned. Further research will assess the effects of the same fixation and preservation fluids on both structural and chemical pigments, to determine whether a protocol could be developed which would not only retain colour, but also cause minimal damage to new specimen preparations. The analysis of colour change in a wider range of species is ongoing. These will also be treated by historic methods reputed to restore colour, to determine whether their results were dependent on specific respiratory pigments. Understanding these complex chemical interactions paves the way for the development of new methods of treating existing specimens.

A MOLDY MYSTERY TURNING INTO A SOAP OPERA

It is not unusual to observe white "spots", often in the form of spherical protrusions, on the surface of specimens in wet collections. This phenomenon is commonly observed in anatomical collections, but it could concern other types of specimens of animal origin. These globular byproducts appear as granules similar to white efflorescence usually easy to remove mechanically. From an aesthetic point of view, the presence of these products disturbs the legibility of the specimens and makes them less suitable for exhibition and teaching purposes. From a preservation point of view, their correct identification allows the selection of proper conservation protocols. What are these spots, why do they form, how should they be removed? In most cases, these white substances are misidentified. Sometimes, they are erroneously assumed to be molds. A campaign conducted on four samples from Dutch anatomist Frederik Ruysch and one preparation from his follower Bernhard Siegfried Albinus dating from the 17th and 18th century revealed metal carboxylates in correspondence with some of these spots. The exact mechanism leading to their formation has not yet been elucidated, but hypothesis can still be made. Similar formations were recently observed on some specimens belonging to the collections of the Institute of Anatomy of the University of Lisbon and the Vrolik Museum in Amsterdam. The samples were collected using small vials, a soft conservation brush or a cotton swab, or, when more difficult to remove, surgical scissors and spatula. A spectroscopic campaign using μ-FTIR and μ-Raman confirmed that the white spots are crystals of salts. This talk aims to raise awareness on the correct characterization of degradation products and to confirm the occurrence of metal carboxylate in fluid-preserved specimens due to the interaction between fatty acids and metal ions and to allow the selection of appropriate conservation strategies.

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THE APPLICATION OF HANDHELD RAMAN SPECTROMETRY TO THE ANALYSIS OF PRESERVATION FLUID COMPOSITION

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Naturalis Biodiversity Center is currently carrying out a large-scale program to perform overdue maintenance on our fluid-preserved collections, such as replacing old containers and refreshing the preservation fluid. Often fluid preservation history is lacking which poses issues both for health and safety as well as collection management. This is critical information as swapping one preservative fluid for another can cause irreparable damage to the specimen. Our project team processes tens of thousands of containers each year; such large scale programs require a fast, inexpensive and reliable method for determining the preservation fluid that is not too intrusive. Formalin test strips were found to be too intrusive (opening the containers is required), too sensitive and too expensive. Desktop Raman spectroscopy, while effective and previously applied successfully (Muséum National d'Histoire Naturelle; Cersoy et al., 2020), was too time consuming. A handheld Raman spectrometer was found to be the most effective instrument for rapid preservation fluid detection. A device originally developed for police and customs, designed for non-experts, has been utilised successfully within our project. A 'plug-and-play' method was developed so that all project team members could utilise this device effectively without needing any specialist training. For example, using the Raman spectrometer's inbuilt software to identify preservation fluids by matching the resulting spectra to a customizable spectra library. In our presentation multiple advantages of the handheld Raman spectrometer are explored such as speed (measurements typically taking less than 60 seconds), cost (While a high initial investment, over the long term cheaper than formalin test strips) and reliability. As well as this, disadvantages are also present such as difficulty measuring through certain containers and measuring opaque preservation fluids. We further demonstrate how we integrated a handheld Raman spectrometer into our large-scale maintenance project workflow and how we would recommend use for other institutions.

THE NEGATIVE PRESSURE: A DECISIVE PARAMETER WHEN SEALING COLLECTION JARS

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For 20 years, the international community has been concerned with the preservation of scientific wet collections (e.g. the KUR project Berlin from 2008, SPNHC conference in Leiden 2009 and Berlin 2016, etc.). After 1960, it was widely accepted that the liquid in collections evaporates and needs to be replenished. This vicious circle with its disadvantages (changes in concentration and pH, damage to the samples and an enormous amount of time) was literally crying out for solutions. Many interlinked problems have since been identified and improved. Intensive efforts have also been made to seal the collection jars tightly for 50 years and more. During the time we concluded, that only a seal, based on the principle of physical negative pressure leads to truly long-term tight results! This principle is neither new nor has it gone unmentioned in the last 20 years, but it has not received the necessary and explicit attention. Obviously, it is still not applied in many collections. Before 1950, jars were sealed with hot sealing compounds, which automatically resulted in a thermally induced negative pressure. New, cold-processed sealing compounds from the 1950s onwards meant that this negative pressure no longer occurred and liquid losses began to increase. This lack of negative pressure effect due to the change of material and technology was not consciously recognized and considered. The results of a long-term test started in 1994 are presented as proof of this sealing principle.

PLANNING FOR FLUID COLLECTION AND EXHIBITION ACCESS AND SAFETY: LESSONS LEARNED

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During any crisis, ensuring human health and safety is paramount. During a crisis that results in the closure of museum facilities, ensuring access to collections in storage and on display must be advocated for by museum personnel. The recent global pandemic highlighted the importance of museum workers being proactive and prepared to maintain access to collection and exhibition spaces, to keep fluid collection specimens safe from harm, and to protect museum personnel and visitors from potentially hazardous collections environments. Inaccessible and unmonitored fluid collections are inherently susceptible to evaporation of preservation fluids which may result in specimen damage as well as increased fire risk. Reactions to a crisis may adversely affect museum operations and result in extended loss of access to work spaces, laboratories, collection storage facilities, and exhibit halls where fluid collections may be present. Research conducted by the Promoting Exhibition Access and Safety (PEAS) Working Group, an academic museums consortium's COVID-19 Reopening Task Force, and others have resulted in case studies, lessons learned, and recommendations applicable to developing policies, protocols, and strategic plans now that will promote the implementation of a proactive response to future planned or unplanned crises (e.g., pandemics, extended staff absences, natural disasters). Recommendations address: identifying the unique requirements for caring for and securing fluid collections; recognizing lack of access to collections comes with increased vulnerabilities and risks; determining risk tolerance; optimizing collection value to research and exhibitions; and prioritizing collaboration and cross-training of personnel in order to ensure continued access to fluid collections in storage and on exhibit during a facilities closure.

BEST PRACTICES IN THE PRESERVATION AND MANAGEMENT OF FLUID-PRESERVED BIOLOGICAL COLLECTIONS – WHAT'S NEXT ?

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The 2012 Cloth Workers Foundation Expert Group on Fluid Preserved Collections, organized by Christropher Collins at the Natural History Museum in London, brought together nine individuals to establish baseline best practices for the storage and management of collections preserved in fluids. After a decade of virtual and in-person meetings, *Best Practices in the Preservation and Management of Fluid-Preserved Biological Collections* was published by the Society for the Preservation of Natural History Collections (SPNHC). The book includes detailed literature reviews and discussions of key aspects of fluid preservation (including collecting, storage, maintenance, conservation, containers, and labeling systems) accompanied by recommendations for baseline best practices in three tiered categories based on collection size and staff resources. The recommendations provided are continuing to evolve as research and new information on materials and techniques becomes available, resulting in plans for a second, revised edition that will also include practical techniques and recommendations for day-to-day collection operations. We are now soliciting suggestions from the fluid preservation community for topics that should be addressed in more detail in the next edition, such as issues related to specimen preparation and processing, shipping preserved specimens internationally, alternative fixation and preservation fluids and processes, environmental monitoring, specimen evaluation, collection assessment, and guidelines for the implementation of sustainable collection management practices within the context of preventive conservation.

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Rannebarger Molly, Illinois State Museum – US
Ritchie Fran, National Park Service, Harpers Ferry Center – US
Robb Angela, National Museums Scotland – GB
Romero-Perez Laura, In Private Practice – GB
Rønning Ann-Helén, Natural History Museum University of Oslo – NO
Russo Silvia, Museum of Fine Arts Houston – US

S

Salmaso Roberta, Museo Civico di Storia Naturale – IT
Santoyo Brito, Enrique Illinois Natural History Survey (INHS) – US
Schönberg Martina, Elisa Herbarium of the Botanical Garden of the University of Bern – CH
Selvantharan Sree, Natural History Museum of Denmark – DK
Shacham Boaz, NNHC - National Natural History Collections, The Hebrew University of Jerusalem – IL
Simmons John, Museologica – US
Smith Claire, Cole Museum of Zoology, University of Reading – GB
Snider Julianne, Earth and Mineral Sciences Museum & Art Gallery, Penn State – US
Sørensen Trine, Museum of Southern Jutland – DK
Stepanova Natasha, University of Michigan – US
Stoffel Céline, Naturéum - Musée cantonal de sciences naturelles – CH

T

Teixeira Catarina, Institute of Contemporary History of the Universidade de Evora; Guest assistant researcher at the Faculty of Medicine of the University of Lisbon – PT
Timmons Zena, National Museums Scotland – GB
Tomsett Louise, Natural History Museum of London – FR

U

Urso Arianna, Western Australian Museum – AU

V

van Dam Andries, Anatomical Museum LUMC – NL
van Trijp Jessica, In Private Practice – NL
van Uden Nathalie, In Private Practice – NL
Verguin Aurélie, Naturéum - Musée cantonal de sciences naturelles – CH
Verwoerd Ronel, Natural History Museum of London – GB
Vetsch Rahel, Herbarium of the Botanical Garden of the University of Bern – CH

W

Ware Fiona, National Museums Scotland – GB
Weigand Alexander, National Museum of Natural History Luxembourg – LU
Westwig Eileen, University of Oslo Natural History Museum – NO

Z

Zyskowski Kristof, Yale Peabody Museum – US

ARRIVAL IN LA CHAUX-DE-FONDS

> By plane:

Geneva Airport:
1h57 (1 change in Neuchâtel)

Zurich Airport:
2h25-to 2h50 by train
(1 or 2 changes depending on trains)

Basel-Eurairport:
2h31 (Bus + train)

> By train:

Train schedules:
https://www.sbb.ch/en/home.html

Adress of venue:
Replat du Dahu 1,
CH-2300 La Chaux-de-Fonds