Abstract & Information Book

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KONINKLIJKE BURGERS' ZOO

Revue de primatologie

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Content of Abstract and Information Book

Foreword

Dear fellow primatologists, dear participant to the EFP-GfP2022 conference,

Finally, we have again a pre-covid style conference. A conference where we can meet, discuss and get inspired by presentations and encounters with others. The past two years mainly virtual meetings were possible, such as the EFP-GfP2021 online lectures in February and March 2021, that gathered a large and engaged audience. Yet as students of the behaviour of utterly social cousins, we know how important interactions are, and what it can mean if you cannot engage directly with others. We have missed many spontaneous opportunities to meet due to the Covid-19 epidemic and accompanying restrictions. As a result, this conference EFP-GfP2022 has been postponed twice, yet the Dutch saying 'driemaal is scheepsrecht' seems to apply: the third time it is working out. We are happy to welcome you to this conference in the Netherlands, at Royal Burgers' Zoo in Arnhem.

Thanks to all your contributions, this is a broad and varied meeting. Topics range from understanding wild primates to care for captive ones; and from cognition and communication to molecular genetics. With five planeray speakers, four parallel sessions, many posters, a Bert Haanstra movie and time to interact, we hope you renew and gain new friendships and quench your scientific thirst. We hope that junior and senior researchers can mingle. To boost starting careers, we give prices to the best master/PhD presentations and posters. We hope you are inspired by the beautiful venue, the park and its many animal inhabitants. Last but not least, we hope that you enjoy the vegetarian menu and the farewell party.

This conference is made possible by many collaborators. We thank Royal Burgers Zoo, our sponsors, all national primatologal societies for support, all chairs and students, our scientific committee, the confidants, the people functioning as jury for the master/PhD prices, the support staff from our Department, and of course you, enthousiastic participants, for your persistent commitment to making this meeting happen.

Happy EFP-GfP2022 conference!

Liesbeth Sterck & Jorg Massen

Organizers

Animal Behaviour & Cognition
Utrecht University

COVID-19 - measures

Currently the Dutch government has no restrictions for people traveling to the Netherlands, nor are there any restrictions within the Netherlands with regard to Covid-19. Nevertheless, we ask from you to pertain to the common rules of washing hands, coughing in your elbow, and staying home / in your hotel when you have complaints that resemble those reported for Covid-19. Additionally, we ask from you to be considerate to those individuals that do choose to wear a face-mask and want to maintain distance between themselves and others.

You can check the Dutch Covid-19 situation at: https://www.government.nl/topics/c/coronavirus-covid-19/tackling-new-coronavirus-in-the-netherlands/coronavirus-measures-in-brief

From the site from the Government of the Netherlands
(https://www.government.nl/topics/c/coronavirus-covid-19/tackling-new-coronavirus-in-the-netherlands/coronavirus-measures-in-brief)

Coronavirus measures and advice in brief

Some measures and advice to limit the spread of coronavirus are still in place. The vaccinations are working as they should and many people have built up resistance due to being infected with coronavirus. But coronavirus has not gone away. People will continue to get infected and become ill. The government is therefore monitoring the situation closely and will take action as appropriate, based on how the situation develops.

Measures for limiting the spread of coronavirus

Nearly all coronavirus measures have been lifted.

Advice and measures to limit the spread of coronavirus

Following the advice below can help you and others avoid getting infected. And you'll be helping to protect people with health concerns.

The basic advice continues to be: wash your hands, cough and sneeze into your elbow, stay home and do a test if you have symptoms, ensure a good flow of fresh air indoors and get vaccinated and boosted.

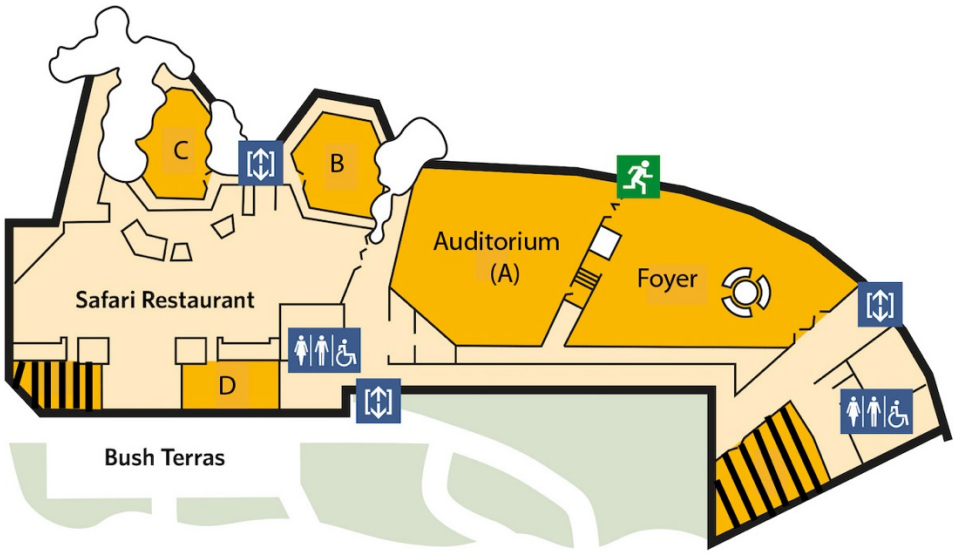
The virus can spread less effectively if you follow a number of hygiene rules:

- Wash your hands thoroughly and often with soap and water. Always do this when you get home or visit someone.
- Cough and sneeze into your elbow.
- Don't shake hands. Instead, give people a nod or bump fists or elbows.
- Touch your face as little as possible.
- Use paper tissues to blow your nose and discard them after use. Then wash your hands.
- In crowded places you can protect yourself and others by wearing a face mask.

Keep your distance

- It is no longer mandatory to stay 1.5 metres from others. But this remains a safe distance. So give others enough space, including when visiting people and at work.

Maps



Auditorium (A) - Plenary and A sessions
B - Kilimanjaro Lodge
C - Mount Kenia Lodge
D - Canopy Lodge
Foyer - Drinks and Posters

Overview program

Wednesday 1 June 2022

12.30-15.30	Registration
15.30-16.00	Opening
16.00-17.00	**Plenary 1: Daniel Haun**
17.00-17.45	General Assembly GfP
17.45-18.15	Drinks

Thursday 2 June 2002

09.00-10.00	**Plenary 2: Sarah Wolfensohn**			
	Room – A Auditorium	*Room – B Kilimanjaro Lodge*	*Room – C Mount Kenia Lodge*	*Room – D Canopy Lodge*
10.30-12.30	Symp: Emotional expression	Behaviour of wild primates	Symp: Social behaviour / Social behaviour	Symp: Great ape welfare
14.00-15.30	Symp: Emotional expression / Communication	Symp: Economic behaviour	Physiology / Neurobiology	Symp: Great ape welfare / Welfare
16.00-17.30	Social behaviour	Cognition	Genetics / Phylogeny	Symp: Phase out NHP
17.30-18.30	**Plenary 3: Tomas Marques-Bonet**			
18.30-19.30	Film Night: Family of Chimps – Bert Haanstra			

Friday 3 June 2022

09.00-10.00	**Plenary 4: Elise Huchard**			
	Room – A Auditorium	*Room – B Kilimanjaro Lodge*	*Room – C Mount Kenia Lodge*	*Room – D Canopy Lodge*
10.30-12.30	Symp: Communication / Communication	Cognition	Symp: Exchanging methods human & primates / Social behaviour	Symp: Mind of the forager
14.00-15.30	Communication	Cognition	Social behaviour	Symp: Mind of the forager / Behaviour of wild primates
16.00-17.30	Communication	Cognition	Social behaviour	Behaviour of wild primates
17.30-18.30	General Assembly EFP			
18.30-19.30	**Plenary 5: Kathelijne Koops**			
19.30-00.00	Diner + Party			

Posters sessions are during coffee, tea & lunch breaks, and the poster titles and presenters can be found at the end of this document.

Conference program - detailed

Wednesday 1 June 2022

12:30 – 15:30h: Registration

15:30 – 16:00h: Opening with welcoming words of Jan van Hooff and Frans de Waal

16:00 – 17:00h: Plenary 1

Daniel Haun - Group differences in chimpanzee social behavior

Chair: Edwin van Leeuwen

17:00 – 17:45h: General Assembly GfP

17:45 - 18:15: Drinks

Thursday 2 June 2022

09:00 – 10:00 | Plenary 2

Sarah Wolfensohn – Assessment of primate welfare: why, where, who, when and how?

Chair: Karline Janmaat

10:00 – 10:30 | Coffee, tea + **posters**

10:30 – 12:30 | Session **A1** – **Symposium:** Great apes' production and perception of emotional expressions

Symposium 1: Great apes' production and perception of emotional expressions. Part 1
Organizers: Yena Kim (Leiden University), Raphaela Heesen (Durham University), Mariska Kret (Leiden University) & Zanna Clay (Durham University)

Chair: Rafhaela Heesen

10:30 – 10:45 | Yena Kim, Jolinde M.R. Vlaeyen, Raphaela Heesen, Mariska E. Kret, Zanna Clay
The association between the bared-teeth display and social dominance structures: a comparison between bonobos and chimpanzees

10:45 – 11:00 | Ivan Norscia, Giada Cordoni
Something has changed between us: emotional communication varies from play- to real-fighting in chimpanzees

11:00 – 11:15 | Jake Brooker, Christine Webb, Frans de Waal, Zanna Clay
Empathic tendencies in Pan - a comparative investigation into the consolation tendencies of sanctuary-living chimpanzees and bonobos

11:15 – 11:30 | Diane A. Austry, Jake S. Brooker, Zanna Clay
Chimpanzees' responses to emotional expressions and its relation to behavioural markers of empathy: A behavioural and thermal investigation

11:30 – 11:45 | Katja Liebal, Manuela Ersson-Lembeck, Manfred Holodynski
The challenge of studying emotion expression in nonhuman primates: a developmental study on mother-infant interactions in humans (*Homo sapiens*) and captive chimpanzees (*Pan troglodytes*)

11:45 – 12:00 | Evy van Berlo, Yena Kim, Mariska E. Kret
Attentional selectivity for emotions: humans and bonobos compared

12:00 – 12:15 | Raphaela Heesen, Yena Kim, Mariska Kret, Zanna Clay
The body speaks for itself: Chimpanzees' perception of emotion from body movements

12:15 – 12:30 | Tonko Zijlstra, Yena Kim, Mariska Kret
Mimicry of playface and laughter in orangutans and humans

Thursday 2 June 2022

10:30 – 12:30 | Session **B1** -Behaviour of wild primates

Chair: Vedrana Šlipogor

10:30 – 10:45 | Williams Celeste, Reinhardt Kathleen, Balestri Michela, Campera Marco, Eppley M. Timothy, Donati Giuseppe - **Drivers of sleep patterns in wild cathemeral and nocturnal lemurs**

10:45 – 11:00 | Julia Mörchen, Frances Luhn, Olivia Wassmer, Maria van Noordwijk, Carel van Schaik, Puji Rianti, Anja Widdig, Caroline Schuppli **- Dispersing orangutan males use social learning to learn about new habitat**

11:00 – 11:15 | Judith Schneider, Loïc Brun, Eduard Mas Carrió, Pooja Dongre, Pierre Taberlet, Erica van de Waal, Luca Fumagalli - **Molecular assessment of wild vervet monkeys' diet compared to observational data**

11:15 – 11:30 | Achille Diodio Sorue, John Vogel, Didier Kimpungi Diana, Jeannette Madamu Massini, Djuma Ngoy Edouard, Ruth Gahani Minahilo, Rodolphe Lutengya Esube, Dieudonné Kwadje Lugala, Markéta Antonínová, Amube Jérôme, Laudisoit Anne - **A decade of silent chimpanzee monitoring in the Garamba Complex, Democratic Republic of the Congo (*Video presentation*)**

11:30 – 11:45 | Camille Lacroux , Emmanuelle Pouydebat, Marie Rossignol, Harish Karthikeyan Ravi, Farid Chemat, Edward Asalu, Alfred Aleeje, Sophie Durand, Fabrice Chandre, Sabrina Krief - **Repellent activity of nesting trees in the Sebitoli chimpanzee community of Kibale National Park, Uganda**

11:45 – 12:00 | Philippa Hammond, Dora Biro, Kaitlyn Gaynor, Tara Easter, Meredith Palmer, Susana Carvalho - **A multi-level approach to the Landscape of Fear**

12:00 – 12:15 | Alessandra Mascaro, Lara Southern, Simone Pika, Tobias Deschner
Wild chimpanzees (*Pan troglodytes troglodytes*) apply insects onto open wounds of self and others

12:15 – 12:30 | Nele Käter, Sri Suci Utami Atmoko, Caroline Schuppli
Variability of tool use in Sumatran orangutans and contributing ecological factors

10:30 – 12:30 | Session **C1** – **Symposium:** The hows and whys of social relationships: applying Tinbergen's four questions to the study of primate social behavior / Social Behaviour

Symposium 2: The hows and whys of social relationships: applying Tinbergen's four questions to the study of primate social behavior.
Organizers: Delphine De Moor (University of Exeter), Erin Siracusa (University of Exeter) & Camille Testard (University of Pennsylvania)

Chairs: Delphine De Moor, Erin Siracusa & Camille Testard

10:30 – 10:45 | Erica van de Waal, Andrew Whiten
Field experiments illuminate three phases of social learning in a wild primate

Thursday 2 June 2022

10:45 – 11:00 | Oliver Schülke, Julia Ostner
Selection in relation to sex and affiliative relationships within and between the sexes

11:00 – 11:15 | Leveda Cheng, Liran Samuni, Stefano Lucchesi, Tobias Deschner, Martin Surbeck
Physiological correlates of intergroup aggression in male bonobos

11:15 – 11:30 | Debottam Bhattacharjee, Jorg J.M. Massen
Partner choice during cooperation in macaque societies

11:30 – 11:45 | Erin R. Siracusa, James P. Higham, Noah Snyder-Mackler, Lauren J.N. Brent
Age-based changes in the social behaviour of rhesus macaques: evidence for social selectivity

11:45 – 12:00 | Camille Testard , Lauren J. N. Brent, Jerome Sallet, Michael L. Platt
Neural correlates of sociality in rhesus macaques

12:00 – 12:15 | Delphine De Moor, Julia Ostner, Oliver Schülke, Lauren Brent
Unravelling the evolution of social relationships: a comparative approach across macaque species

12:15 – 12:30 | James Stranks, Michael Heistermann, Oliver Schülke, Julia Ostner
The dynamics of social bonding and the buffering of the stress response in male Assamese macaques

10:30 – 12:30 | Session **D1** - **Symposium:** Are we smart enough to know what great apes need – studies in great ape welfare

Symposium 3: Are we smart enough to know what great apes need – studies in great ape welfare. Part 1
Organizers: Jeroen Stevens (Odisee Hogeschool), Daan Lameris (University of Antwerp) & Johanna Neufuss (University of Birmingham)

Chairs: Jeroen Stevens, Daan Lameris & Johanna Neufuss

10:30 – 10:45 | Jeroen M.G. Stevens, Sarah Depauw, Hilde Vervaecke
The happiness of chimpanzees: great apes and modern welfare science

10:45 – 11:00 | Johanna Neufuss, Kirsten Pullen, Susannah K.S. Thorpe
Status of resource provision and husbandry management for zoo-housed great apes

11:00 – 11:15 | Daan W. Laméris, Marcel Eens, Jeroen M.G. Stevens
Measuring the effect of managed fission-fusion activities on bonobo affective states

11:15 – 11:30 | Ruth Sonnweber, Jeroen M.G. Stevens, Verena Behringer
Salivary cortisol reaction norms in zoo-housed great apes: a tool to make inferences about the welfare state

Thursday 2 June 2022

11:30 – 11:45 | Lisette M. van den Berg, Eva S.J. van Dijk, Jorrit Verkleij, Kim van Dijk, Thomas R. Bionda, Elisabeth H.M. Sterck- **Using positive and negative behavioural welfare indicators to monitor the welfare of intact and castrated male Western lowland gorillas (*Gorilla gorilla gorilla*) in Dutch zoos**

11:45 – 12:00 | Rachel Jarvis, Sophie Moittié, Mátyás Liptovszky, Kerstin Baiker
Vitamin D status in European zoo-housed chimpanzees (*Pan troglodytes*)

12:00 – 12:15 | Jonas Torfs, Nicky Staes, Marcel Eens
A gut feeling: the potential impact of the gut microbiome on primate welfare

12:15 – 12:30 | Sarah Depauw, Hilde Vervaecke, Jeroen M.G. Stevens
Welfare assessment design for great apes and nutrition: a challenge

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12:30 – 14:00 | Lunch + **posters**

14:00 – 15:30 | Session **A2** – **Symposium:** Great apes' production and perception of emotional expressions / Communication

Symposium 1: Great apes' production and perception of emotional expressions. Part 2
Organizers: Yena Kim (Leiden University), Raphaela Heesen (Durham University), Mariska Kret (Leiden University) & Zanna Clay (Durham University)

Chair: Yena Kim

14:00 – 14:15 | Elisa Demuru, Marta Caselli, Sara De Vittoris, Jean-Pascal Guéry, Lisa Gillespie, Ivan Norsci - **A meta-analysis to (try to) figure out yawn contagion in bonobos**

14:15 – 14:30 | Thibaud Gruber
Identifying affective social learning in great ape cultural learning

14:30 – 14:45 | Miriam Simon, Anja Widdig, Brigitte M. Weiß
Sniffing behaviour of Barbary macaques at Affenberg Salem

14:45 – 15:00 | Adrien Meguerditchian, Yannick Becker, Kep-Kee Loh, Siham Bouziane, Eloïse Disarbois - **Development of gestural communication' Lateralization in primates Papio anubis: early post-natal "Language-homolog" brain structures in newborn can predict it**

15:00 – 15:15 | Maël Leroux, Katie E. Slocombe, Bosco Chandia, Anne M. Schel, Klaus Zuberbühler, Simon W. Townsend - **Call combinations in chimpanzees (*Pan troglodytes schweinfurthii*)?**

15:15 – 15:30 | Emma Doherty, Zanna Clay, Marina Davila-Ross
Communication development in sanctuary-living chimpanzees (*Pan troglodytes*): a multimodal perspective

Thursday 2 June 2022

14:00 – 15:30 | Session **B2** – **Symposium:** Perspectives on non-human primates' economic behaviour(s)

Symposium 4: Perspectives on non-human primates' economic behaviour(s).
Organizers: Elsa Addessi (CNR, Rome), Francesca De Petrillo (Newcastle University) & Valerie Dufour (University of Tours)

Chairs: Elsa Addessi, Francesca De Petrillo & Valerie Dufour

14:00 – 14:15 | Yue Hu, Tobias Kalenscher
Purchasing power computations in rats and humans

14:15 – 14:30 | Alessandro Bongioanni, D Folloni, L Verhagen, J Sallet, N, Khalighinejad, MC Klein-Flügge, MFS Rushworth – **Accurate versus fast decision-making under risk in macaques: brain and behaviour**

14:30 – 14:45 | Stefanie Keupp, Sebastian Grueneisen, Felix Warneken, Elliot A. Ludvig, Alicia Melis
Delay discounting and risk preference in chimpanzees (*Pan troglodytes*)

14:45 – 15:00 | Alejandro Sánchez-Amaro, Daniel Haun, Federico Rossano
The bargaining strategies of chimpanzees and bonobos in the Ultimatum Game

15:00 – 15:15 | Gabriele Schino, Francesco De Angelis, Raffaella Ventura
On decision making during grooming interactions in Japanese macaques (*Macaca fuscata*)

15:15 – 15:30 | Dufour Valerie, Broihanne Marie-Helene
Decision making under risk and ambiguity in human and non-human primates

14:00 – 15:30 | Session **C2** – Physiology / Neurobiology

Chair: Martina Stocker

14:00 – 14:15 | Marlen Kücklich, Brigitte M. Weiß, Susann Jänig, Madita Zetzsche, Andrea Marcillo, Almuth Einspanier, Claudia Birkemeyer, Anja Widdig - **Towards understanding chemical cues of fertility in primates**

14:15 – 14:30 | Johanna Eckert, Danyi Wang, (shared first-authorship), Sam Teague, Ali Al-Naji, Daniel Haun, Javaan Chahl - **Contact-free estimation of chimpanzees' heart rate: Validation and application of a new method for studying animal cognition**

14:30 – 14:45 | Baptiste Sadoughi, Dominik Schneider, Rolf Daniel, Oliver Schülke, Julia Ostner - **Aging manifests across the physical, social, and physiological domains in wild female Assamese macaques (*Macaca assamensis*)**

14:45 – 15:00 | Julia Ostner, Sonia Touitou, Michael Heistermann, Oliver Schülke
Physiological responses to energetic challenges in wild macaques

Thursday 2 June 2022

15:00 – 15:15 | Andreas Berghänel, Verena Behringer, Sean M. Lee, Barbara Fruth, Gottfried Hohmann - **Transition to siblinghood causes substantial and long-lasting physiological stress reactions in wild bonobos**

15:15 – 15:30 | Paula Escriche Chova, Leana R. Goetze, Karen L. Bales - **Neurobiology of pair bonding in female titi monkeys (*Plecturobus cupreus*)**

14:00 – 15:30 | Session **D2** – **Symposium:** Are we smart enough to know what great apes need & Studies in primate welfare

Symposium 3: Are we smart enough to know what great apes need – studies in great ape welfare. Part 2
Organizers: Jeroen Stevens (Odisee Hogeschool), Daan Lameris (University of Antwerp) & Johanna Neufuss (University of Birmingham)

Chairs: Jeroen Stevens, Daan Lameris & Johanna Neufuss

14:00 – 14:15 |Juan Olvido, A. Miani, A. Alstrup, J. Malmkvist, C. Pertoldi, T. H. Jensen, R.K. Nielsen, D. W. Hansen, L.A. Bach - **Voluntary engagement interventions: the reward of novel sensations**

14:15 – 14:30 | Ruta Vaicekauskaite, Christelle Gandon, Helen Beyer, Pascal Ancé, Pierre-Henri Moreau - **Innovative training protocol for common marmosets (*Callithrix jacchus*): group and individual positive reinforcement training to refine husbandry and research procedures**

14:30 – 14:45 | Abigail Gwynn, Hendrik Segah, Helen C. Morrogh-Bernard, Alex Thornton, Abdul Azis, Frank J.F. Van-Veen - **Use of the Mini-FLOTAC apparatus for monitoring gastrointestinal parasites of wild orang-utans**

14:45 – 15:00 | Dian G.M. Zijlmans, Lisette M. van den Berg, Jan A.M. Langermans, Elisabeth H.M. Sterck - **Using behaviour to predict overweight in captive group-living rhesus macaques (*Macaca mulatta*)**

15:00 – 15:15 | Dietmar Crailsheim, Pablo R. Ayuso
Research activity´s potential to support primate care in captivity

15:15 – 15:30 | Sophie Waasdorp, J.A. Tuffnell, L. Bruins-van Sonsbeek, C.M. Schilp, Y.R.A. van Zeeland, E.H.M Sterck - **What is the best way to feed captive white-naped mangabeys (*Cercocebus lunulatus*)?**

15:30 – 16:00 | Coffee, tea + **posters**

Thursday 2 June 2022

16:00 – 17:30 | Session **A3** – Social behaviour

Chair: Jordan Martin

16:00 – 16:15 | Pia M. Böhm, Lena S. Pflüger, Katharina Pink, Michael A. Huffman, Bernard Wallner - **Consortship stability of female homosexual consortships in Japanese macaques (*Macaca fuscata*)**

16:15 – 16:30 | Francisco E. de Oliveira Terceiro, Erik P. Willems, Maria de Fátima Arruda, Judith M. Burkart, Arrilton Araújo - **Food sharing under fluctuating food availability: long-term data from wild common marmosets (*Callithrix jacchus*)**

16:30 – 16:45 | Jenny Jaffe, Fabian Leendertz, Sebastien Calvignac-Spencer, Roman Wittig
Severe injuries in wild chimpanzees - behavioural and medical aspects

16:45 – 17:00 | Alan V. Rincon, Claire Pérez, Peter R. Clark, Julie Dubosq, Bridget M. Waller, Jérôme Micheletta – **Do more complex macaque societies use more complex facial behaviour?**

17:00 – 17:15 | Jordan S. Martin, C.A. Olivier, C. Pilisi, P. Agnani, C. Kauffmann, L. Hayes, A. V. Jaeggi, C. Schradin - **The evolution of inter- and intraspecific variation in primate social organization: A phylogenetic analysis of ancestral states and ecological effects on wild populations**

17:15 – 17:30 | Lucy Baehren, Susana Carvalho
Reinventing the framework for leave-taking: an example using wild chacma baboons (*Papio ursinus*)

16:00 – 17:30 | Session **B3** - Cognition

Chair: Isabelle Laumer

16:00 – 16:15 | Ivo Jacobs, Raquel Costa, Kata Horváth, André Gonçalves, Misato Hayashi
The origins of hominin fire use: Japanese macaques as living models

16:15 – 16:30 | Jonas Verspeek, Edwin J.C. van Leeuwen, Daan W. Laméris, Nicky Staes, Jeroen M.G. Stevens - **Indifferent hippies: lack of prosociality in prosocial choice task and group service paradigm in bonobos**

16:30 – 16:45 | Laura Lewis, Fumihiro Kano, Jeroen Stevens, Erin Wessling, Josep Call, Chris Krupenye
Chimpanzees and bonobos remember groupmates for at least a decade

16:45 – 17:00 | Mathieu S. Stribos, Ryan Sigmundson, Roy Hammer, Julia Herzele, Lena S. Pflüger, Jorg J.M. Massen - **Exploring the cognitive capacities of Japanese macaques in a cooperation game**

17:00 – 17:15 | Sarah Salphati, Marina Davila Ross, Derry Taylor
Rapid facial mimicry in infant chimpanzee play

17:15 – 17:30 | **GfP MASTER RESEARCH PRICE:** Tina Petersen
Representational feedback-loops and behavioural interactions: How, when, and what behaviours „upgrade" the functionality dimension in tool representations?

Thursday 2 June 2022

16:00 – 17:30 | Session **C3** – Genetics / Phylogeny

Chair: Lisa-Claire Vanhooland

16:00 – 16:15 | Laura LaBarge, B. Spillmann, A. Ashbury, A. Marzec, J .Kunz, E.R. Vogel, S.S. Utami Atmoko, C.P. van Schaik, M.A. van Noordwijk - **Local space-use and paternities in Bornean orangutans at Tuanan, Central Kalimantan, Indonesia**

16:15 – 16:30 | Nicky Staes, C.M. White, E.E. Guevara, M. Eens, W.D. Hopkins, S.J. Schapiro, J.M.G. Stevens, C.C. Sherwood, B.J. Bradley - **Epigenetic modification of dopamine receptor gene 2 (DRD2) is associated with extraversion scores in chimpanzees**

16:30 – 16:45 | Tobias van Elst Valisoa S.T. Rovanirina, Romule Rakotondravony, Paul A. Hohenlohe, Dominik Schüßler, Ute Radespiel - **Phylogeography of the critically endangered Gerp's mouse lemur has been shaped by rivers, altitude and paleoclimate**

16:45 – 17:00 | Laura Hagemann, N. Grow, Y.E.-M.B. Bohr, D. Perwitasari-Farajallah, Y. Duma, S.L. Gursky, S. Merker - **Small, odd and old - the most basal Sulawesi tarsier lives in the mountains**

17:00 – 17:15 | Samantha López Clinton, Rachel A. Voyt, Axel Jensen, Gideon Erkenswick Watsa, Mrinalini Erkenswick Watsa, Katerina Guschanski **- Developing saddleback and emperor tamarin SNP set for in situ genotyping using the MinION portable sequencer**

16:00 – 17:30 | Session **D3** – **Symposium:** Is it time to phase out lab research on non-human primates?

Symposium 5: Is it time to phase out lab research on non-human primates?
Organizers: Simone Pollo (Sapienza University of Rome) & Augusto Vitale (Istituto Superiore di Sanità)

Chair: Augusto Vitale

16:00 – 16:15 | Claudio I. Bernardi
Perspectives from the Pharma environment and Regulatory Agencies

16:15 – 16:30 | Luca Bonini
The biggest dilemma: nonhuman primates in neuroscientific basic research

16:30 – 16:45 | Jan A.M. Langermans
Replacement and reduction of non-human primate use inbiomedical research: opportunities and challenges

16:45 – 17:00 | Simone Pollo
Are NHPs a special case for the reform of scientific use of animals?

Thursday 2 June 2022

17:00 – 17:15 | Valeska Stephan
The role of non-human primates in research and development – an (historical) overview

17:15 – 17:30 | Augusto Vitale
Critical issues in the evaluation of Non-Human Primates lab research

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17:30 – 18:30 | Plenary 3

Tomas Marques-Bonet - A global catalog of whole-genome diversity from 233 primate species

Chair: Jan Langermans

18:30 – 19:30 | EFP-GfP movie night with "The family of chimps" (1984) by Bert Haanstra, with an introduction by Prof. dr. Jan van Hooff

Friday 3 June 2022

09:00 – 10:00 | Plenary 4

Elise Huchard - The ecology of sexual coercion and of power asymmetries between the sexes in primates

Chair: Oliver Schülke

10:00 – 10:30 | Coffee, tea + **posters**

10:30 – 12:30 | Session **A4** – **Symposium:** Meaning, context and function: Studies on flexibility versus specificity in primate communication / Communication

Symposium 6: Meaning, context and function: Studies on flexibility versus specificity in primate communication.
Organizers: Marlen Fröhlich (University of Tübingen) & Kirsty E. Graham (University of St Andrews)

Chairs: Marlen Fröhlich & Kirsty Graham

10:30 – 10:45 | Nancy Rebout, Arianna De Marco, Andrea Sanna, Jérôme Micheletta, Jean-Christophe Lone, Reinier F. van den Berg, Elisabeth H.M. Sterck, Jan A.M. Langermans, Bernard Thierry, Alban Lemasson - **Testing the association between social complexity and contextual call flexibility in four species of macaque**

10:45 – 11:00 | Catherine Crockford, Cedric Girard-Buttoz, Emiliano Zaccarella, Tatiana Bortolato, Angela Friederici, Roman Wittig - **The patterning and ontogeny of chimpanzee vocal sequences**

11:00 – 11:15 | Guillaume Dezecache
Vocal functional flexibility: what it is and why it matters for primatologists

11:15 – 11:30 | Peter Clark, Bridget Waller, Jerome Micheletta
Matching crested macaque facial signals to social interaction outcomes

11:30 – 11:45 | Juliette Aychet, Catherine Blois-Heulin, Alban Lemasson
Signal sequences in captive mangabeys: flexible communication in a non-hominoid primate?

11:45 – 12:00 | Carel van Schaik, Marlen Fröhlich
The meanings of 'meaning' of primate signals

12:00 – 12:15 | Alexandra Langehennig-Peristenidou, Daniel Romero-Mujalli, Tjard Bergmann, Marina Scheumann - **From simple to complex: vocal development of the trill call in grey mouse lemurs**

Friday 3 June 2022

12:15 – 12:30 | Kirsty E. Graham, Marlen Fröhlich
A discussion on meaning, context and function

10:30 – 12:30 | Session **B4** - Cognition

Chair: Jessie Adriaense

10:30 – 10:45 | Edwin J.C. van Leeuwen, N. Staes, S. Kordon, J. Brooker, S. Nolte, Z. Clay, M. Eens, J.M.G. Stevens - **Timbres of tolerance: bonobos and chimpanzees do not systematically differ in their expressions of co-feeding tolerance**

10:45 – 11:00 | Shona Duguid, Esther Herrmann, Michael Tomasello
How do chimpanzees coordinate actions to solve a pure coordination problem?

11:00 – 11:15 | Isabelle Laumer, Shubhangi Kansal, Anais van Cauwenberghe, Marlen Fröhlich, Tatang Mitra Setia, Caroline Schuppli - **The development of object manipulations in free-ranging and captive orangutans**

11:15 – 11:30 | Lara Southern, Simone Pika, Tobias Deschner
Lethal coalitionary attacks of chimpanzees (*Pan troglodytes troglodytes*) on gorillas (*Gorilla gorilla gorilla*) in the wild

11:30 – 11:45 | Kathrin S. Kopp, Sonja J. Ebel, Roman M. Wittig, Daniel B.M. Haun, Catherine Crockford - **Mirror, mirror in my hand... A simple method to improve MSR tests in chimpanzees**

11:45 – 12:00 | André Gonçalves, Yuko Hattori, Ikuma Adachi
Strange yet familiar? Chimpanzees' interest towards conspecific skulls, an eye-tracking experiment

12:00 – 12:15 | Marta Panunzi, Elsa Addessi, Gabriele Schino
Capuchin monkeys flexibly coordinate in a Snowdrift game

12:15 – 12:30 | Jessie E.C. Adriaense, Judith M. Burkart
Joint action in common marmosets (*Callithrix jacchus*) and the role of joint commitment

10:30 – 12:30 | Session **C4 – Symposium:** Exchanging methods in the ethological study of human and non-human primates / Social behaviour

Symposium 7: Exchanging methods in the ethological study of human and non-human primates.
Organizer: Virginia Pallante (Netherlands Institute for the Study of Crime and Law Enforcement)

Chair: Virginia Pallante

10:30 – 10:45 | Marie Rosenkrantz Lindegaard
Does Danger Level Affect Human Bystander Intervention in Real-Life Conflicts? Evidence from CCTV Footage

Friday 3 June 2022

10:45 – 11:00 | Peter Ejbye-Ernst
Does third-party intervention matter? A video-based analysis of the effect of third-party intervention on the continuation of interpersonal conflict behaviour

11:00 – 11:15 | Hans Myhre Sunde, Marie Rosenkrantz Lindegaard, Don Weenink
What goes on before the conflict goes off? A systematic video analysis of conflict in police-citizen encounters

11:15 – 11:30 | Carlijn van Baak, Evelien Hoeben, Don Weenink, Marie Rosenkrantz Lindegaard
What do they do? Video analysis of actions by men and women as bystanders in public conflicts captured on CCTV

11:30 – 11:45 | Marjolijn Das
Using administrative register data to study human behaviour

11:45 – 12:00 | Richard Philpot, Lasse Suonperä Liebst, Marie Rosenkrantz Lindegaard, Peter Verbeek, Mark Levine - **Reconciliation in human adults: A video-assisted naturalistic observational study of post conflict conciliatory behaviour in interpersonal aggression**

12:00 - 12.15 | Virginia Pallante, Marie Rosenkrantz Lindegaard
From primatology to the social sciences and back: exchanging methods for a shared research

12:15 – 12:30 | Elizabeth T. Hallers-Haalboom, M.M. Vermande, E.J.C. van Leeuwen, E.H.M. Sterck
Food sharing in human children

10:30 – 12:30 | Session **D4 – Symposium:** Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions

Symposium 8: Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions. Part 1
Organizers: Karline Janmaat (University of Amsterdam) & Miguel de Guinea (The Hebrew University of Jerusalem)

Chairs: Karline Janmaat & Miguel de Guinea

10:30 – 10:45 | Shelly Masi, Silvia Miglietta, Giulia Bardino, Terence Fuh, Paco Bertolani, Benjamin Robira - **Frugivory triggers goal-directed travel in wild western gorillas**

10:45 – 11:00 | Karline Janmaat, Miguel de Guinea, Julien Collet, Richard W. Byrne, Benjamin Robira, Emiel van Loon, Matthias Allritz, Haneul Jang, Andrea Presott1, Cody Ross, Gabriel Ramos-Fernandez, Shauhin Alavi, Dora Biro - **Comparing cognition among wild primates: linking primate movement decisions to information gradients in natural habitats**

11:00 – 11:15 | Bryndan van Pinxteren, Karline R.L. Janmaat, Martijn Egas
Foraging in Fear: the effect of an intra-guild predator on the foraging behavior of sooty mangabeys

Friday 3 June 2022

11:15 – 11:30 | Emma S. McEwen, Matthias Allritz, Josep Call, Ken Schweller, Miguel de Guinea, Karline R. L. Janmaat, Charles R. Menzel, Daniel Haun, Francine L. Dolins - **Chimpanzee navigation in a virtual environment**

11:30 – 11:45 | Bethany Watkins, Miguel de Guinea *, Stephanie A. Poindexter, Jörg U. Ganzhorn, Giuseppe Donati, Timothy M. - **Routes matter: the effect of seasonality on bamboo lemur navigational strategies**

11:45 – 12:00 | Jorin Veen, Bryndan O.C.M. van Pinxteren, Vidrich Kandza, Haneul Jang, Patrick G. Meirmans, Karline R.L. Janmaat - **Examining the diet, foraging behaviour, and botanical knowledge of Mbendjele BaYaka children**

12:00 – 12:15 | Tamara Vallina, Martijn Egas, Haneul Jang, Lucy Bates, Heather Cohen, Jorin Veen, Karline R.L. Janmaat - **Examining the navigational toolbox of the Mbendjele BaYaka forager children**

12:15 – 12:30 | Kavel Ozturk, Martijn Egas, Karline R. L. Janmaat
For Mandrills, timing is everything

12:30 – 14:00 | Lunch + **posters**

14:00 – 15:30 | Session **A5** - Communication

Chair: Paula Escriche Chova

14:00 – 14:15 | Alexandra B. Bosshard, Maël Leroux, Nicholas A. Lester, Balthasar Bickel, Sabine Stoll, Simon W. Townsend - **Using linguistic methods to quantify call combinations in chimpanzees (*Pan troglodytes schweinfurthii*)**

14:15 – 14:30 | Tom S. Roth, Mariska E. Kret
An experimental investigation of attention to and preference for flanges in orangutans

14:30 – 14:45 | Sandro Sehner, Carel van Schaik, Judith Maria Burkart
The evolutionary origin of information donation: a targeted comparison between marmosets and squirrel monkeys

14:45 – 15:00 | Alice Bouchard, Klaus Zuberbühler
Male chimpanzees communicate to mediate competition and cooperation during feeding

15:00 – 15:15 | Julián León, Constance Thiriau, Klaus Zuberbühler
Development of alarm call comprehension in sooty mangabeys

Friday 3 June 2022

15:15 – 15:30 | Adrian Soldati, Pawel Fedurek, Guillaume Dezecache, Geresomu Muhumuza, Klaus Zuberbühler, Josep Call
The ontogeny of behavioural responses to pant hoots in chimpanzees

14:00 – 15:30 | Session **B5** -Cognition

Chair: Debottam Bhattacharjee

14:00 – 14:15 | Mathieu Malherbe, Liran Samuni, Catherine Crockford, Roman Wittig
Developmental trajectories of tool grasping complexity during tooluse in wild chimpanzees (*Pan troglodytes verus*)

14:15 – 14:30 | Edwin J.A.M. de Laat, Jorg J.M. Massen, Elisabeth H.M. Sterck
Tolerance and prosociality in long-tailed macaques

14:30 – 14:45 | Louise Loyant, Bridget Waller, Jerome Micheletta, Hélène Meunier, Sébastien Ballesta, Marine Joly - **Social tolerance and inhibitory control skills in macaque species**

14:45 – 15:00 | Kai Caspar, Fabian Pallasdies, Larissa Mader, Heitor Sartorelli, Sabine Begall
The evolution and biological correlates of anthropoid primate hand preferences

15:00 – 15:15 | Valentina Truppa, Ilaria Soraci, Luca Marino, Patrícia Izar, Dorothy M. Fragaszy, Elisabetta Visalberghi - **Bimanual coordination and laterality in extractive foraging by wild capuchin monkeys**

15:15 – 15:30 | Johanna Henke-von der Malsburg, Peter M. Kappeler, Claudia Fichtel
Linking interspecific cognitive variation to ecological factors in wild sympatric mouse lemur species

14:00 – 15:30 | Session **C5** – Social Behaviour

Chair: Evy van Berlo

14:00 – 14:15 | Jens Mudde, Suska Nolte, Edwin J.C. van Leeuwen, Elisabeth H.M. Sterck
Comparing bonobo and chimpanzee strategies to obtain food from a food owner in a group provisioning paradigm

14:15 – 14:30 | Lauren Seex, Tommaso Saccà, Charlotte K. Hemelrijk
How to measure inter-sexual dominance?

14:30 – 14:45 | Roy Hammer, Mathieu Stribos, Pia Böhm, Michael A. Huffman, Jorg J.M. Massen, Lena S. Pflüger - **How to bring structure to a monkey-jumble? - Introducing a novel methodological framework for group classification during fission in semifree ranging Japanese macaques (*Macaca fuscata*)**

Friday 3 June 2022

14:45 – 15:00 | Jana Muschinski, Dora Biro, Susana Carvalho
Filling gaps in the primate greeting story: a video-based analysis of proximity events in chacma baboons (*Papio ursinus*)

15:00 – 15:15 | Angela Stojan, Bernard Wallner, Lena S. Pflüger
Male-male social relationships during times of social unrest in a semi-free ranging group of Japanese macaques (*Macaca fuscata*

15:15 – 15:30 | Veera Riihonen, Taru Niittynen, Océane Lehrmann, Michael Briga, Sonja E. Koski
Personality in horse-human interaction in young horses (*Equus caballus*)

14:00 – 15:30 | Session **D5** - **Symposium:** Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions & Behaviour ofwild primates

Symposium 8: Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions. Part 2
Organizers: Karline Janmaat (University of Amsterdam) & Miguel de Guinea (The Hebrew University of Jerusalem)

Chairs: Karline Janmaat & Miguel de Guinea

14:00 – 14:15 | Miguel de Guinea, Hanlan Fei, Li Yang, Colin A. Chapman, Pengfei Fan
Where to sleep next? Evidence for spatial memory associated to sleeping sites in Skywalker gibbons (*Hoolock tianxing*)

14:15 – 14:30 | R. Adriana Hernandez-Aguilar, Trond Reitan
What ecological variables do chimpanzees (*Pan troglodytes*) evaluate before selecting a place to spend the night?

14:30 – 14:45 | Zoë Goldsborough, Claudio M. Monteza-Moreno, Margaret C. Crofoot, Brendan J. Barrett - **Tool use and tidal cycles: Activity patterns in island-living whitefaced capuchin monkeys (*Cebus capucinus imitator*)**

14:45 – 15:00 | Sylvain Lemoine, Catherone Crockford, Roman Wittig
Tactical use of high elevation by wild chimpanzees to detect hostile neighbours

15:00 – 15:15 | Benjamin Robira, Simon Benhamou, Erlich Obeki Bayanga, Thomas Breuer, Shelly Masi - **How do primates decide where to go? Insights from wild western gorilla cognitive foraging**

15:15 – 15:30 | *Discussion / summary Symposium: Getting into the mind of the forager*

15:30 – 16:00 | Coffee, tea + **posters**

Friday 3 June 2022

16:00 – 17:30 | Session **A6** - Communication

Chair: Juan Olvido

16:00 – 16:15 | Adam Zeeman, Jorg Massen, Karline Janmaat, Debottam Bhattacharjee - **How animal personality shapes human-animal interactions: A visitor-effect study on crested macaque**

16:15 – 16:30 | Yuri Kawaguchi, Koyo Nakamura, Masaki Tomonaga, Ikuma Adachi
The role of infantile coloration on face recognition in chimpanzees

16:30 – 16:45 | Nick C.P. Dam, Meike K. Zemihn, Carel J. ten Cate
Reproductive cues in trill calls of captive and wild female common marmosets (*Callithrix jacchus*)

16:45 – 17:00 | Tatiana Bortolato, Cédric Girard-Buttoz, Marion Laporte, Mathilde Grampp, Klaus Züberbuehler, Roman M. Wittig, Catherine Crockford- **Call order varies systematically across chimpanzee populations in a greeting vocal sequence**

17:00 – 17:15 | Brigitte Weiß, Michelle Roderer, Anja Widdig
Visual information modulates sniffing behaviour of Barbary macaques at Affenberg Salem

17:15 – 17:30 | Claire Pérez, Jérôme Micheletta, Alexander Mielke, Bridget M. Waller, Julie Duboscq, Alan Rincon - **Use of NetFACS to describe the repertoire of Barbary macaques' facial behaviour**

16:00 – 17:30 | Session **B6** - Cognition

Chair: Tom Roth

16:00 – 16:15 | Vedrana Šlipogor, Markus Stasek, Camila Rezende, Nicola Schiel, Antonio Souto, Thomas Bugnyar - **Common marmosets (*Callithrix jacchus*) learn socially via video demonstrations under captive and natural conditions**

16:15 – 16:30 | Sofia Forss, Erik Willems - **Great Ape curiosity compared: implications for socially triggered curiosity in hominids**

16:30 – 16:45 | Elisa Bandini, Johannes Grossmann, Martina Funk, Anna Albiach Serrano, Claudio Tennie - **Naïve orangutans (*Pongo abelii* and *Pongo pygmaeus*) individually acquire nut-cracking using hammer tools**

16:45 – 17:00 | Rahel K. Brügger, Erik P. Willems, Judith M. Burkart - **Looking out for each other – patterns of synchronization and turn taking in marmoset vigilance**

Friday 3 June 2022

17:00 – 17:15 | Alba Motes Rodrigo, Shannon P. McPherron, Will Archer, R. Adriana Hernandez-Aguilar, Claudio Tennie - **Experimental investigation of orangutans' lithic percussive and sharp stone tool behaviours**

17:15 – 17:30 | Claudio Tennie, Alba Motes-Rodrigo
Which ape behavioural forms might require copying? Introducing the Method of Local Restriction

16:00 – 17:30 | Session **C6** – Social behaviour

Chair: Lena Pflüger

16:00 – 16:15 | Charlotte Hemelrijk, Matthew Cooper, Delphine de Moor, Julia Ostner, Oliver Schülke, Bernard Thierry, Gerrit Gort - **Adult sex ratio, sexual dimorphism and partial female dominance over males in macaques**

16:15 – 16:30 | Sophia Daoudi-Simison, Eoin O"Sullivan, Phyllis Lee, Hannah Buchanan-Smith
Social networks in mixed-species groups of capuchin and squirrel monkeys

16:30 – 16:45 | Rachel Harrison, Jennifer Botting, Erica van de Waal
Social trajectories following early maternal loss in wild vervet monkeys

16:45 – 17:00 | Karlijn Gielen, Annet L. Louwerse, Elisabeth H.M. Sterck
Male infanticide in captive long-tailed macaques (*Macaca fascicularis*)

17:00 – 17:15 | Olga Feliu, Marti Masip, Carme Maté, Sonia Sànchez, Dietmar Crailsheim, Elfriede Kalcher-Sommer - **Development of social competence in three former pet chimpanzees after living at the Mona sanctuary for 10 years**

17:15 – 17:30 | Mulati Mikeliban, Belinda Kunz, Tri Rahmaeti, Natalie Uomini, Caroline Schuppli
Orangutan mothers reactively facilitate learning opportunities for their offspring during food solicitations

16:00 – 17:30 | Session **D6** – Behaviour of wild primates

Chair: Dietmar Crailsheim

16:00 – 16:15 | Odd Jacobson, Meg Crofoot, Susan Perry, Brendan Barrett
Using sleep site locations to investigate historical space-use patterns of capuchin groups

16:15 – 16:30 | Harmonie Klein, Gaelle Bocksberger, Pauline Baas, Sarah Bunel, Erwan Théleste, Simone Pika, Tobias Deschner - **Hunting behavior in central chimpanzees (*Pan troglodytes troglodytes*) in the wild**

Friday 3 June 2022

16:30 – 16:45 | Shawn M. Lehman, Malcolm S. Ramsay, Fernando M. Mercado-Malabet, Hajanirina N. Ravelonjanahary, Andriamahery Raz - **Spatial patterns of roadkill within Ankarafantsika National Park, Madagascar**

16:45 – 17:00 | Franziska Grathwol, C. Roos, D. Zinner, C. Ottoni, W Van Neer, N Dominy, G. H. Kopp **Baboons in Ancient Egypt: Geographic origin of mummified baboons as revealed by ancient DNA analysis**

17:00 – 17:15 | Mélissa Berthet, Geoffrey Mesbahi, Guilhem Duvot, Klaus Zuberbühler, Cristiane Cäsar, Júlio César Bicca-Marques - **A population of titi monkeys declined by 80% after the 2016-2018 yellow fever outbreak in Brazil**

17:15 – 17:30 | Joanna M. Setchell, Barthélemy Ngoubangoye – **Decolonising (European) primatology: why and how?**

17:30 – 18:30 | General Assembly EFP

18:30 – 19:30 | Plenary 5

Plenary 5: Kathelijne Koops - Ape origins of human technology

Chair: Liesbeth Sterck

19:30 – 00:00 | Conference Diner & Party

Posters

Poster 1
Sara Fontani, Giovanna Marliani, Pier Attilio Accorsi, Gale Glendewar, Stefano Vaglio - **Olfactory signals and fertility in captive Alaotran gentle lemurs**

Poster 2
I. Kondova, T. Haaksma, B. Ouwerling, D. Adema, J.A.M. Langermans, N.G. de Groot, R. E. Bontrop - **Biobank of the Biomedical Primate Research Centre (BPRC): Implementation of 3Rs Principles**

Poster 3
Emile Bryon, Nicky Staes, Jeroen M.G. Stevens, Edwin J.C. van Leeuwen - **Aggression in the *Pan* species: a multi-group comparison in zoohoused settings**

Poster 4
Natascha Riedel, Julia Mörchen, Puji Rianti, Caroline Schuppli, Anja Widdig - **Measuring ecological competence in immigrant male orangutans**

Poster 5
Meike K. Zemihn, Miriam Kuspiel, Esther Clarke , Carel ten Cate - **Variability of phee call combinations and related contexts in common marmosets**

Poster 6
Alma Nederlof, Anne Marijke Schel - **Facial temperatures and vocal parameters as non-invasive measures of animal emotions**

Poster 7
Lisa-Claire Vanhooland, Thomas Bugnyar, Jorg J.M. Massen - **Comparing the performances of chimpanzees in two selfawareness tasks**

Poster 8
Annemiek Maaskant , Isabel Janssen, Inge Wouters, Frank van Eerdenburg, Edmond Remarque, Jan Langermans, Jaco Bakker **- Indoor air quality evaluation of naturalistic housed macaques (*Macaca* spp.)**

Poster 9
Juliette Morgan Berthier, Nicholas E. Newton-Fisher, Brandon C. Wheeler - **Studying primates' emotions out of the lab: Adding an infrared thermographic camera in the basic fieldwork kit of primatologists?**

Poster 10
R. Cabo, M. Muchlinski, A. Casado, J.M. Potau, J.F. Pastor - **Ultrastructure of *Varecia variegata sublingual***

Poster 11
Marit Vernes, Martina Stocker, Annet Louwerse, Jan Langermans - **Group training in rhesus macaque breeding groups – feasibility and success rate**

Posters

Poster 12
Megan Beardmore-Herd, Julia Fischer, Kaitlyn Gaynor, Meredith Palmer, Susana Carvalho - **Effects of an extreme weather event on vervet monkeys in the impacted environment of Gorongosa National Park, Mozambique**

Poster 13
Kaja Wierucka, Nikhil Phaniraj, Yvonne Zürcher, Judith M Burkart **- Machine learning and multiverse analysis approaches to studying marmoset vocal accommodation**

Poster 14
Animal Behaviour Collective **- Animal Behaviour Collective: Microgrants and mentorship for animal behaviour students**

Poster 15
Kevin López-Leal, A. Arroyo, D. Riba - **Termite mound behaviour in semi-captive chimpanzees**

Poster 16
Claire Mawdsley, Marina Davila-Ross, Susan M. Cheyne, Giuseppe Donatti, Magdalena S. Svensson - **The effect of age and sex on object play behaviour of chimpanzees (*Pan troglodytes*) in a sanctuary environment**

Poster 17
Martina Stocker, Leonie C. den Ouden, Jan Langermans, Jorg J.M. Massen **- 2D:4D ratio in long-tailed macaques - not sexually dimorphic but stable during growth**

Poster 18
Mathilde Grampp, Patrick Tkaczynski, Catherine Crockford, Roman M. Wittig - **Investigating the link between behavioural flexibility and social complexity in two sympatric primate species**

Poster 19
Shannon Slater-Johnson, Florence Rocque, Edwin van Leeuwen, Marina Davila-Ross - **Social relationships in orangutans in rehabilitation, applying social network analysis and examining change over a 16 month period**

Poster 20
Luca Di Vincenzo - **Meta-representation in primates: a proposal for a multimodal approach in the study of language recursiveness**

Poster 21
Juan Pablo Pimiento Valencia, Vedrana Šlipogor, Jorg JM Massen, Thomas Bugnyar - **How do common marmoset respond to different video stimuli? A comparison between self, other and object**

Poster 22
Sara Cardoso, R. Adriana Hernandez-Aguilar, Laia Dotras, Nadia Mirghani, Manuel Llana, A. Barciela, Jordi G - **Measuring body size of wild chimpanzees from camera trap photographs using a photogrammetric technique**

Posters

Poster 23
Marion Varga, Vedrana Šlipogor, Thomas Bugnyar - **Individual differences in problem-solving in common marmosets (*Callithrix jacchus*)**

Poster 24
Fabio Crepaldi, Leanne Proops, Florence Rocque, Marina Davila-Ross - **Examining orangutan's open-mouth faces during play and their relationship to friendship**

Poster 25
Charlotte Kluiver, Jorg Massen, Debottam Bhattacharjee - **Can inter-individual differences predict time-activity budget of liontailed macaques?**

Poster 26
Stephanie Kordon, Christine Webb, Frans B.M. de Waal, Zanna Clay - **Predictors of life success in sanctuary housed bonobos: A longitudinal approach investigating links among rearing, socioemotional skills, health and survivability**

Poster 27
Laura van Holstein, Hannah McKay, Kathelijne Koops - **Technological Red Queen: Primate technology and interspecific competition**

Poster 28
Judit J. Stolla, Carina Bruchmann, Julia Fischer, Stefanie Keupp - **The "Model/Rival" training method with long-tailed macaques (*Macaca fascicularis*)**

Poster 29
Anne-Marijke Schel, S. Kordon, E.H.M. Sterck - **Intentional gestural communication in two macaque species with different social organizations: a test of the social complexity hypothesis for communication.**

Poster 30
Débora L. da Cruz, Arrilton Araújo, Judith M. Burkart,- **The presence of infants affects food associated calls in wild marmosets: implications for intentional communication**

Poster 31
Charlotte Canteloup , Joonho Lee, Samuel Zimmermann, Marco Hutter, Erica van de Waal - **When monkeys meet an ANYmal robot in the wild**

Poster 32
Sandra Roubos, Annet L Louwerse, Jan AM Langermans, Jaco Bakker - **Longterm and reversible contraception in female common marmosets (*Callithrix jacchus*)**

Poster 33
Maria A. van Noordwijk, C. Ackermann, A.M. Marzec, J.A. Kunz, B. Spillmann, L.R. LaBarge, E.R. Vogel, S.S.Utami Atmoko - **Siring success clustered in space but not time in male Bornean orangutans**

Posters

Poster 34
Elisabeth H.M. Sterck, Han de Vries, Tonko W Zijlstra - **Gaining and maintaining friends: a computer model of primate bonding**

Poster 35
Roman Akyüz - **Contagious yawning towards in versus outgroup members in chimpanzees**

Poster 36
Nanine de Groot, Annemiek J.M. de Vos-Rouweler, Annet Louwerse, Jan A.M. Langermans, Jesse Bruijnesteijn, Natasja G. de Groot, Ronald E. Bontrop - **Genetic assays as tool for conservation management of non-human primate species**

Poster 37
Lena S. Pflüger, Richard L. Hahn, Johanna M. Schulz, Jana Jäckels, Martin Hofer, Helmut Schaschl, Bernard Wallner - **Non-invasive mRNA extraction for gene expression profiling in semi-free ranging Japanese macaques (Macaca fuscata)**

Poster 38
Emily Elwell, Joshua Cox, Elysse Lloyd, Stefano Kaburu, Christopher Young, Stefano Vaglio - **A novel scent enrichment to trigger mating behaviour in ruffed lemurs**

Poster 39
Marie Padberg, Eckert,J., Thiele,M., Wang,D., Howart,L.H., Grosse Wiesmann,C, Haun,D.B.M. - **Don't You (Forget About Me) – The developmental trajectory of the social memory effect in great apes**

Poster 40
Leonie Pethig, Peter Kappeler, Claudia Fichtel - **Sex-specific drivers of an unusual adult sex ratio in redfronted lemurs (*Eulemur rufifrons*)**

Poster 41
Georgia Sandars, Jake Brooker, Zanna Clay - **The significance of positive behavioural contagion in chimpanzees**

Poster 42
Julia Lehmann - **How stressful is social tolerance? An investigation into rank, stress and health measures in two species of macaques**

Plenary speakers - Abstracts

Wednesday 1 June 2022 - *Room – A - Auditorium*

16:00 – 17:00h: Plenary 1

Daniel Haun[1] - **Group differences in chimpanzee social behavior**
1. Department of Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

While we regularly consider sources of variation across groups and individuals when studying animal behaviour in the wild, we often treat performance in cognitive tasks as a stable, species-specific characteristic. By simply speaking of 'chimpanzee' or 'human' cognition, we imply to be stable what we know to be variable. In this talk, I will emphasize the relevance of intraspecific variation in experimental tasks for understanding great ape cognition both within and across species. In an experimental study on group-level co-feeding tolerance, we repeated the same experiment across four groups of chimpanzees over eight years. Variation across both groups and years suggests that co-feeding tolerance is a responding trait of chimpanzee sociality not a species-level characteristic. In a second study on interindividual variation, we repeatedly exposed the same sample of great apes to the same set of cognitive tasks every two weeks for one year. We find that variation in cognitive performance varies much more across individuals than across species or groups, emphasizing the necessity for ontogenetic analysis to identify individual sources of cognitive variation. In conclusion, I will argue that understanding the sources of variation in performance across individuals and groups is not auxiliary, but fundamental to understanding cognitive differences and similarities across species. Cognitive diversity is key, not noise.

Thursday 2 June 2022 - *Room – A - Auditorium*

09:00 – 10:00 | Plenary 2

Sarah Wolfensohn[1] - **Assessment of primate welfare: why, where, who, when and how?**
1. Professor of Animal Welfare, University of Surrey

Good welfare is more than just the absence of pain, disease and injury and assessing it is vital to justify how we keep and interact with primates in all the different settings in which we use them. This presentation will consider a variety of tools that are available to assess welfare, but who takes responsibility for doing so and ensuring that action is taken to maximise good welfare? The ethical implications and differences in opinions that may occur will be discussed and how this increases the need for objective, validated measurements of welfare. It will review the factors to be scored, when and how to measure them and the potential impacts of doing so; along with the outcome of using welfare assessment to educate, inform and promote action to improve the primates' quality of life.

Thursday 2 June 2022 - *Room – A - Auditorium*

17:30 – 18:30 | Plenary 3

Tomas Marques-Bonet[1] - **A global catalog of whole-genome diversity from 233 primate species**

1. ICREA Research Professor and Director of Institute of Evolutionary Biology (UPF-CSIC)

Genomic diversity is at the core of many evolutionary inferences. Studying the genetics of the primates is a necessary endeavour to define the similarities among primates, the uniqueness of humans, and to strengthen the foundations of primate management and conservation. The latter of which should be an international effort, as these species should be considered a treasure of humanity. In the recent years, there have been some efforts to characterize full genome information from all apes and then, considering the population decline that all primates are experiencing, it is time-sensitive to act rapidly and generate a global dataset of variation for all primates.
In this project, we generated high quality full genome information for a large panel of primates all over the world. By analyzing full genome information of 811 individuals from 233 species, using mostly samples from the wild, our results highlight the different patterns of variation elucidating the role of demography, admixture and selection on genome diversity. In so doing, fundamental insights are gained into the study of primates with multiple ramifications to biology including defining a better understanding of the human genome and for a reconciliation of taxonomic and genetic data especially with regards to conservation biology.

Friday 3 June 2022 - *Room – A - Auditorium*

09:00 – 10:00 | Plenary 4

Elise Huchard[1] - **The ecology of sexual coercion and of power asymmetries between the sexes in primates**

1. Anthropologie Évolutive, Institut des Sciences de l'Évolution de Montpellier (ISEM), France

In animal societies, control over resources and reproduction is often biased towards one sex. Such power asymmetries between the sexes are widespread, and largely shape male-female sexual and social relationships. In particular, males often coerce females in reproductive contexts, as well as in other contexts. Yet, the ecological and evolutionary underpinnings of male-female power asymmetries remain poorly understood. In the first part of this talk, I use long-term data from wild chacma baboons and mandrills to show that sexual coercion is common in such species, and to explore its variation across individuals and dyads. In a second part, I use comparative data from several mammalian species to quantify and investigate variation in power asymmetries between the sexes, here measured by sex biases in intersexual dominance (proportion of intersexual conflicts won by each sex). I show that intersexual dominance varies (i) along a continuum from strict male dominance to strict female dominance across species, and (ii) flexibly within species. In the last part, I present an evolutionary framework aimed at understanding and predicting why power is biased towards females (versus males) in different populations or species, and envisage the distinct pathways towards female versus male empowerment.

Friday 3 June 2022 - *Room – A - Auditorium*

18:30 – 19:30 | Plenary 5

Kathelijne Koops[1] - **Ape origins of human technology**
1. Ape Behaviour & Ecology Group, Department of Anthropology, University of Zurich, Switzerland

Complex technology is a defining feature of modern humans. Our technological innovations have reshaped the planet and altered the way in which evolutionary forces impact our lives. Despite the enormous significance of human technology, the evolutionary origin of our complex use of tools is not well understood. Comparative research is crucial to determining which evolutionary forces prompted differences in technological skill to emerge and diverge among humans and other species. In this talk, I will discuss my research into the drivers of tool use and material culture in (non-human) apes and humans. First, I will introduce research undertaken at our chimpanzee study site in the Nimba Mountains (Guinea). Findings from Nimba highlight a key role for the environment in explaining chimpanzee tool use. Next, I will discuss my comparative research on chimpanzees and bonobos, the two ape species most closely related to humans. Chimpanzees are renowned for their tool use, whereas bonobos use few tools and none in foraging. By comparing the two species we discovered that the intrinsic motivation to interact with objects is important in explaining the tool use difference. Lastly, I will introduce you to our current research program, the *Comparative Human and Ape Technology (CHAT) Project*, which investigates the drivers of tool use and culture across African apes and humans. Overall, my research aims to enhance our understanding of the evolution of technology and to shed light on what made humans the uniquely technological ape.

Symposia – symposium abstracts and overview presentations

Thursday 2 June 2022 - *Room – A - Auditorium*

Sessions A1 and A2
Symposium 1: Great apes' production and perception of emotional expressions. Part 1
Organizers: Yena Kim (Leiden University), Raphaela Heesen (Durham University), Mariska Kret (Leiden University) & Zanna Clay (Durham University)

Symposium Abstract:
In any social species, emotion communication plays a crucial role in the ability of individuals to navigate their social worlds. The expression of emotions (whether automatic or voluntary) provides insights into underlying affective states, permitting receivers to rapidly and accurately adjust behaviors when perceiving such expressions, for instance during collaborative settings or during aggression. Compared with other animals, humans have evolved exceptionally communicative faces and bodies which enhance the salience of the emotional signals, and at the same time, highly sensitive perceptual systems to detect subtle emotional cues. Nevertheless, how this emotion communication system evolved in the hominin lineage and in particular *which* selective pressures have acted on these behavioral and perceptual systems remains poorly understood. In this symposium, we address this by exploring and comparing the production and perception of emotional expressions across our closest living relatives, the great apes. Given the highly varied social structure in great apes, ranging from semi-solitary to multi-male and multi-female systems, as well as variable habitats in which they live, we believe that this symposium will provide an exciting opportunity to produce a comprehensive evolutionary comparison from both ultimate and proximate perspectives. Combing research methods from observational to noninvasive behavioural experiments, such as touch-screen and eye-tracking technologies, we aim at unveiling behavioral and perceptual capacities of emotion communication in great apes.

Session A1
10:30 – 10:45 | Yena Kim, Jolinde M.R. Vlaeyen, Raphaela Heesen, Mariska E. Kret, Zanna Clay - **The association between the bared-teeth display and social dominance structures: a comparison between bonobos and chimpanzees**

10:45 – 11:00 | Ivan Norscia, Giada Cordoni - **Something has changed between us: emotional communication varies from play- to real-fighting in chimpanzees**

11:00 – 11:15 | Jake Brooker, Christine Webb, Frans de Waal, Zanna Clay - **Empathic tendencies in Pan - a comparative investigation into the consolation tendencies of sanctuary-living chimpanzees and bonobos**

11:15 – 11:30 | Diane A. Austry, Jake S. Brooker, Zanna Clay - **Chimpanzees' responses to emotional expressions and its relation to behavioural markers of empathy: A behavioural and thermal investigation**

11:30 – 11:45 | Katja Liebal, Manuela Ersson-Lembeck, Manfred Holodynski - **The challenge of studying emotion expression in nonhuman primates: a developmental study on mother-infant interactions in humans (*Homo sapiens*) and captive chimpanzees (*Pan troglodytes*)**

11:45 – 12:00 | Evy van Berlo, Yena Kim, Mariska E. Kret - **Attentional selectivity for emotions: humans and bonobos compared**

12:00 – 12:15 | Raphaela Heesen, Yena Kim, Mariska Kret, Zanna Clay - **The body speaks for itself: Chimpanzees' perception of emotion from body movements**

12:15 – 12:30 | Tonko Zijlstra, Yena Kim, Mariska Kret - **Mimicry of playface and laughter in orangutans and humans**

Session A2
14:00 – 14:15 | Elisa Demuru, Marta Caselli, Sara De Vittoris, Jean-Pascal Guéry, Lisa Gillespie, Ivan Norsci - **A meta-analysis to (try to) figure out yawn contagion in bonobos**

14:15 – 14:30 | Thibaud Gruber - **Identifying affective social learning in great ape cultural learning**

Thursday 2 June 2022

Session C1
Symposium 2: The hows and whys of social relationships: applying Tinbergen's four questions to the study of primate social behavior.
Organizers: Delphine De Moor (University of Exeter), Erin Siracusa (University of Exeter) & Camille Testard (University of Pennsylvania)

Symposium Abstract:
It is now widely recognized that social interactions are an essential part of animal societies. In group-living species, the same individuals often interact repeatedly, giving rise to differentiated social relationships. By forming ties with their group members, animals can better cope with challenges like finding food, avoiding predators, and caring for offspring. As such, social relationships are key to survival, reproductive success, and health for many social mammals. While the value of social relationships is now widely appreciated, open questions remain regarding the mechanisms linking sociality to fitness as well as the evolutionary roots and biological underpinnings of social relationships. New insights driven by the accumulation of long-term data on wild populations and methodological innovations have opened new avenues of research in ecology, neuroscience, genetics and phylogeny. This diversity of approaches has been, and continues to be, one of the strengths of the field of Primatology. However, uniting recent advances in these domains will be essential to piece together the evolutionary puzzle of social relationships. We therefore propose to bring together researchers at the forefront of primate social behaviour, to discuss what our closest living relatives have taught us about the mechanistic underpinnings and evolutionary origins of forming social relationships.
We propose that Tinbergen's four questions provide an excellent framework for integrating recent developments in the field of social behaviour. Our speakers will discuss 1) the adaptive function of being socially connected ('function'), 2) the evolutionary roots and ecological drivers of social relationships ('evolution'), 3) the neurological and physiological underpinnings of social behavior ('causation'), and 4) how social behaviour develops throughout an animal's lifetime ('ontogeny'). The symposium is meant to highlight recent findings, reveal overlap between research fields that will help foster interdisciplinary approaches, and outline future research avenues to better understand why and how social relationships evolved.

10:30 – 10:45 | Erica van de Waal, Andrew Whiten - **Field experiments illuminate three phases of social learning in a wild primate**

10:45 – 11:00 | Oliver Schülke, Julia Ostner - **Selection in relation to sex and affiliative relationships within and between the sexes**

11:00 – 11:15 | Leveda Cheng, Liran Samuni, Stefano Lucchesi, Tobias Deschner, Martin Surbeck - **Physiological correlates of intergroup aggression in male bonobos**

11:15 – 11:30 | Debottam Bhattacharjee, Jorg J.M. Massen - **Partner choice during cooperation in macaque societies**

11:30 – 11:45 | Erin R. Siracusa, James P. Higham, Noah Snyder-Mackler, Lauren J.N. Brent - **Age-based changes in the social behaviour of rhesus macaques: evidence for social selectivity**

11:45 – 12:00 | Camille Testard , Lauren J. N. Brent, Jerome Sallet, Michael L. Platt - **Neural correlates of sociality in rhesus macaques**

12:00 – 12:15 | Delphine De Moor, Julia Ostner, Oliver Schülke, Lauren Brent - **Unravelling the evolution of social relationships: a comparative approach across macaque species**

12:15 – 12:30 | James Stranks, Michael Heistermann, Oliver Schülke, Julia Ostner - **The dynamics of social bonding and the buffering of the stress response in male Assamese macaques**

Thursday 2 June 2022

Sessions D1 and D2
Symposium 3: Are we smart enough to know what great apes need – studies in great ape welfare
Organizers: Jeroen Stevens (Odisee Hogeschool), Daan Lameris (University of Antwerp) & Johanna Neufuss (University of Birmingham)

Symposium Abstract:
In the last decade, welfare of animals in human care is becoming ever more important for science and society. Animal welfare science is a burgeoning field, mainly focusing on farm and domestic animals. Society is becoming more and more involved in the debate around animal welfare, leading to public discussion on whether or how to keep animals in captivity. Modern zoos strive to offer optimal welfare to the animals in their care. Great apes play a central part in this discussion, because on the one hand they are endangered in the wild, and zoos can play a key role in raising awareness and funds to support actions and conservation. On the other hand there are ethical debates on whether they should be kept in captivity, and whether they can have "a life worth living". For this, an accurate understanding of great ape welfare is needed. Welfare science in farm and domestic animals has made major conceptual and methodological leaps, which are not always incorporated in studies of great apes. The aim of this symposium is to bring together speakers who use innovative approaches to study great ape welfare in zoos or sanctuaries, using a combination of resource-based, husbandry-based and animal-based indicators, focusing on different domains of welfare, including housing, nutrition, health and behaviour which can all influence affective states of great apes in our care, and thus ultimately their welfare.

Session D1
10:30 – 10:45 | Jeroen M.G. Stevens, Sarah Depauw, Hilde Vervaecke - **The happiness of chimpanzees: great apes and modern welfare science**

10:45 – 11:00 | Johanna Neufuss, Kirsten Pullen, Susannah K.S. Thorpe - **Status of resource provision and husbandry management for zoo-housed great apes**

11:00 – 11:15 | Daan W. Laméris, Marcel Eens, Jeroen M.G. Stevens - **Measuring the effect of managed fission-fusion activities on bonobo affective states**

11:15 – 11:30 | Ruth Sonnweber, Jeroen M.G. Stevens, Verena Behringer - **Salivary cortisol reaction norms in zoo-housed great apes: a tool to make inferences about the welfare state**

11:30 – 11:45 | Lisette M. van den Berg, Eva S.J. van Dijk, Jorrit Verkleij, Kim van Dijk, Thomas R. Bionda, Elisabeth H.M. Sterck - **Using positive and negative behavioural welfare indicators to monitor the welfare of intact and castrated male Western lowland gorillas (*Gorilla gorilla gorilla*) in Dutch zoos**

11:45 – 12:00 | Rachel Jarvis, Sophie Moittié, Mátyás Liptovszky, Kerstin Baiker - **Vitamin D status in European zoo-housed chimpanzees (*Pan troglodytes*)**

12:00 – 12:15 | Jonas Torfs, Nicky Staes, Marcel Eens - **A gut feeling: the potential impact of the gut microbiome on primate welfare**

12:15 – 12:30 | Sarah Depauw, Hilde Vervaecke, Jeroen M.G. Stevens - **Welfare assessment design for great apes and nutrition: a challenge**

Session D2

14:00 – 14:15 |Juan Olvido, A. Miani, A. Alstrup, J. Malmkvist, C. Pertoldi, T. H. Jensen, R.K. Nielsen, D. W. Hansen, L.A. Bach - **Voluntary engagement interventions: the reward of novel sensations**

Thursday 2 June 2022

Session B2

Symposium 4: Perspectives on non-human primates' economic behaviour(s).

Organizers: Elsa Addessi (CNR, Rome), Francesca De Petrillo (Newcastle University) & Valerie Dufour (University of Tours)

Symposium Abstract:

In the last decade, non-human primate economic behaviour has been among the most debated topics in the fields of primate cognition, evolutionary biology and behavioural ecology. Although non-human primates have not developed human-like economic systems (i.e., culturally-established structures through which exchanges, or other joint activities, can take place for the general benefit), they do possess some of the cognitive pre-requisites for human economic behaviour. Here, we will attempt to elucidate which shared cognitive abilities and basic mechanisms in our closest relatives may have promoted the evolution of human sophisticated economies. This symposium will provide an overview of the current research on non-human primate economics from a range of perspectives, spanning from individuals to societies. Contributions will include, but will not limited to, value-based decision-making, token exchange, decision-making over time and under risk, economic games, reciprocity, prosociality and cooperation. The discussion arising from this exchange of perspectives will foster the debate on the evolutionary origins of economic behaviour and pave the way for future waves of comparative research that can help us evaluate which selective pressures led to the emergence of primate economies, including our own.

14:00 – 14:15 | Yue Hu, Tobias Kalenscher - **Purchasing power computations in rats and humans**

14:15 – 14:30 | Alessandro Bongioanni, D Folloni, L Verhagen, J Sallet, N, Khalighinejad, MC Klein-Flügge, MFS Rushworth – **Accurate versus fast decision-making under risk in macaques: brain and behaviour**

14:30 – 14:45 | Stefanie Keupp, Sebastian Grueneisen, Felix Warneken, Elliot A. Ludvig, Alicia Melis **Delay discounting and risk preference in chimpanzees (*Pan troglodytes*)**

14:45 – 15:00 | Alejandro Sánchez-Amaro, Daniel Haun, Federico Rossano - **The bargaining strategies of chimpanzees and bonobos in the Ultimatum Game**

15:00 – 15:15 | Gabriele Schino, Francesco De Angelis, Raffaella Ventura - **On decision making during grooming interactions in Japanese macaques (*Macaca fuscata*)**

15:15 – 15:30 | Dufour Valerie, Broihanne Marie-Helene - **Decision making under risk and ambiguity in human and non-human primates**

Thursday 2 June 2022

Session D3
Symposium 5: Is it time to phase out lab research on non-human primates?
Organizers: Simone Pollo (Sapienza University of Rome) & Augusto Vitale (Istituto Superiore di Sanità)

Symposium Abstract:
The Directive 2010/63/EU on the protection of animals in scientific procedures aims at increasingly reducing the number of animals used in laboratory research, while ensuring at the same time an elevated standard of animal welfare and scientific quality. However, although a negative trend in the use of animals in EU Member States has been noted in recent years, there has been a steady increase in the number of non-human primates (NHPs) used for research. NHPs are treated in a privileged way by the EU norms, due to the awareness triggered in society by the use of animals perceived very close to us, and considered to be able to experience pain and suffering in sophisticated ways. The increase of the NHPs used clashes with the increase of concern in the public for the use of these animals in laboratory research. The symposium aims to challenge directly the question whether it is time to seriously think about the possibility to phase out the use of NHPs in laboratory research. Experts invited to participate will be asked to discuss such hypothesis. Moral, political, and scientific reasons for and against such hypothesis will be discussed and challenged.

16:00 – 16:15 | Claudio I. Bernardi - **Perspectives from the Pharma environment and Regulatory Agencies**

16:15 – 16:30 | Luca Bonini - **The biggest dilemma: nonhuman primates in neuroscientific basic research**

16:30 – 16:45 | Jan A.M. Langermans - **Replacement and reduction of non-human primate use inbiomedical research: opportunities and challenges**

16:45 – 17:00 | Simone Pollo - **Are NHPs a special case for the reform of scientific use of animals?**

17:00 – 17:15 | Valeska Stephan - **The role of non-human primates in research and development – an (historical) overview**

17:15 – 17:30 | Augusto Vitale - **Critical issues in the evaluation of Non-Human Primates lab research**

Friday 3 June 2022 - *Room – A - Auditorium*

Session A4
Symposium 6: Meaning, context and function: Studies on flexibility versus specificity in primate communication.
Organizers: Marlen Fröhlich (University of Tübingen) & Kirsty E. Graham (University of St Andrews)

Symposium Abstract:
A central challenge in the study of primate communication has been determining what signals "mean", often with the aim to draw inferences about language evolution. Methodological approaches addressing this question vary widely between research domains, most notably between vocal and gesture researchers. The former have predominantly deployed playback experiments, while the latter rely on observational studies that initially focussed on context – the circumstances that immediately surround a communicative act. This focus on context has resulted in gestures being characterized as extraordinarily flexible, since the first studies reported large degrees of means-end dissociation (i.e. the use of several signals for the same context and vice versa). However, there is now growing consensus that we need to distinguish signal types that are produced for several communicative functions ("functional flexibility"), from those that are produced in a range of contexts ("contextual flexibility"). Contact calls, for example, are "contextually flexible" as they are produced in multiple contexts, but not "functionally flexible" as their function is nonetheless specific, namely maintaining group cohesion.
To gain insight about signal function ("meaning") rather than context, comparative researchers have increasingly studied receiver behaviour and interaction outcomes. As a result, recent work suggests that many gesture types are more functionally specific than previously acknowledged, and others that remain seemingly functionally flexible are mostly disambiguated by means of situational context. In the meantime, interest in and evidence for vocal functional flexibility has increased. However, not all signals can be easily fitted into this paradigm focusing on interaction outcomes, as they do not necessarily result in an immediate change in a specific recipient's behaviour (e.g. the contact calls mentioned above). While meaning, context and function are often used synonymously, we here want to discuss to which extent these concepts differ, as well as the implications this has for comparative research on language origins. Inviting contributions from various domains of primate communication research, this symposium aims to showcase current work in this field and discuss ways to move forward and bridge gaps between research groups.

10:30 – 10:45 | Nancy Rebout, Arianna De Marco, Andrea Sanna, Jérôme Micheletta, Jean-Christophe Lone, Reinier F. van den Berg, Elisabeth H.M. Sterck, Jan A.M. Langermans, Bernard Thierry, Alban Lemasson - **Testing the association between social complexity and contextual call flexibility in four species of macaque**

10:45 – 11:00 | Catherine Crockford, Cedric Girard-Buttoz, Emiliano Zaccarella, Tatiana Bortolato, Angela Friederici, Roman Wittig - **The patterning and ontogeny of chimpanzee vocal sequences**

11:00 – 11:15 | Guillaume Dezecache - **Vocal functional flexibility: what it is and why it matters for primatologists**

11:15 – 11:30 | Peter Clark, Bridget Waller, Jerome Micheletta - **Matching crested macaque facial signals to social interaction outcomes**

11:30 – 11:45 | Juliette Aychet, Catherine Blois-Heulin, Alban Lemasson - **Signal sequences in captive mangabeys: flexible communication in a non-hominoid primate?**

11:45 – 12:00 | Carel van Schaik, Marlen Fröhlich - **The meanings of 'meaning' of primate signals**

12:15 – 12:30 | Kirsty E. Graham, Marlen Fröhlich - **A discussion on meaning, context and function**

Friday 3 June 2022 -

Session C4
Symposium 7: Exchanging methods in the ethological study of human and non-human primates.
Organizer: Virginia Pallante (Netherlands Institute for the Study of Crime and Law Enforcement)

Symposium Abstract:
Decades of research in primatology extensively contributed to track a behavioral continuity between human and non-human primates. This continuity, however, has frequently been addressed without an extensive inclusion of humans in the ethological research, leaving the study of human behavior to disciplines other than primatology. The intent of this panel is to fill this gap by promoting a discussion between different fields that focus on similar questions and theories in human and non-human species. We aim to present how different methodologies advanced by different disciplines may be integrated to provide an ethological perspective on human behavior, offering a scientific and systematic evolutionary approach on humans and contributing to build a cross fields bridge for the ethological study of our species.
The panel includes contributions from sociology, anthropology, social psychology and criminology, that focus on human behavior by combining methodologies that are 1. Developed in the primatological field for the study of nonhuman primates and adapted to humans and 2. Proper of disciplines different from primatology but offering relevant material for an ethological understanding of humans. While the first integrate methodological standards based on naturalistic observations on human behavior to directly obtain ethological data, the latter include secondary data that provide information on background characteristics (e.g., demographic, socio-economic etc.) on the persons under study. We suggest that the conjunction of such twofold – direct and indirect – approaches advance the understanding and explanation of human behavior, and further has the potential for adaptation into the study of nonhuman primates. We advocate a future consistent interdisciplinary communication leading to the exploration of human nature from an evolutionary perspective.

10:30 – 10:45 | Marie Rosenkrantz Lindegaard - **Does Danger Level Affect Human Bystander Intervention in Real-Life Conflicts? Evidence from CCTV Footage**

10:45 – 11:00 | Peter Ejbye-Ernst - **Does third-party intervention matter? A video-based analysis of the effect of third-party intervention on the continuation of interpersonal conflict behaviour**

11:00 – 11:15 | Hans Myhre Sunde, Marie Rosenkrantz Lindegaard, Don Weenink - **What goes on before the conflict goes off? A systematic video analysis of conflict in police-citizen encounters**

11:15 – 11:30 | Carlijn van Baak, Evelien Hoeben, Don Weenink, Marie Rosenkrantz Lindegaard - **What do they do? Video analysis of actions by men and women as bystanders in public conflicts captured on CCTV**

11:30 – 11:45 | Marjolijn Das - **Using administrative register data to study human behaviour**

11:45 – 12:00 | Richard Philpot, Lasse Suonperä Liebst, Marie Rosenkrantz Lindegaard, Peter Verbeek, Mark Levine - **Reconciliation in human adults: A video-assisted naturalistic observational study of post conflict conciliatory behaviour in interpersonal aggression**

12:00 - 12.15 | Virginia Pallante, Marie Rosenkrantz Lindegaard - **From primatology to the social sciences and back: exchanging methods for a shared research**

Friday 3 June 2022

Sessions D4 and D5
Symposium 8: Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions
Organizers: Karline Janmaat (University of Amsterdam) & Miguel de Guinea (The Hebrew University of Jerusalem)

Symposium Abstract:
In this symposium we present the results of case studies examining specific foraging decisions of human and non-human primates across a series of socio-ecological and developmental gradients. Efficient foraging across ecosystems that are characterized by complex patterns of food resource distribution requires a cognitive ability to locate such resources but also to know their temporal cycles of productivity. Here we show that non-human primates (chimpanzees, *Pan troglodytes*, and bonobos, *Pan paniscus*) are able to gather sensory information *en route* and integrate it with past experiences to reach foraging sites. In addition, we present evidence that non-human primates (mandrills, *Mandrillus sphynx*) show the skills necessary to keep track of time intervals of renewable food resources and to navigate flexibly across virtual reality scenarios (chimpanzees). While using their cognition to decide *where* and *when* to forage, primates are thought to flexibly modulate their foraging strategies in response to external drivers. We present evidence for such responses to 1) variability in food availability (in bamboo lemur, *Hapalemur meridionalis*), 2) predation risk (in sooty mangabeys, *Cercocebus atys*), 3) within-group competition (in mandrills), 4) sleeping site locations (in skywalker gibbon, *Hoolock tianxing*, and chimpanzees) and 5) familiarity with the area (in chimpanzees). We furthermore present results from studies on human hunter-gatherers (*Homo sapiens*) that indicate that foraging children learn to optimize their orientation abilities, foraging performance, and botanical knowledge over the years. This opens up new questions on how foraging cognition develops in non-human primates. The results presented in this symposium stress the importance of considering the role of context, but also of individual differences in experience, on the foraging decisions of wild non-human primates. The finding presented can help us to better understand the intra-and inter individual variation in foraging decisions and further improve the designs of comparative studies across populations and species that investigate the evolutionary function and development of foraging cognition.

Session D4
10:30 – 10:45 | Shelly Masi, Silvia Miglietta, Giulia Bardino, Terence Fuh, Paco Bertolani, Benjamin Robira - **Frugivory triggers goal-directed travel in wild western gorillas**

10:45 – 11:00 | Karline Janmaat, Miguel de Guinea, Julien Collet, Richard W. Byrne, Benjamin Robira, Emiel van Loon, Matthias Allritz, Haneul Jang, Andrea Presott1, Cody Ross, Gabriel Ramos-Fernandez, Shauhin Alavi, Dora Biro - **Comparing cognition among wild primates: linking primate movement decisions to information gradients in natural habitats**

11:00 – 11:15 | Bryndan van Pinxteren, Karline R.L. Janmaat, Martijn Egas - **Foraging in Fear: the effect of an intra-guild predator on the foraging behavior of sooty mangabeys**

11:15 – 11:30 | Emma S. McEwen, Matthias Allritz, Josep Call, Ken Schweller, Miguel de Guinea, Karline R. L. Janmaat, Charles R. Menzel, Daniel Haun, Francine L. Dolins - **Chimpanzee navigation in a virtual environment**

11:30 – 11:45 | Bethany Watkins, Miguel de Guinea *, Stephanie A. Poindexter, Jörg U. Ganzhorn, Giuseppe Donati, Timothy M. - **Routes matter: the effect of seasonality on bamboo lemur navigational strategies**

11:45 – 12:00 | Jorin Veen, Bryndan O.C.M. van Pinxteren, Vidrich Kandza, Haneul Jang, Patrick G. Meirmans, Karline R.L. Janmaat - **Examining the diet, foraging behaviour, and botanical knowledge of Mbendjele BaYaka children**

12:00 – 12:15 | Tamara Vallina, Martijn Egas, Haneul Jang, Lucy Bates, Heather Cohen, Jorin Veen, Karline R.L. Janmaat - **Examining the navigational toolbox of the Mbendjele BaYaka forager children**

12:15 – 12:30 | Kavel Ozturk, Martijn Egas, Karline R. L. Janmaat - **For Mandrills, timing is everything**

Session D5
14:00 – 14:15 | Miguel de Guinea, Hanlan Fei, Li Yang, Colin A. Chapman, Pengfei Fan - **Where to sleep next? Evidence for spatial memory associated to sleeping sites in Skywalker gibbons (*Hoolock tianxing*)**

14:15 – 14:30 | R. Adriana Hernandez-Aguilar, Trond Reitan - **What ecological variables do chimpanzees (*Pan troglodytes*) evaluate before selecting a place to spend the night?**

Presentations - Abstracts

Thursday 2 June 2022 - *Room – A - Auditorium*

10:30 – 12:30 | Session **A1** – **Symposium:** Great apes' production and perception of emotional expressions

Symposium 1: Great apes' production and perception of emotional expressions. Part 1
Organizers: Yena Kim (Leiden University), Raphaela Heesen (Durham University), Mariska Kret (Leiden University) & Zanna Clay (Durham University)

10:30 – 10:45 | Yena Kim[1], Jolinde M.R. Vlaeyen[1,2,4], Raphaela Heesen[3], Mariska E. Kret[1], Zanna Clay[3] - **The association between the bared-teeth display and social dominance structures: a comparison between bonobos and chimpanzees**
1. Institute of Psychology, Cognitive Psychology Unit, Leiden University, The Netherlands; 2. Animal Behaviour and Cognition, Utrecht University, The Netherlands; 3. Department of Psychology, DurhamUniversity, UK; 4. Institute of Cognitive Science, Comparative BioCognition, University of Osnabrück

Facial expressions are of key importance for social communication, often reflecting an individual's internal state. In some species, certain facial displays have different meanings across different social contexts (e.g., smiles in humans). The homologue of the human smile is the bared-teeth display (BT), widely observed in primates, most often reflecting fear. The Power Asymmetry Hypothesis (PAH) predicts that the type of a species' dominance hierarchy shapes the use and meaning of BT. For example, in despotic species, BT is expressed from low- to high-ranking individuals (signaling submission), while in egalitarian species, BT is produced irrespective of rank (signaling appeasement and affiliation). We tested this hypothesis by investigating the contextual use of BT in relation to social dominance in dyadic interactions of captive bonobos (N=11) – a species commonly characterized as egalitarian –, and in captive chimpanzees (N=8) – a species commonly characterized as despotic. Contrary to the common assumption, the bonobos were found to be more despotic than the chimpanzees. The species differed in their use of BT in that bonobos used BT exclusively during socio-sexual interactions, when tensions were high, regardless of rank. In contrast, the chimpanzees used BT across multiple contexts (submissive, sexual, and affiliative) contingent on rank. We discuss the flexibility of facial displays under the PAH framework in relation to species' and current social characteristics.

10:45 – 11:00 | Ivan Norscia[1], Giada Cordoni[1] - **Something has changed between us: emotional communication varies from play- to real-fighting in chimpanzees**
1. University of Torino, Department of Life Sciences and Systems Biology

Play re-organizes and recombines behaviours that are typical of other systems, including aggression. Consistently, play fighting shows similar motor patterns as real fighting and it is not immediately obvious how the communication of playful or aggressive mood (e.g. via facial expressions / vocalisations) are modulated between subjects in the two contexts. In chimpanzees this ambiguity reflects on the valence of social play which - in adults - can be associated with negative (i.e. anxiety/competition for dominance) or positive (affiliation/social bonding) contexts. We assessed how emotional communication via facial expressions changes between these two contexts. We analyzed videos of play/real fighting interactions between adult chimpanzees (from 3 captive groups at Beauval Zoo, Vallée des Singes, and Fundació Mona). During play fighting, play face replication was influenced by the relationship quality and not by the age difference between interactants. During real fighting the scream face was replicated but age difference and not the relationship quality between the interactants had an influence on the phenomenon. Specifically, scream face replication increased as the age difference increased, possibly informing greater rank differences. Hence, as in humans, in

chimpanzees appear to use facial expressions depending on the subject they interact with, possibly to mark the emotional valence of the behavioural exchange and avoid context misunderstanding.

11:00 – 11:15 | Jake Brooker[1], Christine Webb[2], Frans de Waal[3], Zanna Clay[4] - **Empathic tendencies in Pan - a comparative investigation into the consolation tendencies of sanctuary-living chimpanzees and bonobos**
1. Durham University, UK; 2. Harvard University, Cambridge, MA, USA; 3. Emory University, Atlanta, GA, USA

Empathy helps the forming of strong, long-term bonds in various mammalian societies. In some primates including humans, consolatory responses to distressed conspecifics is observable, but the evolutionary origins of such emotional responses is still unclear. Studying our closest living relatives, chimpanzees (*Pan troglodytes*) and bonobos (*Pan paniscus*), provides an opportunity to explore how hominid socio-cognitive behaviours evolved. We investigated consolation and conflict resolution strategies in sanctuary-living chimpanzees and bonobos to compare how individual differences, in terms of age, sex and social closeness, between species influence one's propensity to respond to a distressed victim. We logged 1400 observation hours of N=47 chimpanzees at Chimfunshi Wildlife Orphanage in Zambia and N=40 bonobos at Lola ya Bonobo in the Democratic Republic of the Congo including all sex and age classes. We focal followed victims during 276 post-conflict periods of five minutes each, and recorded behaviour and initiators of all consolatory approaches from uninvolved bystanders towards victims. Analyses using generalised linear mixed models revealed that individual variation significantly mediated such consolatory responses. Directly comparing consolation in chimpanzees and bonobos provides a more balanced approach to understanding how empathic tendencies influence respective individual-, group- and species-level social dynamics and conflict management.

11:15 – 11:30 | Diane A. Austry[1], Jake S. Brooker[1], Zanna Clay[1] - **Chimpanzees' responses to emotional expressions and its relation to behavioural markers of empathy: A behavioural and thermal investigation**
1. Department of Psychology, Durham University

Chimpanzees and bonobos show consolatory responses when witnessing the distress of others, which are considered to be markers of empathy. However, the underlying mechanisms driving this empathic-like behaviour are little understood. To address this, we combined behavioural experiments using the non-invasive technique of infrared thermography with naturalistic observations of the consolatory responses of the same subjects towards their peers. To do so, we examined the facial skin temperature variation of N = 25 sanctuary-living chimpanzees housed in Chimfunshi Wildlife Orphanage, Zambia in response to video clips depicting both conspecifics as well as familiar and unfamiliar humans showing negative and positive emotional states. We also examined the subjects' spontaneous consolatory responses to conspecific victims in distress during post-conflict contexts. Results showed that the facial skin temperature change in the periorbital region upon observing a peer in distress predicted a subject's consolation rate in naturalistic settings, and thermal variation in the nose tip region was predicted by stimulus familiarity for positive emotion expressions as well as subject age. This project highlights the relationship between internal arousal and external empathic responding in chimpanzees. It also shows the complexity of studying the mechanisms supporting empathy while providing new insights into the use of infrared thermography as a method for studying emotional responding.

11:30 – 11:45 | Katja Liebal[1,2], Manuela Ersson-Lembeck[1,2], Manfred Holodynski[1,2] - **The challenge of studying emotion expression in nonhuman primates: a developmental study on mother-infant interactions in humans (*Homo sapiens*) and captive chimpanzees (*Pan troglodytes*)**
1. Leipzig University, Freie Universität Berlin; 2. Westfälische Wilhelms-Universität Münster, Germany

Comparative researchers often investigate facial expressions of nonhuman primates as part of an emotional system and assign specific emotional states to particular facial expressions, like in research with humans. However, such comparisons can be misleading, as similar facial expressions might be used differently across species, and since it is difficult to reliably identify emotions underlying facial expressions in nonhuman species. Therefore, we observed the development of emotional communication in 1- to 12 months old chimpanzee and human infants in interactions with their mothers. However, rather than assigning specific expressions to emotional states, we first identified identical situations in both species, with focus on separation events, potentially eliciting fearful expressions of the infants. We then coded the infant's facial and bodily expressions in such situations, how mothers reacted to these signals, and how the infant's behavior changed accordingly. With increasing age, repertoires of facial and bodily expressions used during separation events increased in both human and chimpanzee infants, but across ages, human infants used larger repertoires than chimpanzees. Each species also used some species-specific expressions. Infant-initiated separations increased with age in humans, but not in chimpanzees. We discuss these findings and the suitability of this approach with regard to the challenges of studying emotion expression in nonhuman primates.

11:45 – 12:00 | Evy van Berlo[1,2,3], Yena Kim[1,2], Mariska E. Kret[1,2] - **Attentional selectivity for emotions: humans and bonobos compared**
1. Faculty of Social and Behavioral Sciences, Department of Cognitive Psychology, Leiden University, the Netherlands 2. Leiden Institute for Brain and Cognition, Leiden University, the Netherlands 3. Institute for Biodiversity and Ecosystem Dynamics, Department of Evolutionary and Population Biology, University of Amsterdam, the Netherlands

Perceiving emotions in others is an adaptive mechanism that forms the basis for higher-order social cognition. Currently, our understanding of how our closest living relatives, bonobos (*Pan paniscus*), perceive emotionally-salient cues is not yet clear. In this comparative study, we investigated how bonobos and humans view emotions of conspecifics and heterospecifics using eye tracking. Using Bayesian modeling, we established that in both species, attention is preferentially sustained to emotional scenes of conspecifics rather than heterospecifics. Moreover, individuals displaying high levels of distress hold attention longest, consistent with the idea that survival is predicated on swiftly detecting critically important situations in the environment. Additionally, bonobos attend to sexual behaviors of other bonobos, and in humans, emotion-biased attention extends to positively valenced emotions (grooming, sex, play). These findings reveal a key similarity in attentional mechanisms underlying emotion perception in hominids, and suggest that sensitivity to emotional states in others was already present in the last common ancestor of Homo and Pan.

12:00 – 12:15 | Raphaela Heesen[1], Yena Kim[2], Mariska Kret[2], Zanna Clay[1] - **The body speaks for itself: Chimpanzees' perception of emotion from body movements**
1. Department of Psychology, Durham University, UK; 2. Institute of Psychology, Cognitive Psychology Unit, Leiden University, Netherlands

Emotion communication plays a critical role in the regulation of social life among many animal species. Although emotion research has traditionally been focused on humans, recent comparative studies have produced an array of research findings on the communication of affective states in nonhuman animals, notably primates. Most studies demonstrating primates' understanding of affective states have been devoted to single signal components, with a major emphasis on facial or vocal signals. However, emotion expressions are rarely produced as isolated signals and in fast-paced naturalistic interactions, bodily movements may be just as important in communicating emotional states, especially for species highly reliant on visual communication, e.g., gestures. To address the extent to which perceivers of such signals integrate information across channels, we used an innovative eye-tracking paradigm with N = 6 captive chimpanzees. We investigated i) whether chimpanzees associate bodily cues of unfamiliar conspecifics in either neutral, positive or negative interaction scenes with corresponding facial expressions and ii) whether emotional valence (positive vs. negative) influences their ability in associating bodily cues with facial expressions. These data improve our understanding

of the evolution of emotional signals and the rich complexity of both emotional signal production and perception beyond our own species.

12:15 – 12:30 | Tonko Zijlstra[1], Yena Kim[1], Mariska Kret [1] - **Mimicry of playface and laughter in orangutans and humans**

1. Institute of Psychology, Cognitive Psychology Unit, LeidenUniversity, NetherlandsAbstract

Being able to process emotional expressions from group members quickly and accurately is a valuable skill for social animals. A mechanism through which this may be achieved is facial mimicry. An ability and propensity for facial mimicry has been shown in several non-human primate species. For example, orangutans, chimpanzees and gorillas have all demonstrated facial mimicry of play faces during playful interactions. However, this has not been tested in a controlled experiment. To make a species comparison, this study tested orangutans and humans on the presence of facial mimicry of a similar facial expression (play face and laughter respectively) using a similar experimental paradigm. Participants were shown a series of videos showing 2 playing juvenile conspecifics or the same 2 individuals in a neutral interaction as a control, while their reactions were recorded with a video camera. The occurrence of laughter or a play face during the viewing of these stimuli was scored to measure mimicry. Results showed that while humans laughed significantly more during the experimental condition when compared to the control condition, this was not true for orangutans. However, the results of the experiment in humans indicate that the occurrence of facial mimicry in this controlled setting is rare and varies greatly between individuals, highlighting the importance of considering the limitations of an experiment when making species comparisons.

Thursday 2 June 2022 – *Room B - Kilimanjaro Lodge*

10:30 – 12:30 | Session **B1** -Behaviour of wild primates

10:30 – 10:45 | Williams Celeste[1], Reinhardt Kathleen[2], Balestri Michela[3], Campera Marco[3], Eppley M. Timothy[4,5], Donati Giuseppe[3] - **Drivers of sleep patterns in wild cathemeral and nocturnal lemurs**

1. Lewis & Clark Law School, Portland, USA; 2. Department of Anthropology and Archaeology, University of Calgary, Calgary, Canada; 3. Department of Social Sciences, Oxford Brookes University, Oxford, UK; 4. Conservation Science and Wildlife Health, San Diego Zoo Wildlife Alliance, Escondido, USA; 5. Department of Anthropology, Portland State University, Portland, USA

Though sleep occurs in every mammal studied thus far, its drivers and functions continue to be poorly understood. Sleep differs greatly among mammals, with durations and timing showing differences between species. Variations have been linked to the environmental and ecological pressures that different species face in their environment. The ability of some lemurs to be active over the 24-hours, aka cathemerality, makes these strepsirrhines an interesting model in which to investigate the drivers and regulation of primate sleep. However, sleep remains a difficult behaviour to study in the wild, with most studies focusing on captive individuals. The recent introduction of high-resolution accelerometers allows now for collection of more fine-grained data on wild species. Here, we used accelerometer data attached to the collars of the cathemeral southern woolly lemur (Avahi meridionalis) and the nocturnal Mme Fleurette's sportive lemur (*Lepilemur fleuretae*) to examine their sleep patterns and how it is shaped by light levels. The cathemeral lemur tended to sustain longer uninterrupted sleep bouts as opposed to the nocturnal lemur. Sunrise had a more significant effect on the cathemeral lemur as opposed to the nocturnal lemur. Sunset had a strong effect on each species. The results suggest that the sleep patterns of these lemurs are influenced by thermoregulation, security of sleeping sites, and energy conservation.

10:45 – 11:00 | Julia Mörchen[1,2], Frances Luhn[1], Olivia Wassmer[3], Maria van Noordwijk[3], Carel van Schaik[3], Puji Rianti[4], Anja Widdig[1,2], Caroline Schuppli[3,5] - **Dispersing orangutan males use social learning to learn about new habitat**

1. Behavioural Ecology Research Group, Institute of Biology, University of Leipzig, Germany. 2. Primate Behavioural Ecology Research Group, Department of Human Behavior, Ecology and Culture, Max Planck Institute for Evolutionary Anthropology, Germany. 3. Department of Anthropology, University of Zurich, Switzerland. 4. Department of Biology, IPB University, Indonesia. 5. Development and Evolution of Cognition Research Group, Max Planck Institute of Animal Behavior, Germany

Dispersal has been suggested to be challenging, especially for species that heavily rely on social learning for knowledge acquisition in complex feeding niches. In orangutans males disperse, whereas females settle close to their natal area. So far, it has remained unclear, how immigrant orangutans learn about their new habitat. Here we examine how male orangutans use observational social learning ("peering") to learn from the host population after dispersal. In total, we analysed 127 peering events of 30 males of the highly sociable Sumatran orangutans (Pongo abelii) at the Suaq population and 129 peering events of 29 males of the less sociable Bornean orangutans (Pongo pygmaeus) at the Tuanan population, covering a combined study time of 28 years. Results indicated that immigrants peered the most shortly after arrival and that peering then decreased with increasing residency. Males preferentially peered at local adult females compared to other age-sex classes and at food items which are rare in the area or difficult to process. Peering rates at Suaq were significantly higher than at Tuanan and food availability had a positive effect on peering rates. Our results suggest that males learn new ecological information and continue to learn complex skills as adult. Furthermore, our results underline the importance of ecological and social conditions on social learning. In summary, social learning seems to be a beneficial strategy when adapting to a new habitat after dispersal.

11:00 – 11:15 | Judith Schneider[1], Loïc Brun[2,3], Eduard Mas Carrió[1], Pooja Dongre[2,3], Pierre Taberlet[4,5], Erica van de Waal[2,3], Luca Fumagalli[6] - **Molecular assessment of wild vervet monkeys' diet compared to observational data**

1. Laboratory for Conservation Biology, Department of Ecology and Evolution, University of Lausanne, Switzerland; 2. Department of Ecology and Evolution, Biophore, University of Lausanne, 1015 Lausanne, Switzerland; 3. Inkawu Vervet Project, Mawana Game Reserve, Swart Mfolozi, KwaZulu Natal, South Africa; 4. Université Grenoble Alpes, CNRS, Laboratoire d'Ecologie Alpine, 38000 Grenoble, France; 5. UiT – The Arctic University of Norway, Tromsø Museum, Tromsø, Norway; 6. Swiss Human Institute of Forensic Taphonomy, University Centre of Legal Medicine Lausanne- Geneva, Switzerland

Assessing the diet of wild animals provides valuable information about their ecology and behaviour. Advances in environmental DNA (eDNA) analyses open new perspectives to investigate a species' diet. The DNA metabarcoding approach has been used only recently for diet studies in primatology, as the research field has traditionally relied on various observational methods. In many cases observational feeding data of primates are available, however with weak taxonomic resolution especially for feeding habits that are difficult to observe. We compared dietary variation inferred from DNA metabarcoding to direct observations in an omnivorous primate, the vervet monkey (*Chlorocebus pygerythrus*). We analysed 823 faecal samples of 130 individuals collected over 12 months from four neighbouring wild groups, with two DNA metabarcoding assays targeting plant and arthropod components of the diet. Metabarcoding data were compared to direct observations for the same study population and sampling duration. We found a strong effect of season on variation in plant consumption, with both methods. However, we showed that the DNA metabarcoding assay largely outperformed direct observations of plant and arthropod consumption in both taxonomic coverage and resolution. The seasonal effect on arthropod consumption was weaker but feeding on arthropods was more frequent in spring and summer, showing overall that vervets adapt their diet according to available resources.

11:15 – 11:30 | Achille Diodio Sorue[1,2], John Vogel[1], Didier Kimpungi Diana[3], Jeannette Madamu Massini[1], Djuma Ngoy Edouard[3], Ruth Gahani Minahilo[1], Rodolphe Lutengya Esube[3], Dieudonné

Kwadje Lugala[3], Markéta Antonínová[4], Amube Jérôme[3], Laudisoit Anne[5,6] - **A decade of silent chimpanzee monitoring in the Garamba Complex, Democratic Republic of the Congo**
1. African Parks Congo; 2. University of the Kisangani, Kisangani, DRC; 3. Institut Congolais pour la Conservation de la Nature (ICCN), DRC; 4. Friends of Arabuko-Sokoke Forest, Kenya; 5. Ecohealth Alliance, New York, United States of America; 6. University of Antwerp, EVOBIO, Antwerpen, Belgium

Due to recurrent insecurity, eastern chimpanzee populations (Pan troglodytes schweinfurthii) of North- Eastern DR Congo range map contain significant spatial gaps. This is the case for the Garamba Protected Areas Complex (GC). Except from chimpanzees occurrence reports by the Saeger's mission (1952-1954) and Nicholas (1995) in Azande Hunting Domain (AHD), no systematic surveys on chimpanzees of the GC have been carried out. Since 2007, efforts to document eastern chimpanzees in the Mondo-Missa hunting domain (MMHD) were initiated and confirmed the presence of a (meta)population of chimpanzees which may yield interesting behavioral observations in the future. Between 2006 and 2020, groups of chimpanzees were directly observed in MMHD with a 1 to a maximum of 10 individuals. In 2010, 477 nests were counted along 1160.7km recce walked making a nest encounter rate (NER) of 0.41 nest/km. In 2012, chimpanzees were seen on camera traps for the first time. In June 2021 the first video footages. In June 2021, 79 nests were recorded along 30.98 km recce (NER=2.55). The NER (all categories considered) varied greatly between years, habitat and areas surveyed. Mondo people consider chimpanzees like humans, and "when you kill the chimpanzee you commit a crime against humanity". Recent surveys confirm that chimpanzee density is currently low in MMHD and repeated use of nesting sites suggest that sleeping options are limited, and that the major threat is habitat loss and degradation.

11:30 – 11:45 | Camille Lacroux [1,2,3,4], Emmanuelle Pouydebat[3], Marie Rossignol[5], Harish Karthikeyan Ravi[6], Farid Chemat[6], Edward Asalu[7], Alfred Aleeje[2], Sophie Durand[4], Fabrice Chandre[5], Sabrina Krief [1,2] - **Repellent activity of nesting trees in the Sebitoli chimpanzee community of Kibale National Park, Uganda**
1. UMR 7206 CNRS/MNHN/P7, Eco-anthropologie, Museum national d'Histoire naturelle, Musée de l'Homme, Paris, France; 2. Sebitoli Chimpanzee Project, Great Ape Conservation Project, Kibale National Park, Uganda; 3. UMR 7179 CNRS/MNHN, Adaptations du Vivant, Museum national d'Histoire naturelle, Paris, France; 4. La Phocéenne de Cosmétique, ZA Les Roquassiers, Salon-de-Provence, France; 5. UMR 5290 IRD, Maladies Infectieuses et Vecteurs : Ecologie, Génétique, Evolution et Contrôle, Institut de Recherche et Développement, Montpellier Cedex 5, France; 6. UMR 408 INRA-UAPV, Sécurité et Qualité des Produits d'Origine Végétale UFR-ip STS, Avignon Université, 84000 Avignon, France; 7. Uganda Wildlife Authority, Kibale National Park, Uganda

Every night, like all great apes, chimpanzees (*Pan troglodytes*) build a "nest" by intertwining stems and foliage. As nighttime is a key period when female mosquitoes are feeding and may transmit diseases, chimpanzees may have developed strategies to avoid biting at this time. Indeed, a previous survey showed that they use to build their nest at tree heigh where fewer female mosquitoes are present. As most of chimpanzees' communities studied have a preference for trees in which they nest, a complementary strategy could be to choose species that emit aromatic substances to reduce bites risk. To test this hypothesis, we analyzed 1081 recorded nesting trees between 2017 and 2019 to determine the 10 most used trees and compared them to the 10 common trees yet not preferred for nesting in the Sebitoli community of Kibale National Park in Uganda. Extensive bibliographic research show that more biological properties were found in the leaves and bark of nesting trees. Interestingly, four nesting trees were reporting having potentially repellent/fumigant properties according to ethnological surveys. Then, we hydro-distillated leaves from the 20 trees selected to obtain essential oils for bioassays against females of the African mosquito, *Anopheles gambiae*. We discovered that out of the 10 nesting trees, 7 showed repellent activity, 7 were irritant (vs 3 and 5 respectively in common trees) and none were toxic. This study is one of the first evidence that chimpanzees could choose their nesting trees according to their biological and chemical properties, a potential inspiration for human health.

11:45 – 12:00 | Philippa Hammond[1], Dora Biro[2,3], Kaitlyn Gaynor[5,6], Tara Easter[7], Meredith Palmer[8], Susana Carvalho[1,4] - **A multi-level approach to the Landscape of Fear**
1. Primate Models for Behavioural Evolution Lab, School of Anthropology and Museum Ethnography, University of Oxford; 2. Department of Zoology, University of Oxford; 3. Department of Brain and Cognitive Sciences, University of Rochester; 4. Gorongosa National Park, Sofala, Mozambique; 5. Department of Environmental Science, Policy, and Management. University of California - Berkeley, USA; 6. National Center for Ecological Analysis and Synthesis. University of California - Santa Barbara, USA; 7. School for Environment and Sustainability, University of Michigan; 8. Department of Ecology & Evolutionary Biology, Princeton University, Princeton, New Jersey, USA

Every animal exists and acts within a "landscape of fear" – a perceptual representation of how predation risk varies across its environment. This variation in perceived risk is influenced both by variation in actual risk of predation – determined by presence, abundance, and behaviours of predators – as well as mediating factors like habitat structure. Here we present results from a series of studies that explore baboons' (genus Papio) responses to risk at several scales. First, at the troop level and in an environment with minimal predation risk, we find that baboons respond to human observers with behaviours indicative of perceived risk, but that these decrease with habituation and are influenced by openness of habitat and time of day. This study also supports findings that primate terrestriality increases when perceived risk is low. In two further studies, we use camera trap grids to explore these dynamics amongst a population of baboons in Gorongosa National Park, Mozambique, and between populations in both Mozambique and Tanzania. Results from these studies indicate how terrestrial activity is influenced by risk at broader spatio-temporal scales, emphasising the roles of predator type and time of day in shaping baboons' landscapes of fear. We discuss these findings in relation to the evolution of terrestriality in human and non-human primates.

12:00 – 12:15 | Alessandra Mascaro[1], Lara Southern[1], Simone Pika[1], Tobias Deschner[1] - **Wild chimpanzees (*Pan troglodytes troglodytes*) apply insects onto open wounds of self and others**
1. Max Planck Institute

Self-medication has been repeatedly documented in great apes. So far, observed behaviors mainly involved the ingestion and topical application of different plant species. Here, we report novel observations of the application of insects as a potential form of medication to self, and others, by wild living chimpanzees in Loango National Park, Gabon. Across a 15- month period (November 2019 - February 2021), out of a total of 76 documented fresh open wounds, we observed chimpanzees applying insects to their own wounds 19 times, and to those of conspecifics 3 times. During each event, the individuals systematically displayed the same behavioural sequence. First, they caught a small-size insect and immobilized it by placing it between the lips. Second, they placed it on the surface of the fresh wound in question, moving it using their fingertips or lips. Third, they extracted the insect with their mouth or fingers. Often, the sequence was repeated for several times. Although the identity of the insect species and its potential pharmaceutical value are still unknown, we suggest that these observations may represent a novel case of medicative behaviour in non-human primates. Finally, evidence of treatment of others has previously not been reported in the selfmedication literature. Therefore, our observations may significantly contribute to the ongoing debate on cooperation and prosocial behaviour in non-human species.

12:15 – 12:30 | Nele Käter[1,2], Sri Suci Utami Atmoko[3], Caroline Schuppli[1] - **Variability of tool use in Sumatran orangutans and contributing ecological factors**
1. Development and Evolution of Cognition Research Group, Max Planck Institute of Animal Behviour; 2. University of Konstanz; 3. Universitas Nasional (UNAS), Fakultas Biologi, Jakarta

Even though the ability to use tools is spread over many taxa, habitual tool use in the wild is limited to a few species only. Within non-human great apes, chimpanzees and orangutans are the only habitual tool users. To date, orangutan tool use has received comparably little attention. In this study, we looked at the variability of tool use and the ecological factors that affect tool use rates in Sumatran

orangutans (*Pongo abelii*). Our results are based on data collected at the Suaq Balimbing research station, in South Aceh, Indonesia from 2007 until 2019. We observed more than 600 tool use events (excluding nestbuilding), by 61 different individuals. We found that most tools were used to obtain food resources including seeds and different types of insects or their products, followed by tools used for protection against the weather or stinging insects, grooming, and vocalization. 71 % of the tools were sticks and the rest included leaves, bigger branches and vines. Tool use substrates included insect nests, fruits, the own body and other surfaces. The overall availability of food in the habitat had a non-linear effect on individuals' tool use rates with the highest rates of tool use occurring at medium-level food availability. In conclusion, the variability shown by the orangutans at Suaq regarding tool types and contexts is large, resembling the one found in chimpanzees. On the individual level, the occurrence of orangutan tool use is influenced by ecological factors.

Thursday 2 June 2022 – *Room C - Mount Kenia Lodge*

10:30 – 12:30 | Session **C1** – **Symposium:** The hows and whys of social relationships: applying Tinbergen's four questions to the study of primate social behavior / Social Behaviour

Symposium 2: The hows and whys of social relationships: applying Tinbergen's four questions to the study of primate social behavior.
Organizers: Delphine De Moor (University of Exeter), Erin Siracusa (University of Exeter) & Camille Testard (University of Pennsylvania)

10:30 – 10:45 | Erica van de Waal[1,3], Andrew Whiten[2] - **Field experiments illuminate three phases of social learning in a wild primate**
1. University of Lausanne, Switzerland; 2. University of St Andrews, UK; 3. Inkawu Vervet Project, South Africa

Learning from others - social learning - is the basis for cultural behaviour to evolve and is a widespread process across the animal kingdom. A recent review documented the pervasive role of social learning in primate lifetimes, and developed a hypothesis that it typically occurs in three main phases. First, infants learn their core behavioural repertoire mainly from their primary care giver, usually the mother. Then older juveniles will extend their learning to other role models within their group, and this is expected to take place for the acquisition of specific skills or knowledge. The final phase occurs in adulthood at dispersal, with immigrants learning local skills from residents or residents learning foreign knowledge from immigrants. In this presentation, we summarise multiple field experiments on a population of six groups of wild vervet monkeys that offer support for all three phases described above. The first phase, infants do as mother do is supported by food choice and foraging technique experiments. For the second one, results of a novel food experiment highlight the spread of innovations to juveniles from more efficient models than the mother. For the third one, we find immigrants conforming to the food choice of residents as well as immigrants triggering the spread of novel food. Taking this ontogenetic approach to social learning enables a better understanding of the context linked to the various social learning biases documented in this wild primate.

10:45 – 11:00 | Oliver Schülke[1], Julia Ostner[1] - **Selection in relation to sex and affiliative relationships within and between the sexes**
1. Department for Behavioral Ecology, Georg August University Goettingen, Germany Social Evolution in Primates Group, German Primate Center Göttingen, Germany

The order primates is known for the pronounced variation in social systems between and within species. The components of a social system, i.e. social organization, social structure, mating and rearing system, are best studied first in isolation to allow for investigation of co-evolutionary processes in a second step. Here, we summarize how selection in relation to sex will shape not only the mating

system of a species, but also important aspects of social structure. The observable level of direct competition among males over access to fertile females is a consequence of interacting male and female strategies. More importantly for the topic at hand, direct male competition may be a primary driver in the evolution of male social bonds. Via its influence on group genetic structure, direct male competition should also drive patterns in female social relationships. Where males have limited control over access to fertile females, alternative male mating and reproductive strategies include the formation of close affiliative relationships and investments in caretaking with effects on female competition over access to male partners. Inconclusion, the diversity of primate social structure can only be understood with a firm understanding of how it co-evolved with strategies promoted by selection in relation to sex.

11:00 – 11:15 | Leveda Cheng[1,2], Liran Samuni[1,2], Stefano Lucchesi[1,2], Tobias Deschner[3], Martin Surbeck[1,2] - **Physiological correlates of intergroup aggression in male bonobos**
1. Department of Human Evolutionary Biology, Harvard University, Cambridge, USA; 2. Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 3. Interim Group Primatology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

Hostile between-group relations are a characteristic trait of many group-living species. In some species, however, there is larger variation in intergroup relationships ranging from aggressive to peaceful. Such relationships potentially facilitate resource sharing and information transfer. To date, little is known about the factors contributing to reduced hostility towards neighbouring groups. Testosterone is a hormone that is secreted in contexts where aggression is critical to male fitness. Therefore, it can be used as a physiological marker to study the adaptive nature of male aggression. I investigated the role of aggression during largely tolerant intergroup encounters in bonobos by examining male aggression and testosterone response to these encounters at the Kokolopori Bonobo Reserve, Democratic Republic of Congo. I found that while male aggression increased in the context of intergroup encounters, testosterone levels did not rise. This raises questions about the ultimate functions of male intergroup aggression in this species, as well as how the interplay of male aggression and affiliation during intergroup encounters may have undermined their testosterone response to the presence of neighbouring groups.

11:15 – 11:30 | Debottam Bhattacharjee[1], Jorg JM Massen[1] - **Partner choice during cooperation in macaque societies**
1. Affiliations: Animal Behaviour and Cognition Group, Faculty of Science, Utrecht University, The Netherlands

A wide range of species, including humans, are social. The maintenance of sociality largely depends on cooperative relationships among individuals, eventually leading to considerable gains in survival and reproduction. Addressing cooperation from an evolutionary perspective has proven to be very challenging. Little is known about what motivates cooperation, or how individuals choose their partners during cooperation. Similarly, the role of a social system in which individuals interact with each other remains largely unexplored. Finally, the underlying cognitive mechanisms require vigorous investigation. Understanding proximate mechanisms like personality and prosociality may provide us with crucial insights. Regardless of theoretical and empirical explanations, experimental evidence detailing these proximate mechanisms is limited. In this large-scale comparative study, we aim to examine the interactions of behavioural and cognitive mechanisms that regulate cooperation in 6 different species of macaques with varying social styles (*Macaca mulatta, M. fuscata, M. fasicularis, M. sylvanus, M. silenus*, and *M. nigra*). We aim to test a total of ~ 150 macaques from multiple groups (at least 2 groups/species) of the 6 species, therefore, emphasizing inter-group variabilities. The interdisciplinary and comparative approach of the study, examining the abovementioned mechanisms will be vital to comprehend cooperation in animal societies.

11:30 – 11:45 | Erin R. Siracusa[1], James P. Higham[2], Noah Snyder-Mackler[3], Lauren J.N. Brent[1] - **Age-based changes in the social behaviour of rhesus macaques: evidence for social selectivity**
1. University of Exeter, Exeter, UK; 2. New York University, NY, USA; 3. Arizona State University, AZ, USA

Narrowing of social networks with age is commonly observed in human and non-human primates. Given the importance of social relationships for health and fitness in group-living species, shrinkage in networks with age has typically been thought to be maladaptive. However, recent research has suggested that older individuals might selectively prune their networks by focusing on important relationships. We tested this "social selectivity" hypothesis using 8-years of data from a population of female rhesus macaques on Cayo Santiago. Our analyses revealed that while female macaques actively reduce their number of partners in old age, they spend similar amounts of time grooming and in proximity to other females, suggesting that network narrowing does not result from lack of motivation or ability to socially engage. Additionally, aging females focus in on important social partners such as kin, strongly connected partners, and stable partners. All age-related changes were the result of within-individual changes in behavior rather than population-level processes like selective disappearance. Our findings add to a growing body of evidence showing that age-based changes in numbers of social partners may relate to adaptive changes in social selectivity among older individuals.

11:45 – 12:00 | Camille Testard [1], Lauren J. N. Brent[2], Jerome Sallet[3], Michael L. Platt[1] - **Neural correlates of sociality in rhesus macaques**
1. Department of Neuroscience, University of Pennsylvania; Philadelphia, PA, USA; 2. University of Exeter, Exeter, Devon, UK; 3. Université Lyon 1, Inserm, Stem Cell and Brain Research Institute, France

Reproduction and survival in most primate species reflects management of both competitive and cooperative relationships. Here we investigated the links between neuroanatomy and sociality in free-ranging rhesus macaques. In adults, the number of social partners predicted volume of the mid-superior temporal sulcus and ventral insula, implicated in social decision-makinga nd empathy, respectively. We found no link between brain structure and other key social variables such as social status or indirect connectedness in adults, nor between maternal social networks or status and dependent infant brain structure. Our findings demonstrate the size of specific brain structures varies with the number of direct affiliative social connections, and suggest that this relationship may arise during development. These results reinforce proposed links between social network size, biological success, and the expansion of specific brain circuits.

12:00 – 12:15 | Delphine De Moor[1], Julia Ostner[2,3], Oliver Schülke[2,3], Lauren Brent[1]
Unravelling the evolution of social relationships: a comparative approach across macaque species
1. Centre for Research in Animal Behaviour, University of Exeter, Exeter, UK; .2. Department of Behavioral Ecology, University of Göttingen, Göttingen, Germany; 3. Research Group Primate Social Evolution, German Primate Center, Göttingen, Germany

Although affiliative relationships between dyads are wide-spread in group-living animals, the evolved function of these relationships remains unclear. Macaques share a similar social organisation, but show substantial variation in their social structure and socio-ecology, making them an ideal system in which to study the selective forces acting on social relationships. I will present our large-scale collaborative project currently underway, using macaque social behaviour data shared by researchers across the world. Using network-based approaches we will quantify variation in the expression of dyadic relationships between female macaques across several groups and populations of 15 species of macaques. The next step will be to link these differences in social structure to differences in social and ecological pressures, such as female hierarchy steepness, male reproductive skew, mean relatedness, climate & seasonality of the habitat and predation risk. We will also consider phylogenetic relationships between species as a driver of similarity between closely related species. By taking a cross-species comparative approach, we can uncover which types of social relationships are selected for under different socio-ecological contexts. Ultimately, we aim to explicitly address which types of social relationships are adaptive under which circumstances, and why.

12:15 – 12:30 | James Stranks[1,2,4], Michael Heistermann[3], Oliver Schülke[1,2,4], Julia Ostner[1,2,4] - **The dynamics of social bonding and the buffering of the stress response in male Assamese macaques**
1. Department of Behavioral Ecology, Johann-Friedrich- Blumenbach Institute for Zoology and Anthropology, University of Goettingen, Goettingen, Germany; 2. Leibniz ScienceCampus Primate Cognition, Goettingen, Germany; 3. Endocrinology Laboratory, German Primate Center, Leibniz Institute for Primate Research, Goettingen, Germany; 4. Research Group Social Evolution in Primates, German Primate Center, Leibniz Institute for Primate Research, Goettingen, Germany

Strong affiliative relationships or bonds are found in many social animals and may mediate fitness via their underlying physiological correlates. The social buffering hypothesis suggests a mechanism for this: the presence of bonded partners buffers against the adverse effects of increased physiological stress. This hypothesis predicts that (1) the physiological stress response is moderated by the strength of social affiliation, (2) social bonds provide an attenuating effect on stress during competitive social situations and (3) hormonal changes will therefore correlate with dynamics in social bonding. However, an alternative hypothesis suggests that lower stress responses are found in high-quality individuals due to subject-specific traits, independent of social affiliation. By examining the longitudinal physiological changes produced by the dynamics of social bonding, it is possible to tease apart the contributions of these two mechanisms to the stress response. To do so, we tested the predictions of the social buffering hypothesis in wild male Assamese macaques (*Macaca assamensis*), who form and maintain long-lasting cooperative social bonds with each other that lead to higher dominance ranks and reproductive success. We combined glucocorticoid metabolite data from more than 4800 fecal samples with extensive behavioural data of 65 adult males, collected from 2006 to 2021 at Phu Khieo Wildlife Sanctuary, Thailand.

Thursday 2 June 2022– *Room D - Canopy Lodge*

10:30 – 12:30 | Session **D1** - **Symposium:** Are we smart enough to know what great apes need – studies in great ape welfare

Symposium 3: Are we smart enough to know what great apes need – studies in great ape welfare. Part 1
Organizers: Jeroen Stevens (Odisee Hogeschool), Daan Lameris (University of Antwerp) & Johanna Neufuss (University of Birmingham)

10:30 – 10:45 | Jeroen M.G. Stevens[1,2], Sarah Depauw[1], Hilde Vervaecke[1]
The happiness of chimpanzees: great apes and modern welfare science
1. SALTO Odisee University of Applied Sciences, Hospitaalstraat 23, 9100 Sint-Niklaas, Belgium; 2. Department of Biology, Behavioral Ecology and Ecophysiology, University of Antwerp, 2610 Wilrijk

The welfare of great apes in human care is becoming increasingly important. There is however not much consensus on how to measure welfare in these highly developed primates. While animal welfare science is making major progress in farm, lab and companion animals, its concepts are not readily applied to great apes. Welfare can be regarded from three angles: biological functioning and health; natural living and positive feelings or affective states. Rarely are these three concepts integrated in great ape welfare science. Mellor's five domains model builds on to these three concepts to work towards good housing, good nutrition, good health and appropriate behaviour so that they lead to positive affective states. Heretoo, information on great apes is sparse and more integration is needed. Affective states have been said to correspond to 'Happiness' inhuman Quality of Life Assessments, but are of course harder to measure. Science is now making progress in measuring emotions in primates, and this knowledge should be integrated into great ape welfare science. Most research on measuring welfare in great apes inhuman care looks at changes in environmental resources or social dynamics, focusing on behaviour and sometimes endocrinology asoutcomes, rather than affective states. Here

we review which animalbased indicators in behaviour, physiology and cognition may beavailable in relation to affective states. We propose using moremultidimensional welfare assessment in great apes.

10:45 – 11:00 | Johanna Neufuss[1], Kirsten Pullen[2], Susannah KS Thorpe[1] - **Status of resource provision and husbandry management for zoo-housed great apes**

1. Locomotor Ecology and Biomechanics Lab, School of Biosciences, University of Birmingham, UK; 2. Wild Planet Trust, Paignton Zoo, UK

Many zoos currently rely on measuring welfare inputs (e.g., housing, social management) rather than outputs (e.g., behaviour, physiology) in practical welfare assessments, because inputs are easier to assess quantitatively and are quick to collect. This gap offered us the opportunity to check that resource- and husbandry-based parameters are grounded in what great apes do in the wild and to assess what the current practice of resource provision and husbandry is. One key aim was thus to develop a great ape welfare assessment survey and to use the survey to obtain a holistic overview of the resources and husbandry practices used by great ape facilities in the UK/Ireland. Ultimately, this up-to-date assessment will act as a baseline against which future improvements can be measured and demonstrated. Here we will show the results of the survey, share best practise in evidence-based care, and assess ways forward to improve welfare across the sector. In total we identified 60 measures that best indicate the opportunities for great apes to have good welfare and surveyed the majority of UK/Irish zoos (16/22). Results show that all sampled zoos used a resource- and husbandry-based approach but not all zoos offered all resources and husbandry practices that are most important for their species in care. However, we identified a range of practises, some clearly best practise in evidence-based care, and have identified ways to improve welfare.

11:00 – 11:15 | Daan W. Laméris[1,2], Marcel Eens[1], Jeroen M.G. Stevens[1,3] - **Measuring the effect of managed fission-fusion activities on bonobo affective states**

1. Behavioural Ecology and Ecophysiology Group, Department of Biology, University of Antwerp, 2610 Wilrijk, Belgium; 2. Antwerp ZOO Centre for Research & Conservation (CRC), Royal Zoological Society of Antwerp (RZSA), 2018 Antwerp, Belgium; 3. SALTO, Agro- and Biotechnology, Odisee University College, 1000 Brussels, Belgium

Zoological institutions aim to optimize the welfare of the animals under their care by promoting natural behaviours and social dynamics. In the wild, bonobos live in fission fusion societies in which subgroup composition often changes. Recreating such dynamics is assumed to be beneficial for the welfare of bonobos in zoos, although empiric evidence is lacking. In this study, we aimed to evaluate changes in the affective states in a group of bonoboswho were managed in two subgroups. We measured changes in theiraffective states using a response-slowing paradigm, in which individualswith negative affect show longer latencies on a simple cognitive taskwhen an emotional distractor is displayed. We trained 7 bonobos on atouchscreen task and introduced mildly threatening (faces with directedgaze) and non-threatening (faces with averted gaze) stimuli. We testedthe bonobos during a baseline period, on days with fission-fusionactivities, and on the day after. Replicating previous studies, we foundno effect of stimulus type during baseline days but found significantresponse slowing on days with fission-fusion activities. This effectdisappeared on the day afterward. This suggests that on days wheregroup compositions were changed, the bonobos experienced someform of negative affect, although this was only of short duration. Furtherquantification of behavioural and physiological variables can help tobetter understand the welfare implications of such husbandry activities.

11:15 – 11:30 | Ruth Sonnweber[1], Jeroen M. G. Stevens[2], Verena Behringer[3] - **Salivary cortisol reaction norms in zoo-housed great apes: a tool to make inferences about the welfare state**

1. Department of Behavioural and Cognitive Biology, University of Vienna, Vienna, Austria; 2. Behavioral Ecology and Ecophysiology, Department of Biology, University of Antwerp, Wilrijk, Belgium; 3. Endocrinology Laboratory, German Primate Center, Leibniz Institute for Primate Research, Göttingen, Germany

Animal welfare is becoming more of a focus in science and society. We need objective, non-invasive methods to quantify animal welfare. Cortisol is a physiological marker repeatedly mentioned in this context as it is often used as a proxy for the stress response. However, many, of the factors leading to cortisol level increases (e.g., food intake, excitement) do not negatively impact animal welfare. This does not imply that monitoring of changes in cortisol levels is inappropriate to inform about an individual's welfare state. We propose to use a reaction norm approach to examine patterns in cortisol excretion to make inferences about the stress-state of an animal: in saliva, cortisol excretion follows a circadian pattern. Diurnal cortisol patterns (slopes) together with absolute levels of cortisol(intercepts) may allow to distinguish potentially detrimental from short term (neutral) stress responses. Here we measured salivary cortisol levels in three ape species. We examined salivary cortisol intercepts (SCI) and slopes (SCS) in three conditions: (i) routine days, (ii)enrichment days, and (iii) after a move to a new building. All Individuals had higher SCI on enrichment days as compared to the other conditions. SCS were steeper on routine days in the old building than in the new building. Our study shows that SCI and SCS are independent from each other. The composite information of both measures describe stress responses better than single cortisol level measurements alone.

11:30 – 11:45 | Lisette M. van den Berg[1,2], Eva S.J. van Dijk[1], Jorrit Verkleij[1], Kim van Dijk[1], Thomas R. Bionda[2], Elisabeth H.M. Sterck[1] - **Using positive and negative behavioural welfare indicators to monitor the welfare of intact and castrated male Western lowland gorillas (*Gorilla gorilla gorilla*) in Dutch zoos**

1. Utrecht University, The Netherlands; 2. Apenheul Primate Park, Apeldoorn, The Netherlands; 3. Biomedical Primate Research Centre, Rijswijk, The Netherlands

In EAZA zoos, Western lowland gorillas (*Gorilla gorilla gorilla*) are part of an Ex situ breeding Programme (EEP) to maintain a genetically healthy and demographically stable population. Preferably, gorillas are housed in their naturalistic social organisation of polygynous groups. However, a surplus of adult males exists for whom no place is available as harem group leaders. Finding a long-term management strategy for these animals considering their welfare is challenging. Pre-pubertal castration is one of these strategies, as this may allow these males to remain in their natal group after adulthood. However, only anecdotal information is available on the long-term effects. This study monitored the behaviour and welfare of intact and castrated male gorillas in Dutch zoos. Preliminary cross-sectional data from 2021 suggest castrated males show more self-directed behaviour and receive more displacement behaviour from group members compared to intact males. Yet, castrated males show similar rates of play behaviour and spend more time in close proximity to other group members compared to intact males. These positive welfare indicators suggest the welfare of castrated males is not impaired. However, further monitoring of these animals is necessary as most castrated males are still adolescent. Individual assessment of the impact of castration on welfare is crucial to decide whether this is indeed an option for surplus males compared to other strategies available to the EEP.

11:45 – 12:00 | Rachel Jarvis[1], Sophie Moittié[2], Mátyás Liptovszky[3], Kerstin Baiker[4] - **Vitamin D status in European zoo-housed chimpanzees (*Pan troglodytes*)**

1. School of Veterinary Medicine and Science, University of Nottingham, UK; 2. School of Veterinary Medicine, St. George's University, Grenada, West Indies; 3. Department of Life Sciences, Perth Zoo, Australia; 4. Department of Veterinary Clinical Sciences, City University of Hong Kong, Hong Kong SAR, China

Vitamin D plays a crucial role in overall health and its deficiency is associated with a range of disorders, including cardiovascular disease (CVD), the main cause of death in zoo-housed great apes. Vitamin D deficiency is a public health concern in humans, but comparatively little is known about vitamin D in nonhuman great apes. Due to their genetic similarity, shared risk factors and prevalence in zoos, chimpanzees were chosen for this study. Serum samples (n=250) from European zoo-housed chimpanzees were measured for 25-OHD2, 25-OHD3 and total 25-OHD using liquid-liquid extraction and tandem mass spectrometry (LC-MS/MS) at a single accredited laboratory. Epidemiological

information about samples was gathered via a survey. Human reference intervals (RIs) were used to interpret vitamin D status. Sampling season, skin pigmentation, health status and outdoor access had a significant effect on chimpanzee vitamin D status. A notable proportion of results in each sampling season were under the human threshold of deficiency. This is an important indication of the physiological status and needs of zoohoused chimpanzees. Species-specific RIs must be developed to enable more meaningful clinical interpretations of results. Further investigations into vitamin D status in bonobos, gorillas and orangutans, as well as the relationship between vitamin D and CVD, are ongoing. Correspondence is welcome from potential collaborators with access to relevant samples, in Europe and worldwide.

12:00 – 12:15 | Jonas Torfs[1,2], Nicky Staes[1,2], Marcel Eens[1] - **A gut feeling: the potential impact of the gut microbiome on primate welfare**

1. Behavioural Ecology and Ecophysiology Research Group, Department of Biology, University of Antwerp Belgium; 2. Centre for Research and Conservation, Royal Zoological Society of Antwerp, Belgium

The primate gut is teeming with microbes that are known to modulate host physiology and digestion. However, the gut microbiome (GM) also plays a vital role in the regulation of health and behaviour and can therefore affect animal welfare. On one hand, the GM provides protection against invading pathogens, and imbalances in the GM have been linked to several health issues such as obesity, diabetes, infectious disease risk, parasitism, and cardiac disease in primates. On the other hand, the GM can also directly influence central brain function and behaviour, a connection known as the gut-brain axis. While host intrinsic and extrinsic traits can impact the GM, for example through genetics, diet, and social environment, the GM can also impact host affective state, levels of stress, and sociality directly through the gut-brain axis. While this mechanism is well-documented in rodents and humans, studies in non-human primates, and in particular great apes, are virtually lacking. Here, we provide an overview of the role of the GM in primate welfare and discuss potential future applications that can make important contributions to the field.

12:15 – 12:30 | Sarah Depauw[1], Hilde Vervaecke[1], Jeroen M.G. Stevens[1] - **Welfare assessment design for great apes and nutrition: a challenge**

1. Odisee University of Applied Sciences, Hospitaalstraat 23, 9100 Sint-Niklaas, Belgium; 2. University of Antwerp, Universiteitsplein 1, 2610 Wilrijk, Belgium

Recent animal welfare insights showthe importance for animals to experience positive emotional states rather than just avoiding negative states. As such, species specific indicators for positive welfare become increasingly important in welfare assessment protocols. In addition, the concept of 24/7 welfare across lifespan is used in the design of recent welfare assessment tools. When screening published protocols however, it is remarkable that the 'good feeding' principle, although always accounted for, is mainly measured by focusing on the absence of negative welfare aspects such as the absence of prolonged hunger. Also, little attention is given to nutritional welfare from a 24/7 perspective. Such an approach leads to welfare indicators often restricted to appropriate weight, body condition and healthy coat. What and how you feed your animals can however be crucial for them to experience positive mental states such as satiety, gastrointestinal comfort, pleasure of taste, smell or texture, playfulness, engagement and control. As a first step to develop a welfare assessment tool for great apes, a husbandry survey was distributed to all global bonobo holders resulting in a response rate of 80% EAZA and 56% AZA institutions. During this presentation, an overview of their feeding practices will be shown. These data together with published research will expose the challenges we face filling the gap between modern insights in animal welfare and measuring good feeding practices.

Thursday 2 June 2022 - *Room – A - Auditorium*

14:00 – 15:30 | Session **A2** – **Symposium:** Great apes' production and perception of emotional expressions / Communication

Symposium 1: Great apes' production and perception of emotional expressions. Part 2
Organizers: Yena Kim (Leiden University), Raphaela Heesen (Durham University), Mariska Kret (Leiden University) & Zanna Clay (Durham University)

14:00 – 14:15 | Elisa Demuru[1,2], Marta Caselli[3], Sara De Vittoris[3], Jean-Pascal Guéry[4], Lisa Gillespie[5], Ivan Norsci[3] - **A meta-analysis to (try to) figure out yawn contagion in bonobos**
1. Dynamique Du Langage, CNRS-UMR 5596, University Lyon 2, Lyon, France; 2. Equipe de Neuro-Ethologie Sensorielle, ENES/CRNL, CNRS-UMR 5292, Inserm UMR S1028, University of Lyon/Saint-Etienne, Saint-Etienne, France; 3. Department of Life Sciences and Systems Biology, University of Torino, Torino, Italy; 4. LaVallée des Singes, Romagne, France; 5. Twycross Zoo, Little Orton, UK

Contagious yawning occurs when a subject's yawn is induced by another subject's yawn. This phenomenon has been linked to inter-individual coordination, physiological synchronization, and emotional contagion. Research on yawn contagion in bonobos has provided mixed results as it has not been found in all studied groups. To date, the effect of individual and social variables, such as sex, age, and familiarity, remains unclear. We carried out a meta-analysis on bnobo groups hosted at La Vallée de Singes (N=2) and Twycross Zoo (N=2). We found that yawn contagion was present at population level, but the GLMM model showed that the group significantly affected the occurrence of yawn contagion, with the La Vallée groups showing significantly higher frequencies than the Twycross groups. This result suggest that yawn contagion is higher instable than in fission fusion groups, thus suggesting that long-term stable social bonds may affect its occurrence. Moreover, the frequency of yawn contagion significantly increased along with the number of yawns perceived. The sensitivity to the number of triggering yawns (not found in chimpanzees and humans) suggests that bonobos may have a higher response threshold, which would explain the high variability of the phenomenon reported in previous studies. Our study highlights the importance of carrying out meta-analyses on different groups to make inferences on presence and modulating factors of a phenomenon at the population level.

14:15 – 14:30 | Thibaud Gruber [1] - **Identifying affective social learning in great ape cultural learning**
1. University of Geneva

Research on the evolution of culture and communication has overwhelmingly focused on cognitive processes, building on arguments that specific processes would set humans apart from other species. Even when results embed human traits within their primate heritage, they remain fiercely debated, with little hope of evolution in a debate opposing deeply entrenched positions. Here, I will propose an affective approach as a way out of the conundrum of animal versus human culture and communication. A benefit of social life is an extended emotional life, which underlies social interactions. Building on influential emotional theories such as social appraisal, the newly proposed framework of Affective Social Learning (ASL) focuses on the acquisition of values, participating to the building of an Affective, Behavioural and Cognitive (ABC) approach to social learning. ASL is particularly interesting for cultural evolution, considering that much of our norms exist through the affective reactions we display towards them. Here, I will discuss what an ABC approach to social learning brings to culture and communication research, taking examples relevant to the evolution of norms and language. I will argue that ASL provides a continuum between so-called 'simple' and 'complex' cognitive processes and thus, by firmly establishing emotions as an integral part of cultural transmission and communication, could assist in solving the decade long debates on the evolution of culture and communication.

14:30 – 14:45 | Miriam Simon[1], Anja Widdig[2,3], Brigitte M. Weiß[2.3] - **Sniffing behaviour of Barbary macaques at Affenberg Salem**
1. Institute for Organismic and Molecular Evolutionary Biology, Institute of Anthropology, Johannes Gutenberg University Mainz, Germany; 2. Behavioural Ecology Group, University of Leipzig, Germany; 3. Research Group Primate Behavioural Ecology, Max-Planck- Institute for Evolutionary Anthropology, Leipzig, Germany

For Old World Primates (OWP), optic convergence, trichromacy and stereoscopic vision represent significant parts of their evolution, accompanied by a relative shrinking of the olfactory apparatus and fewer olfactory receptor genes. This led to the belief that olfaction in OWP is negligible. Newer findings, however, point towards a more important role of olfaction than previously inferred. To add to the growing understanding of olfaction in OWP, we observed the olfactory behavior of 48 Barbary macaques (*Macaca sylvanus*) at Affenberg Salem, Germany. Barbary macaques showed a mean of 1.8 ± 1.7 (mean ± SD) sniffs per individual/20 min. Sniffs were defined as bringing the nose close (<3cm) to an object. Most sniffs were observed in relation to food in both sexes, suggesting that information about the quality of edible items is received by olfactory cues. Females sniffed more on food than males and males more in a social context than females. Furthermore, younger individuals sniffed in general more often than older ones. The selective process for mating also involved olfaction, males inspected female anogenital swellings not only visually but at times olfactorily. Macaques were less likely to copulate if the anogenital inspection included sniffing, but we could not determine why olfactory inspection occurred or not. In summary, this study shows that olfaction in Barbary macaques is more prevalent than assumed and primarily plays a role in feeding behavior but also in reproduction.

14:45 – 15:00 | Adrien Meguerditchian[1], Yannick Becker[1], Kep-Kee Loh[1], Siham Bouziane[1], Eloïse Disarbois[1] - **Development of gestural communication' Lateralization in primates Papio anubis: early post-natal "Language-homolog" brain structures in newborn can predict it**
1. Laboratoire de Psychologie Cognitive UMR7290 CNRS/Aix- Marseille Univ

Language involves structural and functional hemispheric asymmetries of the human brain which occur very early in the development and include keys-regions such the Superior Temporal Sulcus (STS), the Insula and the Planum Temporale (PT). Comparative developmental work on behavioral & brain lateralization in nonhuman primates might enable investigate potential shared features with this early language hemispheric organization. In the present brain studies using MRI 3T at the Centre IRM of Marseille, we analyzed anatomical images acquired in vivo in anesthetized 30 newborns baboons Papio anubis housed in social groups at the Station de Primatologie CNRS. First, we found, just like in humans, early structural asymmetries in young baboons for those key "language homolog" areas: (1) toward the left hemisphere for the PT & Insula grey matter volume and (2) toward the right hemisphere for the STS depth. Second, we found that early PT & STS individual asymmetry predicted the direction of hand preference for gestural communication only. In contrast, early handedness for manipulative action was associated with contralateral depth asymmetries within the central sulcus (related to the motor hand area). These collective findings suggest a continuity between baboon newborns and human babies for such early "language" cortical organization which might date back to the common ancestor of Catarrhini at 25-40 million years ago and ultimately be related to gestural communication development.

15:00 – 15:15 | Maël Leroux[1,2,3], Katie E. Slocombe[4], Bosco Chandia[2], Anne M. Schel[5], Klaus Zuberbühler[2,3,6,7], Simon W. Townsend[1,3,8] - **Call combinations in chimpanzees (*Pan troglodytes schweinfurthii*)?**
1. Department of Comparative Linguistics, University of Zürich, Zürich, Switzerland; 2. Budongo Conservation Field Station, Masindi, Uganda; 3. Center for the Interdisciplinary Study of Language Evolution (ISLE), University of Zürich, Zürich, Switzerland; 4. Department of Psychology, University of York, York, UK; 5. Animal Ecology, Utrecht University, Utrecht, Netherlands; 6. Department of Comparative Cognition, University of Neuchâtel, Neuchâtel, Switzerland; 7. School of

Psychology and Neuroscience, University of St Andrews, St Andrews, UK; 8. Department of Psychology, University of Warwick, Warwick, UK

A key feature of language that distinguishes it from other animal communication systems is its syntactic structure: meaning-bearing units are combined into larger structures. By searching for syntax in the communication systems of our closest-living relatives, the primates, it is possible to elucidate whether this is a de novo-evolved trait in humans or whether it is evolutionary more ancient. While experimental data have confirmed the presence of syntactic-like structures in monkeys, comparable data in great apes are missing yet key to reconstructing the evolutionary origins of syntax. Here, we fill this gap through experimentally investigating a promising candidate for syntactic-like structure in chimpanzees: the alarmhoo+ waa-bark combination. First, predator presentation experiments investigated its context of production. Results suggest chimpanzees combine alarm-hoos with waa-barks when encountering snakes, specifically when other individuals are present potentially to recruit group members in a dangerous situation. Second, ongoing playback experiments aim to further investigate the meaning and function of this call combination. Preliminary analyses suggest the alarm-hoo+waabark combination is meaningful with receivers processing the combination through binding the individual meaning of the comprising calls. Ultimately, this work will help clarify whether syntax also exists in the communication systems of our closest relative and therefore predates language.

15:15 – 15:30 | Emma Doherty[1,2], Zanna Clay[1], Marina Davila-Ross[1,2] - **Communication development in sanctuary-living chimpanzees (*Pan troglodytes*): a multimodal perspective**
1. Durham University; 2. University of Portsmouth

Human language is characterised by the integration of multiple signal modalities such as facial expressions and gestures to spoken word, which act to add important clarity to our communicative interactions. To better understand its evolutionary origins, substantial research has been focused on the signalling behaviours of some of our closest living relatives. However, to date, the study of communication in NH apes has largely concentrated on signal modalities in isolation rather than considering if and/ or how these may be freely combined into the type of multimodal messaging that so typifies human language. Additionally, while developmental research is also critical to truly understand the ultimate mechanisms driving multimodal signalling, this research is lacking in NH apes. Here we examined the gestural, vocal and facial signalling of semi-wild chimpanzees (*Pan troglodytes*) living at Chimfunshi Wildlife Orphanage, Zambia. More specifically we aimed assess how age influences their proportionate production as part of single unimodal (UM) or freelycombined multimodal (MC) signals. We used video recordings obtained from 27 individuals aged 1-12 years totalling 46h of observation throughout two field periods. Overall, we show that while unimodal signals were produced most often across all individuals, with increasing age the proportionate production of multimodal signals increased significantly in a pattern more resembling that seen in human infants than previously thought.

Thursday 2 June 2022 – *Room B - Kilimanjaro Lodge*

14:00 – 15:30 | Session **B2** – **Symposium:** Perspectives on non-human primates' economic behaviour(s)

Symposium 4: Perspectives on non-human primates' economic behaviour(s).
Organizers: Elsa Addessi (CNR, Rome), Francesca De Petrillo (Newcastle University) & Valerie Dufour (University of Tours)

14:00 – 14:15 | Yue Hu[1], Tobias Kalenscher[1] - **Purchasing power computations in rats and humans**
1. Comparative Psychology, Heinrich-Heine-Universität, Düsseldorf

Demand theory can be applied to analyze how animal consumers change their selection of commodities in response to changes in commodity prices, given budget constraints. Here, we show that demand elasticities in rats differ between uncompensated budget conditions in which the budget available to be spent on the commodities (the finite number of discrete operants to "purchase" rewards in two-alternative fixed-ratio schedules) is kept constant, and compensated budget conditions in which the budget is adjusted so that rats could potentially continue to obtain the original reward bundles. This suggests that rats behave as if they considered the purchasing power of their budget above and beyond the net effort costs. We also report results from a cross-species comparison in a matched human version of this task. Human participants had a limited budget of effortful button-presses to obtain the opportunity to drink milk rewards or watch erotic pictures. Choice data were comparable to that of rats when purchasing milk rewards, but this was not the case when purchasing the opportunity to watch erotic pictures: compared to the milk and the rat task, participants made more internally inconsistent, irrational choices in the erotic picture task, despite otherwise identical task structures. Hence, the type of reward matters not only for capturing the convergence in human and non-human economic decision-making but also for understanding the factors behind compromised economic rationality.

14:15 – 14:30 | Alessandro Bongioanni[1], D Folloni, L Verhagen[1], J Sallet, N[1], Khalighinejad[1], MC Klein-Flügge[1], MFS Rushworth[1] - **Accurate versus fast decision-making under risk in macaques: brain and behaviour**

1. Wellcome Centre for Integrative Neuroimaging (WIN), University of Oxford

Economic decisions can be assessed by a rationality benchmark: do they maximise utility in the long term? In practice, behaviour often deviates from the optimal strategy, which may be due to the computational costs associated with it. Taking the specific case of binary risky choices, we assessed how the stake and probability of each option influenced choice. Consistent with dual-system theories, we found that behaviour can be explained by a mixture of an optimal approach and a faster heuristic in both humans and macaques. Moreover, we show that the optimal computations were performed in a specialised medial prefrontal brain circuit in macaques, consistent with previous results in humans. This suggests that we share with other primates a sophisticated decision system, assumedly slow and effortful, together with the need to arbitrate between it and an evolutionarily older fast and frugal decision system. But under which circumstances should one be favoured over the other? With a separate, perceptual decision-making task in macaques, we investigated the amount of time allocated to different decisions. This was found to vary as a function of the relative value of the choice and the environment, but also of fluctuations in arousal, indicating that macaques are able to adjust the cognitive resources allocated to decisions depending on the external and internal situation, and, like humans, their risky economic behaviour is driven by a mixture of rational and irrational factors.

14:30 – 14:45 | Stefanie Keupp[1,2,3], Sebastian Grueneisen[4], Felix Warneken[5], Elliot A. Ludvig[3], Alicia Melis[2] - **Delay discounting and risk preference in chimpanzees (*Pan troglodytes*)**

1. Cognitive Ethology Lab, German Primate Center, Goettingen, Germany; 2. Experimental Psychology, University College London, London, United Kingdom; 3. Department of Psychology, University of Warwick, Coventry, United Kingdom; 4. Max Planck Institute for Human Development, Berlin, Germany; 5. Psychology, University of Michigan, Ann Arbor, Michigan, United States

Adaptive decisions require that decision makers factor in the subjective values of different possible outcomes, and the probability of these outcomes occurring. Subjective values depend, among other things, on how far an outcome is away in time. This can be captured by assessing an individual's delay discounting of different options. An individual's risk preference also affects how attractive particular choice options appear to them. In humans, probability discounting and delay discounting are often related. People who show more risky behaviors also tend to be more impulsive and less patient. Based on such findings, single-process models of delay discounting and probability discounting have been

suggested. In the current study, we tested if this relationship is equally present in chimpanzees, one of human's closest extant evolutionary relatives. We presented 23 chimpanzees with a patience task and a risky-choice task. The patience task was designed to explicitly distinguish between delay preference and self-control (i.e., the ability to wait a given delay). Still, we found no strong correlations between risk and delay preferences, indicating that risky choice and patience don't draw on a single process and make up specific types of decision makers, in chimpanzees.

14:45 – 15:00 | Alejandro Sánchez-Amaro[1], Daniel Haun[1], Federico Rossano[2] - **The bargaining strategies of chimpanzees and bonobos in the Ultimatum Game**

1. Department of Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology; 2. Department of Cognitive Science, University of California San Diego

The Ultimatum Game (UG) is used to investigate our sense of fairness, a trait that differentiates us from our phylogenetic relatives, the great apes. Early work found that, in general, great apes behave as rational maximizers in the UG. Proposers tend to choose self-maximizing offers, while responders accept the majority of non-zero offers. Importantly, these studies do not rule out the possibility that apes can behave prosocially to improve the returns for themselves and others. In our first study, we offer chimpanzees and bonobos proposers the possibility of taking into account the leverage of responders over the offers they receive. This leverage takes the form of access to alternatives for responders. We find that proposers tend to propose fairer offers when responders have the option to access alternatives. We also find that both species use their leverage to reject unequal offers. The results suggest that the access to alternatives can lead great apes to change their strategies, such as not choosing the self-maximizing offer as proposers and not accepting every offer higher than zero as responders. In our second study, we present chimpanzees with a triadic UG in which two proposers can make offers to a responder. The responder then chooses the best offer, and only the chosen proposer obtains her share. In this study, we aim to investigate whether proposers compete with each other by increasing their offers. We plan to present preliminary results at the conference.

15:00 – 15:15 | Gabriele Schino[1], Francesco De Angelis[2], Raffaella Ventura[3] - **On decision making during grooming interactions in Japanese macaques (*Macaca fuscata*)**

1. Istituto di Scienze e Tecnologie della Cognizione, CNR, Rome, Italy; 2. Dipartimento di Biologia Ambientale, Sapienza Università di Roma, Italy; 3. Dipartimento di Genetica e Biologia Molecolare, Sapienza Università di Roma, Italy

In this study, we analysed the factors affecting the decisions to initiate and then to terminate grooming interactions among captive female Japanese macaques (*Macaca fuscata*) living in the Rome zoo. After approaching a group mate, grooming initiation was more likely if the approacher was subordinate to the approachee and if the two were maternally related. Once grooming was initiated, the probability to terminate it decreased slowly for the first 5 minutes, and then increased rapidly. The longer was the duration of grooming, the more (on its termination) the former groomer was likely to solicit grooming from the former groomee. This first set of results suggests groomers were well aware of the duration of grooming given, aimed at a duration of about five minutes, and expected to receive grooming in relation to grooming given. Groomees were not more likely to return grooming after receiving a longer grooming, nor (if they did reciprocate grooming) was the returned grooming longer. This second set of results suggests groomees were either unaware of, or they chose to ignore, the duration of grooming received. Overall, these results highlight the existence of a subtle conflict in the decision making about the duration of grooming interactions in macaques.

15:15 – 15:30 | Dufour Valerie[1], Broihanne Marie-Helene[1] - **Decision making under risk and ambiguity in human and non-human primates**

1. PRC, UMR7247, CNRS-INRAE-IFCE- University of Tours

Decision making under risk (knowledge about the odds of an outcome) and ambiguity (incomplete knowledge about the odds) is fundamental in humans and other animals. Previous studies showed that

in a risky context, great apes and monkeys can take into account the odds of winning or losing when trading one food for another. We also know that animals, including humans, generally avoid ambiguous options. Decision-making should thus differ between these two contexts. Here we compare decision-making in capuchins, macaques, orangutans, gorillas, chimpanzees and bonobos in risky and ambiguous contexts. Subjects were shown lotteries (a tray of potential rewards, some large, some small) and could gamble a medium-sized food item to obtain one of the displayed rewards. The odds of winning and losing varied and were accessible in the risky context (all rewards were visible) or partially available in the ambiguous context (some rewards were covered). In the latter case, the level of information varied from fully ambiguous (individuals could not guess what was under the covers) to predictable (individuals could guess). Only chimpanzees and orangutans consistently build correct expectations about the size of the covered rewards. They combined decision rules according to the number of large visible rewards and the level of predictability, a process resembling conditional probabilities assessment in humans. Our finding is a key element to the understanding of the origins of economics.

Thursday 2 June 2022 – *Room C - Mount Kenia Lodge*

14:00 – 15:30 | Session **C2** – Physiology / Neurobiology

14:00 – 14:15 | Marlen Kücklich[1,2], Brigitte M. Weiß[1,2], Susann Jänig[1,2], Madita Zetzsche[1,2], Andrea Marcillo[3], Almuth Einspanier[4], Claudia Birkemeyer[3], Anja Widdig[1,2,5] - **Towards understanding chemical cues of fertility in primates**

1. Primate Behavioural Ecology, Department of Human Behavior, Ecology and Culture, Max-Planck-Institute for Evolutionary Anthropology, Leipzig, Germany; 2. Behavioural Ecology Research Group, Institute of Biology, University of Leipzig, Leipzig, Germany; 3. Research Group of Mass Spectrometry, Institute of Analytical Chemistry, University of Leipzig, Leipzig, Germany; 4. Institute of Physiological Chemistry, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany; 5. German Centre for Integrative Biodiversity Research (iDiv), Leipzig, Germany

Current research has emphasized the importance of olfaction in primate social communication, including reproduction. In various species, observational data have shown that males regularly investigate females by sniffing and behavioral tests revealed that males differentiate between fertile states using olfaction alone. However, the chemical underpinning remains poorly understood. Using different approaches, we aim to understand chemical fertility cues in primates. We collected data from common marmosets (*Callithrix jacchus*) and chimpanzees (*Pan troglodytes*) to identify fertility-related olfactory changes using GC-MS in combination with behavioral observations and odor presentations (bioassays). We derived olfactory profiles from body odor samples and related the chemical composition of odors to the fertile phase. Additionally, we conducted bioassays, presenting pairwise odor samples of various menstrual cycle phases, to male marmosets and observed sniffing behavior of male chimpanzees directed towards females. Together, data obtained with different sampling and analytical approaches suggest that fertility cues are detectable in chemical profiles and are received by conspecifics. In follow-up studies, we will link olfactory cues to other sensory modalities and expand to fertility cues in humans. Overall, these studies provide compelling insights into the mechanisms of olfactory fertility cues and their use by conspecifics, emphasizing the importance of olfaction in primates.

14:15 – 14:30 | Johanna Eckert[*1], Danyi Wang[*1], Sam Teague[1], Ali Al-Naji[1], Daniel Haun[1], Javaan Chahl[1] - **Contact-free estimation of chimpanzees' heart rate: Validation and application of a new method for studying animal cognition**

* shared first authorship; 1. Department of Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

Cardiac measures such as heart rate measurements are important indicators of both physiological and psychological states. Despite their extraordinary potential, they have rarely been used in comparative psychology because they involved direct physical contact with the subject. In the case of undomesticated animals such as nonhuman primates, direct contact is usually only possible during anesthesia or after extensive training. Here, we validated and applied a camera-based system that enables contact-free detection of animals' heart rates in real-time. The system estimates the heart rate by tracking subtle body movements caused by the cyclic change of blood flow. In Experiment 1, we recorded the heart rate of chimpanzees using the new technology, while simultaneously measuring heart rate using classic PPG finger sensors. We found that both methods were in good agreement. In Experiment 2, we applied our new method to measure chimpanzees' heart rate in response to seeing different types of video scenes (groupmates in an agonistic interaction; foreign conspecifics eating; nature videos). Heart rate changed during video presentation depending on the video content. Our results show that the new contact-free technology can reliably assess the heart rate of freely moving chimpanzees and most likely other animals. Furthermore, the technique opens up new avenues of research within comparative psychology and facilitates health management of captive individuals.

14:30 – 14:45 | Baptiste Sadoughi[1,2,3], Dominik Schneider[3], Rolf Daniel[3], Oliver Schülke[1,2], Julia Ostner[1,2] - **Aging manifests across the physical, social, and physiological domains in wild female Assamese macaques (*Macaca assamensis*)**

1. Dept. Behavioral Ecology, University of Goettingen, Göttingen; 2. Primate Social Evolution Group, German Primate Center, Leibniz Institute for Primate Research Göttingen; 3. Genomic and Applied Microbiology, Institute of Microbiology and Genetics, University of Goettingen, Göttingen

Aging is a complex process impacting the physiological, physical, and social aspects of life, but age-related changes in humans and laboratory animals may not reflect patterns observed in wild long-lived systems. Wild primates exhibit physical aging (e.g. tooth wear), but evidence of changes in sociality and physiology with age remains scarce, and the drivers and consequences of aging for individuals' fitness largely untested. Using a cross-sectional design with repeated sampling we studied associations between age, physical activity, social behavior, and bacterial gut composition in female Assamese macaques (*Macaca assamensis*) living in their natural habitat in the Phu Khieo Wildlife Sanctuary, Thailand. Data were collected over 1.5 years from 51 adult females from three groups. Physical activity and social behavior were recorded during 2729 hours of animal focal sampling (53.5 ± 17.9 h/female). Gut bacterial communities from 543 fecal samples were assessed using 16S rRNA gene amplicon sequencing. Time resting increased whereas time socializing decreased with age, associated with a reduction in bond strength to the closest social partner. The diversity of gut microbial communities did not differ according to age, but uniqueness of bacterial composition increased with age. Thus, age was associated with changes in all dimensions investigated and further work will have to clarify how these changes interact to produce the phenotype of aging individuals in a long-lived primate.

14:45 – 15:00 | Julia Ostner, Sonia Touitou, Michael Heistermann, Oliver Schülke - **Physiological responses to energetic challenges in wild macaques**

1. Dept Behavioral Ecology, University of Goettingen Primate Social Evolution Group, German Primate Center; 2. Leibniz Institute for Primate Research Endocrinology Laboratory, German Primate Center; 3. Leibniz Institute for Primate Research

Energy availability crucially affects life history traits such as maturation age, reproductive rate, or longevity. Advance of noninvasive methods to measure energetic markers like thyroid hormones (T3), regulating metabolic rate, and glucocorticoids (GC), reflective of energy mobilization, allows investigating individual metabolic strategies in the wild. We combine behavioral (~3000 focal hours), physiological (~400 urine samples), life history (reproductive state), and environmental (phenology, temperature) data on 42 female Assamese macaques at Phu Khieo WS Thailand, to investigate how females cope with seasonal fluctuations in energy expenditure & intake. Fluctuations in intake, ambient temperature, and reproductive state affected both hormones in partly contrasting, yet predicted directions. T3 decreased with decreasing intake, reflective of a downregulation of metabolic

rate and thus an energy-saving strategy, whereas GC increased with reduced food intake potentially indicating allocation of energy away from storage and into other functions. GC (but not T3) also increased in response to low ambient temperatures indicating energy mobilization to react to cold stress. Lastly, as predicted, reproduction, particularly gestation, was associated with increases in both hormones reflecting increased expenditure. Results are discussed in light of the species' breeding strategy in relation to seasonally fluctuating resources which is a mix of income & capital breeding traits.

15:00 – 15:15 | Andreas Andreas Berghänel[1], Verena Behringer[2,3], Sean M. Lee[4,5], Barbara Fruth[6,7], Gottfried Hohmann[3,6] - **Transition to siblinghood causes substantial and long-lasting physiological stress reactions in wild bonobos**

1. Domestication Lab, Konrad Lorenz Institute of Ethology, University of Veterinary Medicine Vienna, Austria; 2. Endocrinology Laboratory, German Primate Center, Leibniz Institute for Primate Research, Göttingen, Germany; 3. Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 4. Wildlife Research Team, Office of Applied Science, Wisconsin Department of Natural Resources, Madison, WI, USA; 5. Primate Behavioral Ecology Lab, Center for the Advanced Study of Human Paleobiology, Department of Anthropology, George Washington University, Washington, DC, USA; 6. Max Planck Institute of Animal Behavior, Konstanz, Germany; 7. Centre for Research and Conservation, Royal Zoological Society of Antwerp, Belgium

The birth of a sibling marks a major developmental transition in humans, straining the older sibling's relationship with its parents. It is a widely accepted but untested assumption that this transition to siblinghood (TTS) is physiologically stressful. Monitoring TTS in wild bonobos (Pan paniscus), we investigated urinary cortisol (stress response), neopterin (cell-mediated immunity) and total T3 (metabolic changes), as well as proxies for social and nutritional weaning from the mother, including nursing, carrying, body contact with the mother and independent foraging. We found that cortisol levels in the older offspring rose fivefold when mothers gave birth to a sibling and remained elevated thereafter for seven months. Importantly, this cortisol response to TTS did not attenuate with the age of the older sibling (2.3 to 8.6 years). Elevated cortisol levels seemed unrelated to both metabolic changes (T3) and temporal patterns of social and nutritional weaning. In addition, sibling birth led to a sudden decline in cell-mediated immunity. The physiological stress reaction in our study matches the assumption that TTS is accompanied by strong and lasting stress reactions and suggests that they are not primarily related to maternal weaning processes. The physiological response of juvenile bonobos further suggests that changes associated with TTS have evolutionary roots.

15:15 – 15:30 | Paula Escriche Chova[1,2], Leana R. Goetze[1], Karen L. Bales[1] - **Neurobiology of pair bonding in female titi monkeys (*Plecturobus cupreus*)**

1. University of California-Davis, Department of Psychology, California National Primate Research Center, One Shields Avenue, Davis, CA, 95616, USA; 2. Animal Behaviour & Cognition, Utrecht University, the Netherlands

Pair bonding in humans, and in certain other animal species is essential for physical and emotional well-being. However, this attachment comes together with disadvantages such as separation, grief or jealousy. Unfortunately, the understanding of the neurobiology underlying this social bonding comes primarily from studies in rodents and to a large extent in males, drawing a knowledgeable gap in pair bonding in female primates. In this study therefore, we used for the first time socially monogamous titi monkeys to examine the physiological, neural and behavioral responses of females to their partners as opposed to stranger males. Positron emission tomography (PET) scans were performed on 8 well-established paired adult female titi monkeys using a within-subjects design in which each female underwent thought 3 different conditions. Females were either reunited with their partner, encountered a stranger, or were alone during a conscious FDG uptake. Behavioral observations were recorded. In addition, cortisol plasma was collected and assayed. As result, we found that a brief separation period significantly increased plasma cortisol levels in female titi monkeys compared to partner and stranger condition. Moreover, there was a significant effect of experimental condition on FDG uptake in the amygdala and hippocampus, although in a different direction than predicted. These

results indicate the need for further studies to unravel the underlying mechanisms of female social attachments.

Thursday 2 June 2022 – *Room D - Canopy Lodge*

14:00 – 15:30 | Session **D2** – **Symposium:** Are we smart enough to know what great apes need & Studies in primate welfare

Symposium 3: Are we smart enough to know what great apes need – studies in great ape welfare. Part 2
Organizers: Jeroen Stevens (Odisee Hogeschool), Daan Lameris (University of Antwerp) & Johanna Neufuss (University of Birmingham)

14:00 – 14:15 |Juan Olvido[1,2], A. Miani[3], A. Alstrup[3], J. Malmkvist[4], C. Pertoldi[4], T. H. Jensen[5], R.K. Nielsen[5], D. W. Hansen[6], L.A. Bach[1] - **Voluntary engagement interventions: the reward of novel sensations**
1. Interacting Minds Centre, Aarhus University; 2. Leiden University; 3. Aarhus University, Denmark; 4. Aalborg University, Denmark; 5. Aalborg Zoo, Denmark; 6. IT University of Copenhagen, Denmark

In this talk, I present the results of an enrichment intervention for an individual orangutan housed at the Aalborg zoo. The intervention consisted of daily exposure to visual material curated for orangutan well-being. This visual material was made up of videos of different environments without anything resembling facial stimuli. We used behavioral and endocrinological measurements to assess the effects of the intervention. I discuss the results in terms of novelty in the context of the typically hyper-stable environment of a zoo.

14:15 – 14:30 | Ruta Vaicekauskaite[1], Christelle Gandon[1], Helen Beyer[1], Pascal Ancé[1], Pierre-Henri Moreau[1] - **Innovative training protocol for common marmosets (*Callithrix jacchus*): group and individual positive reinforcement training to refine husbandry and research procedures**
1. SILABE - Université de Strasbourg, Fort Foch – 67207 Niederhausbergen – France

It is widely acknowledged that positive reinforcement training (PRT) participates in improving animals' welfare, especially during husbandry and research procedures. Certain aspects of PRT, like social isolation or unhealthy rewards, still remain questionable. We present an innovative PRT protocol for Common Marmosets aiming to avoid these negative aspects of PRT which was developed within the SILABE platform of the Strasbourg University in France. The protocol focuses on habituating group members for stationing and then giving the opportunity for individual to participate more actively in certain husbandry and research procedures (weighing, urine sample, routine separation, health checks, treatments, etc.). The reward used was Arabic gum which is part of the nutritional needs of this species and has the benefit to be distributed in different ways. Behavioural observations have been measured and has allowed to follow-up the changes over time of the animals' behaviours and therefore also assessing human-animal interactions. As a result, the PRT protocol permitted to perform with success all the sought husbandry and research procedures. Also, behaviours described as stressful and anxious decreased with time and female marmosets showed more affiliative/cooperative behaviour with the trainer compared to males. To conclude, PRT without social isolation and behavioural changes permitted to refine husbandry and research procedures in the context of animal welfare.

14:30 – 14:45 | Abigail Gwynn[1], Hendrik Segah[3], Helen C. Morrogh-Bernard[1,2], Alex Thornton[2], Abdul Azis[1], Frank J.F. Van-Veen[2] - **Use of the Mini-FLOTAC apparatus for monitoring gastrointestinal parasites of wild orang-utans**

1. University of Exeter; 2. Borneo Nature Foundation; 3. Universitas Palangka Raya

Infectious diseases can pose a significant threat to wild primate health and even eradicate populations, so long-term monitoring to identify the emergence, transmission and outbreaks of disease should be standard protocol in primate field research projects. Monitoring the health of wild primates can prove challenging, however, due to factors such as accessibility, cost, resource availability, epidemiological expertise and technique invasiveness. With 61% of non-human primates classed as vulnerable, endangered, or critically endangered, and human expansion increasing the risk of zoonotic disease transmission, such monitoring is critically important. We developed a monitoring protocol for detecting and analysing gastrointestinal parasites in wild orangutans entirely in the field environment using the innovative Mini-FLOTAC® apparatus. Between March and December 2019, we collected and analysed 77 faecal samples, identifying five helminth taxa and compared the prevalence and intensity of helminths between seasons and periods before and after a fire event. We hope that this protocol will assist insitu research projects with limited access to laboratory facilities to monitor gastrointestinal parasites over the long-term and have the ability to detect parasites which may pose a deadly threat to populations.

14:45 – 15:00 | Dian G.M. Zijlmans[1,2], Lisette M. van den Berg[2], Jan A.M. Langermans[1,3], Elisabeth H.M. Sterck[1,2] - **Using behaviour to predict overweight in a captive group-living rhesus macaques (*Macaca mulatta*)**

1. Animal Science Department, Biomedical Primate Research Centre, Rijswijk, the Netherlands; 2. Animal Behaviour and Cognition, Department of Biology, Utrecht University, Utrecht, the Netherlands; 3. Department Population Health Sciences, Unit Animals in Science and Society, Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands

Overweight and obesity are relatively prevalent problems in captive non-human primates (NHPs). NHPs in social groups experience the same housing conditions, yet not every individual develops overweight. Individual variation in adiposity may result from differences in behaviour related to energy intake and expenditure and to dominance rank. This study investigates whether behaviour predicts overweight in captive female rhesus macaques (*Macaca mulatta*) housed in three social groups at the Biomedical Primate Research Centre in Rijswijk, the Netherlands. Relative adiposity was quantified with two years between measurements. Behavioural data were collected on food intake, activity budgets and dominance rank at baseline. High relative adiposity was associated with little moving and foraging at baseline, but not related to food intake or dominance rank. Higher-ranking females had a higher increase in relative adiposity compared to lower-ranking monkeys, while there was no effect of food intake or activity budgets. These results suggest that high dominance rank is a risk factor for becoming overweight. Yet, behaviour related to energy intake and expenditure is likely not useful to predict overweight in captive group-living NHPs.

15:00 – 15:15 | Dietmar Crailsheim[1,2], Pablo R. Ayuso[1] - **Research activity´s potential to support primate care in captivity**

1. Research Department, Fundació Mona, Spain; 2. Facultat d'Educació i Psicologia, Universitat de Girona, Spain

Over the last few decades, the number of scientific papers generated by zoological gardens, sanctuaries and rescue centres have increased drastically. While the main objective of such institutions is to house and provide a high standard of wellbeing for the animals in their care, employing research related staff is becoming more common these days. Yet we want to highlight that, apart from adding to the scientific knowledge pool by publishing papers, a permanent research department has the potential to provide more services and can actively support efforts related to the animal's wellbeing and care. At Fundació MONA, a primate rescue and rehabilitation centre in the north of Spain, research became a growing force supporting the animal care and welfare monitoring over the years. By conducting longitudinal observations using modern observation tools and ample but precise ethograms, the research department can produce meaningful publications, provides ongoing formation opportunities for students and supports the Animal Care department simultaneously.

Caregivers tend to lack the time to observe the animals in their care. Yet well trained observers can provide ad libitum and systematic input, which can prove to be useful or even essential for care and veterinary decisions. By adjusting the research department objectives and methods slightly, it becomes possible to collect large amounts of data valid for publications as well as frequent internal reports and evaluations.

15:15 – 15:30 | Sophie Waasdorp[1], J.A. Tuffnell[2], L. Bruins-van Sonsbeek[2], C.M. Schilp[2,3], Y.R.A. van Zeeland[4], E.H.M Sterck[1,3] - **What is the best way to feed captive white-naped mangabeys (*Cercocebus lunulatus*)?**

1. Animal Behaviour & Cognition, Utrecht University, the Netherlands; 2. Rotterdam Zoo, the Netherlands; 3. Animal Science Department, Biomedical Primate Research Centre, the Netherlands; 4. Division of Zoological Medicine, Utrecht University, the Netherlands

The manner in which food is presented to captive primates can affect their behavior and, as a consequence, their welfare. Both clumped and whole food may result in aggression and stress, while dispersed and chopped food may counter this. We investigated the effect of food presentation on time-budget behaviours (i.e., activity, inactivity, forage, allogroom, play, self-groom) and stressrelated measures (i.e., diarrhoea, aggression, self-directed behaviours) in white-naped mangabeys of Rotterdam Zoo, using four crossed-over test conditions of food distribution; Dispersed-Whole, Clumped- Chopped, Dispersed-Chopped, and Clumped-Whole. The results show that subordinate and young mangabeys spent most time foraging and all mangabeys (N=8) spent least time being inactive and expressed the lowest rates of self-directed behaviours during Dispersed-Chopped compared with Clumped-Whole and Dispersed-Whole. Food presentation did not affect other behaviors or measures. Consistent with most of the literature, presenting food dispersed and chopped was the best condition, while presenting food as whole items was the worst condition. In conclusion, paying attention to food presentation can improve welfare of zoo-housed primates.

Thursday 2 June 2022 - *Room – A - Auditorium*

16:00 – 17:30 | Session **A3** – Social behaviour

16:00 – 16:15 | Pia M. Böhm[1,2], Lena S. Pflüger[1,2], Katharina Pink[3], Michael A. Huffman[2,4], Bernard Wallner[1,2] - **Consortship stability of female homosexual consortships in Japanese macaques (*Macaca fuscata*)**

1. Department of Behavioral & Cognitive Biology, University of Vienna, Austria; 2. Austrian Research Center for Primatology, Ossiach, Austria; 3. Department of Evolutionary Anthropology, Faculty of Life Sciences, University of Vienna, Austria; 4. Primate Research Institute, Kyoto University, Inuyama, Aichi, Japan

Research on homosexual consorts in female Japanese macaques (*Macaca fuscata*) has expanded our knowledge of the nature of homosexuality. In same-sex consorts both females gain sexual reward through mounting and genital stimulation. Accordingly, female-female consorts are defined by elements of sexual behavior. The duration and intensity of consort behaviors can vary and some females change their same-sex partners within hours, while others stay together for days or reunite more than once. The present study aimed at factors responsible for differences in pair bond stability in female-female pairs. We focused on behaviors already described to strengthen pair bonds in other primates. We hypothesized that the intensity and reciprocity of affiliative behaviors and sexual stimulation affect consort duration and reoccurrence. A semi-free population of Japanese macaques (Affenberg Landskron, Austria) was observed for one mating season. Both homo- and heterosexual consorts were quantified and about 40h of focal data on same-sex consort behaviors were analysed. Of all sexually mature females, 46% engaged in homosexual interactions. The pairs showed differences in their consort durations - some met only once, others engaged repeatedly. The amount of body

contact (huddling) a pair shared increased their consort duration and their chance of reuniting, while the frequency of mounting had no effect. The present findings underline the complexity of sexual relationships in non-human primates.

16:15 – 16:30 | Francisco E. de Terceiro[1], Francisco Edvaldo[1,2], Willems, Erik P.[2], Arruda, Maria de Fátima[1], Burkart, Judith Maria[2], Araújo, Arrilton[1] - **Food sharing under fluctuating food availability: long-term data from wild common marmosets (*Callithrix jacchus*)**

1. Department of Physiology and Behaviour, Universidade Federal do Rio Grande do Norte, PO Box 1511, Campus Universitário, 59078-970. Natal - RN, Brazil; 2. Department of Anthropology, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich, Switzerland

Offspring care is composed of several behaviours affected by ever-changing social and environmental conditions. Unending effects on parents and offspring fitness alike arise from such variation. Thus, understanding behavioural changes upon such variation might be crucial to unravel infant care allocation. Food sharing towards infants in *Callithrix jacchus* is a caring behaviour of well-established importance. Our goal, therefore, was to assess how this caring behaviour changes under environmental fluctuations. More specifically, we tested if a decrease in food abundance would have a positive, negative, or no effect on food sharing towards infants. Data was collected using focal animal sampling as the primary method, and instantaneous recording for every food sharing event during ≈ 1970 hours over eight years from 35 group members of a free-ranging marmoset group. We found a clear distinction between female helpers and the remaining subjects. Female helpers decreased their food sharing when food was less abundant whereas female breeders and males increased sharing when food was less bountiful. Moreover, in harsher circumstances, food was shared more often proactively, to more dependent infants and when food was harder to obtain. Our results underscore how diverging strategies in infant care allocation not only coexist within a group of wild *C. jacchus* but also are uniquely affected by an infant's needs and by environmental variation.

16:30 – 16:45 | Jenny Jaffe[1,2], Fabian Leendertz[1,3], Sebastien Calvignac-Spencer[1], Roman Wittig[2,4] - **Severe injuries in wild chimpanzees - behavioural and medical aspects**

1. Epidemiology of Highly Pathogenic Microorganisms, RKI, Berlin, Germany; 2. Taï Chimpanzee Project, Centre Suisse de Recherches Scientifiques, Abidjan, Côte d'Ivoire; 3. Helmholtz Institute for One Health, Greifswald, Germany; 4. Institute of Cognitive Sciences Marc Jeannerod, UMR 5229 CNRS / Universite Claude Bernard Lyon 1, Bron, France

When trauma is extensive, the natural process of wound healing does not always achieve complete recovery. This research describes three cases of severe injury in wild habituated chimpanzees (Pan troglodytes verus) in Taï National Park, Côte D'Ivoire, likely all caused by leopard attacks, which are well documented in this population of chimps. One of the three cases made a full recovery, the other two died after weeks of gradual deterioration. The observations cover the behavioural changes of the injured individuals, which allowed the chimps to conserve energy. They spent a lot of time cleaning their wounds themselves, and allowing family and group members to clean the wounds, in one case using tools made from twigs to probe the wound. Photos illustrate the healing of a wound involving full thickness loss of skin from the back of the head, leaving a large expanse (approx. 20 x 30 cm) of exposed bone. This wound healed fully over a period of 15 months. In the other two (fatal) cases, though some level of wound healing did take place, the larger wounds remained purulent, suggesting that infection played a role in the deterioration and death of these chimps. The observational findings are supplemented by gross pathology, histopathology and molecular techniques on necropsy tissues in the chimps that died, and by quantification of biomarkers of inflammation and infection (suPAR and neopterin) in urine samples collected before and after the injury in all three chimps.

16:45 – 17:00 | Alan V. Rincon[1], Claire Pérez[1], Peter R. Clark[1,3], Julie Dubosq[2], Bridget M. Waller[3], Jérôme Micheletta[1] – **Do more complex macaque societies use more complex facial behaviour?**

1. Department of Psychology, Centre for Comparative and Evolutionary Psychology, University of Portsmouth, UK; 2. UMR7206 Eco-Anthropology, CNRS-MNHN-Université de Paris, Paris, France; 3. Department of Psychology, Nottingham Trent University, Nottingham, UK

The social complexity hypothesis for communicative complexity (SCHCC) posits that animal societies with a more complex social system will evolve more complex communication systems. Here, we test the SCHCC across three macaque species, rhesus, Barbary, and crested macaques, that vary in their degree of social tolerance and complexity. Macaques regularly use facial signals as a communication tool and previous studies have quantified complexity in facial communication by the number of different expressions. However, facial behaviour is fluid and subtle complexities may be lost when classifying facial signals into discrete categories. In this study, we coded facial behaviour at the level of individual muscle movements using the Facial Action Coding System (FACS) developed for each macaque species. We FACS coded facial behaviour in >1500 social interactions across three different social contexts (aggressive, submissive, affiliative). By using a combination of bootstrapping techniques and network analysis (NetFACS), we describe and quantify the complexity of facial behaviour of the different macaque species. Using network analysis at the level of individual muscle movements gives us a flexible approach to the study of facial signals that could be generalized and used in a unified multimodal approach to the study of communication.

17:00 – 17:15 | Jordan S. Martin*[1], C.A. Olivier* [2,3], C. Pilisi[2], P. Agnani[2], C. Kauffmann[2], L. Hayes[4], A. V. Jaeggi[1], C. Schradin[2,3] - **The evolution of inter- and intraspecific variation in primate social organization: A phylogenetic analysis of ancestral states and ecological effects on wild populations**

*shared first authorship; 1 Human Ecology Group, Institute of Evolutionary Medicine, University of Zurich, Switzerland; 2. IPHC, UNISTRA, CNRS, France; 3. School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, South Africa; 4. Department of Biology, Geology, and Environmental Science, University of Tennessee at Chattanooga, USA

Primates exhibit extensive variation in social organization (SO), and explaining this variation has been fundamental to understanding the evolution and ecology of animal societies more broadly. However, previous research has assumed that species are characterized by a single SO, failing to account for welldocumented patterns of intraspecific variation. To address this issue, we compiled a database on SO from field studies of 499 populations of 216 primate species. We used Bayesian phylogenetic models to estimate the probability of different SOs at the population level as well as the proportion of social units deviating from the primary SO, while also accounting for relevant socioecological factors. In contrast to prior studies, we found that the most likely ancestral SO was pair-living, with ~15% of social groups within a population expected to show different SOs. Socioecological factors generally had weak effects on SO and intraspecific variation in SO, although collectively explaining a moderate to large proportion of variance. We argue that pair-living may have evolved in ancestral primates as a simple strategy for increasing males' mating success and reducing intrasexual competition among females, as compared to solitary living. Our results also suggest that intraspecific variation in SO has been widespread throughout primates' evolutionary history, encouraging greater attention to the within-population causes and consequences of this underappreciated heterogeneity.

17:15 – 17:30 | Lucy Baehren[1,2], Susana Carvalho[1,2,3,4] - **Reinventing the framework for leave-taking: an example using wild chacma baboons (*Papio ursinus*)**

1. Primate Models for Behavioural Evolution Lab, Institute of Human Sciences, School of Anthropology and Museum Ethnography, University of Oxford, Oxford, UK. 2. Gorogonsa National Park, Sofala, Mozambique. 3. Centre for Functional Ecology, Department of Life Sciences, Coimbra University, Coimbra, Portugal. 4. Interdisciplinary Centre for Archaeology and Evolution and Human Behaviour, Algarve University, Faro, Portugal

Humans typically greet when they meet one another and have rituals of leave-taking when they part. Greeting rituals have been well studied across human societies as well as across the animal kingdom, however studies of leave-taking are sparse in humans and almost entirely absent in other species. Insights into the presence of leave-taking in non-human species could provide unique insights into the

evolutionary history of this behaviour, and possible function(s). Baboons provide a valuable model for investigating human evolution and are particularly suitable for the study of leavetaking as they move frequently between interactions within troops. This study on wild chacma baboons (*Papio ursinus*) of Gorongosa National Park, Mozambique, investigates leave-taking using a range of candidate behaviours: 1) self-scratching, 2) eye gaze, and 3) orientation in the direction of parting. Using multivariate analysis, controlling for interaction duration and individual variation, our results show that orientation in the direction of parting occurs significantly before social separation events (n= 205, $p<0.05$), compared to non-social separation events. This result reveals the first evidence of leave-taking in a wild non-human species, challenging previous ideas that it is uniquely human. Presence of leave-taking in baboons suggests, a potentially deep evolutionary history of leave-taking behaviour, warranting further investigation into function and presence across other non-human species.

Thursday 2 June 2022 - *– Room B - Kilimanjaro Lodge*

16:00 – 17:30 | Session **B3** - Cognition

16:00 – 16:15 | Ivo Jacobs[1], Raquel Costa[2,6], Kata Horváth[1,3], André Gonçalves[4], Misato Hayashi[2,5] - **The origins of hominin fire use: Japanese macaques as living models**

1. Department of Cognitive Science, Lund University, Lund, Sweden; 2. Japan Monkey Centre, Inuyama, Japan; 3. ELTE, Eötvös Loránd University, Budapest, Hungary; 4. Language & Intelligence Section, Primate Research Institute, Kyoto University, Kyoto, Japan; 5. Chubu Gakuin University, Seki, Japan; 6. Primate Cognition Research Group, University of Lisbon, Lisbon, Portugal

Fire transformed our evolution by providing numerous benefits – cooking in particular – but little is known about what kindled its early transition. Some animals also possess pyrocognition, the behavioural and cognitive abilities required to harness the potential of fire. These animals can serve as models for how early hominins managed this unique and dangerous phenomenon, and how its use went on to shape the creatures we are today. Here, we studied the troop of ~150 Japanese macaques (*Macaca fuscata yakui*) at the Japan Monkey Centre (JMC) in Inuyama, Japan, which has been exposed to bonfires every winter for the past 63 years. We filmed (>300 hours) and focal-sampled 33 adults (11 F, 22 M) during bonfire and control days to address ten questions. Video coding and analysis is ongoing, and preliminary activity budgets are reported here. The macaques spend much time near the fire, particularly facing it directly. They search the area for ash and charcoal to eat. They also frequently groom and sit in body contact. These preliminary results and further observations suggest that the macaques warm themselves by the fire, compete over access to it, eat charcoal and ash, retrieve burning sticks, and are calm and confident near the fire. Thus, Japanese macaques are suitable models for the pyrocognitive capacities of early hominins, which is a research question that requires study of living animals to supplement traditional approaches.

16:15 – 16:30 | Jonas Verspeek[1,2], Edwin J. C. van Leeuwen[1,2], Daan W. Laméris[1,2], Nicky Staes[1,2], Jeroen M. G. Stevens[1,2,3] - **Indifferent hippies: lack of prosociality in prosocial choice task and group service paradigm in bonobos**

1. Behavioural Ecology and Ecophysiology Group, Department of Biology, University of Antwerp, 2610 Wilrijk, Belgium; 2. Centre for Research and Conservation, Royal Zoological Society of Antwerp, 2018 Antwerp, Belgium; 3. SALTO, Agro- and Biotechnology, Odisee University College, 1000 Brussels, Belgium

We presented a group of bonobos with two platform food-provisioning tasks: the prosocial choice task (PCT) and the group service paradigm (GSP). The latter has so far never been applied to bonobos. To allow for free choice of participation and partner, we implemented both tasks in a group setting. Like in previous PCT studies, bonobos did not choose the prosocial option more often when a group member could benefit versus not benefit. In the GSP, where food provisioning is costly, only subadult bonobos showed a limited amount of food provisioning, which was much lower than what was

previously reported for chimpanzees. In both experiments, adult subjects were highly motivated to obtain rewards for themselves, suggesting that bonobos behaved indifferently to the gains of group members. We suggest that previous positive food-provisioning prosociality results in bonobos are mainly driven by the behaviour of subadult subjects. The lack of prosociality in this study corresponds to the hypothesis that proactive food provisioning co-occurs with cooperative breeding and suggests that proactive prosociality might not be part of the selfdomestication syndrome in bonobos.

16:30 – 16:45 | Laura Lewis, Fumihiro Kano, Jeroen Stevens, Erin Wessling, Josep Call, & Chris Krupenye - **Chimpanzees and bonobos remember groupmates for at least a decade**

1. Department of Human Evolutionary Biology, Harvard University, Cambridge, MA, USA; 2. School of Psychology & Neuroscience, University of St Andrews, St Andrews, UK; 3. Kumamoto Sanctuary, Wildlife Research Center, Kyoto University, Kumamoto, Japan; 4. Center for the Advanced Study of Collective Behavior, University of Konstanz, Konstanz, Germany; 5. Behavioural Ecology and Ecophysiology, Department of Biology, University of Antwerp, Belgium; 6. Centre for Research and Conservation, Royal Zoological Society of Antwerp, Antwerp, Belgium; 7. Department of Psychological & Brain Sciences, Johns Hopkins University, Baltimore, MD, USA; 8. Department of Psychology, Durham University, Durham, UK

Navigating a complex social environment requires sophisticated mechanisms for processing and responding to conspecifics, such as long-term social memory. Remembering individuals that have not been seen for days or years is adaptive, and aids in avoiding hostile interactions and benefitting from prosocial ones. Although individual recognition is widespread among animals, surprisingly little is known about social memory in nonhuman apes and the shared evolutionary foundations of human memory. Our closest ape relatives, chimpanzees and bonobos, live in large social groups but range in smaller foraging parties that change in social composition (fission-fusion social dynamics). Thus, robust long-term memory in great apes could facilitate stronger social bonds and intragroup cohesion. In a novel eye-tracking experiment, we presented a large sample of chimpanzees and bonobos (N = 26) with adjacent images of a former groupmate and a conspecific stranger of the same sex. Apes' attention was robustly biased toward former groupmates, indicating long-term memory for past social partners for at least a decade. Importantly, apes' looking biases were stronger for individuals with whom they had more positive social interactions. This suggests that, like humans, ape social memory incorporates content about relationship quality. Our results help clarify the evolution of long-term social memory in primates, and the origins of humans' ability to track other agents across distant space and time.

16:45 – 17:00 | Mathieu S. Stribos[1], Ryan Sigmundson[2], Roy Hammer[1], Julia Herzele[3], Lena S. Pflüger[3,4], Jorg J. M. Massen[1,3] - **Exploring the cognitive capacities of Japanese macaques in a cooperation game**

1. Animal Behaviour and Cognition, Department of Biology, Utrecht University, 3584 CH Utrecht, The Netherlands; 2. Department of Philosophy, University of Vienna, 1010 Vienna, Austria; 3. Austrian Research Center for Primatology, 9570 Ossiach, Austria; 4. Department of Behavioral and Cognitive Biology, University of Vienna, 1090 Vienna, Austria

Inequity aversion (IA) is defined as a negative reaction to inequity in reward distribution. Such a sensitivity to inequity has been argued to have co-evolved with cooperation. Nonetheless, experiments investigating IA have rarely incorporated cooperation paradigms in their design. To pursue this avenue of study, we conducted two cooperation experiments in a captive population of a despotic primate species infamous for its low tolerance, the Japanese macaque (*Macaca fuscata*, N = 164), using a modified version of the loose-string paradigm. Our first experiment demonstrated that the success rate of the individuals involved in the cooperation task increased as the experiment progressed. Furthermore, at least some individuals demonstrated an understanding of the cooperative nature of the task, as evidenced by their waiting for the arrival of a potential partner before attempting the task. Our second experiment manipulated the task reward outcomes to assess reactions to unequal reward distribution and demonstrated that individuals receiving a lesser reward following a cooperative effort were more likely to display aggressive and stress-related behaviors than when they received the same type of reward equivalent in size to that of their partner. Beyond demonstrating a

capacity for cooperation in the species, our study concluded that the Japanese macaques of our study population possess a sensitivity to reward division inequity.

17:00 – 17:15 | Sarah Salphati[1], Marina Davila Ross[2], Derry Taylor[3] - **Rapid facial mimicry in infant chimpanzee play**

1. Royal School of Veterinary Studies, University of Edinburgh; 2. Department of Psychology, University of Portsmouth; 3. Institute of Biology, University of Neuchâtel

Facial expressions are a central feature of primate communication. The open-mouth faces (OMF) of play in great apes have been discussed as homologues of human smiles based on their facial anatomy and function. OMFs often trigger a mirror effect in the receiver, who responds with the same expression as the sender. This behaviour of matching the facial expression, and consequently the emotion, of another individual, is called facial mimicry and is often displayed by adult apes during play. However, it is yet to be studied when this behaviour develops and how it relates to social bonding. This study assessed whether rapid facial mimicry (within one second) of OMFs was present in infant chimpanzees (*Pan troglodytes*) aged zero to four (N = 21) during everyday dyadic play at the Chimfunshi Wildlife Orphanage. Results indicated that only older infants (2 – 4 years old) significantly performed rapid mimicry of their playmates' OMFs, suggesting mimicry may be a socio-emotive ability that develops and refines with age. Additionally, rapid facial mimicry was more common in rough than gentle play, suggesting mimicry may ensure coordination between playmates from an early age. Understanding the evolutionary and developmental roots of rapid facial mimicry is important, as this behaviour is closely linked to theory of mind, emotional contagion, and the experience of empathy and can give us insight into the development of these mechanisms in both humans and nonhuman primates.

17:15 – 17:30 | **GfP MASTER RESEARCH PRICE:** Tina Petersen[1] - **Representational feedback-loops and behavioural interactions: How, when, and what behaviours „upgrade" the functionality dimension in tool representations?**

1. University of St Andrews

What is a tool to the primate mind? Tool representations might include object features and past associations, but at least in humans the tool's "functionality" may be evaluated and rated as well. This is a fascinating representational feat: How did human representational capacities arrive at a state where the mere *potential* of a tool's usefulness suffices to motivate its preservation? I would like to offer tool transport as a candidate behaviour to scaffold the formation of more abstract tool representations like these. Transporting a tool enables innovative improvisation on the journey and exposes additional object properties. Both processes allow the tool to shift into focus outside its relation to a specific task and be considered as its own object, which in turn may facilitate further preservation. To test this hypothesis, preservation-like behaviours could be experimentally approximated with nonhuman primates and tested for their impact on the animal's ability to exploit multi-functionality under uncertainty. A preference for multi-functional tools when the task demands are uncertain would then suggest a capacity to evaluate and represent some degree of tool functionality. Depending on our conceptualization of functionality, finding this capacity in nonhuman primates might then imply other fundamental abilities as well.

Thursday 2 June 2022 – *Room C - Mount Kenia Lodge*

16:00 – 17:30 | Session **C3** – Genetics / Phylogeny

16:00 – 16:15 | Laura LaBarge, B. Spillmann, A. Ashbury, A. Marzec, J. Kunz, E.R. Vogel, S.S. Utami Atmoko, C.P. van Schaik, M.A. van Noordwijk - **Local space-use and paternities in Bornean orangutans at Tuanan, Central Kalimantan, Indonesia**

1. Max Planck Institute of Animal Behavior, Konstanz, Germany University of Zurich, Zurich, Switzerland; 2. Borneo orangutan survival (BOS) foundation, West Java, Indonesia; 3. Rutgers The State University of New Jersey, New Jersey, USA; 4. Faculty of Biology and Primates Research Center, Universitas Nasional, Jakarta, Indonesia

Bornean orangutans (Pongo pygmaeus wurmbii) are generally non-gregarious, but their space-use patterns may reveal additional complexities of their social system. Flanged adult males are especially solitary and range widely – yet their movement decisions likely reflect the contrasting social demands of avoiding competitors and maximizing access to females. Here we use 15 years (2003-2018) of GPS and paternity data collected in the 750 ha Tuanan Orangutan Research Area to explore patterns of flanged male movement. We examine whether males tend to concentrate their longterm space-use within the study area near mates, and if they shift their range following a successful siring. To do this, we fit and selected continuous-time stochastic models to individual movement processes of seven sires, created utilization distributions, and quantified interindividual overlap with mate (n=8) and non-mate (n=19) females via Bhattacharyya Coefficients. These movement data best fit Ornstein-Uhlenbeck-Foraging (OUF) models (based on AICc). Sires were intermittently present in Tuanan and spent no more time in association with mates than non-sires, yet their long-term space-use tended to be concentrated nearer to mates than non-mates. In the few examples where we had data pre- and post-birth, sires maintained significant overlap with mother-offspring pairs for three years afterward (n=4 siremother pairs). This suggests that flanged males may be engaging in long-term indirect mate-guarding.

16:15 – 16:30 | Nicky Staes[1,2,3], CM White[1], EE Guevara[1], M Eens[2], WD Hopkins[4,5,6], SJ Schapiro[4], JMG Stevens[2,7], CC Sherwood[1], BJ Bradley[1] - **Epigenetic modification of dopamine receptor gene 2 (DRD2) is associated with extraversion scores in chimpanzees**

1. Center for the Advanced Study of Human Paleobiology, Department of Anthropology, The George Washington University; 2. Behavioural Ecology and Ecophysiology Group, Department of Biology, University of Antwerp; 3. Centre for Research and Conservation, Royal Zoological Society of Antwerp; 4. Michale E. Keeling Center for Comparative Medicine and Research, The University of Texas MD Anderson Cancer Center; 5. Neuroscience Institute and Language Research Center, Georgia State University; 6. Ape Cognition and Conservation Initiative; 7. SALTO Agro- and Biotechnology, Odisee University College

Chimpanzees have consistent individual differences in behavior, also referred to as personality. Similar to human personality structure, five dimensions are commonly found in chimpanzee studies that show evidence for convergent and predictive validity (Dominance, Openness, Extraversion, Agreeableness, and Reactivity/Undependability). These dimensions are to some extent heritable, indicating a genetic component that explains part of the variation in personality scores, but are also influenced by environmental factors, such as early rearing. Here, we investigated the role of epigenetic modification of the dopamine receptor D2 gene (DRD2) as a potential mechanism underlying personality variation in 51 captive chimpanzees. We used previously collected personality trait rating data and determined levels of DRD2 CpG methylation in peripheral blood samples. DRD2 methylation was most strongly associated with Extraversion, and varying methylation levels at specific DRD2 sites were associated with changes in Extraversion in nursery-reared, but not mother-reared, individuals. These results highlight the role of dopaminergic signaling in chimpanzee personality, and indicate that environmental factors, such as social experiences early in life, can have long-lasting behavioral effects, potentially through modification of the epigenome. These findings add to the growing evidence demonstrating the importance of the experience-dependent methylome ffor the development of complex social traits.

16:30 – 16:45 | Tobias van Elst Valisoa S.T. Rovanirina, Romule Rakotondravony, Paul A. Hohenlohe, Dominik Schüßler, Ute Radespiel - **Phylogeography of the critically endangered Gerp's mouse lemur has been shaped by rivers, altitude and paleoclimate**

1. Institute of Zoology, University of Veterinary Medicine Hannover Foundation, Bünteweg 17, 30559 Hannover, Germany; 2. Faculté des Sciences, de Technologies et de l'Environnement, University of Mahajanga, 5 Rue Georges V - Immeuble KAKAL, Mahajanga Be, B.P. 652, Mahajanga, 401, Madagascar; 3. Institute for Bioinformatics and Evolutionary Studies, Department of Biological Sciences, University of Idaho, Moscow, ID 83844, USA; 4. Research Group Vegetation Ecology and Nature Conservation, Institute of Biology and Chemistry, University of Hildesheim, Universitätsplatz 1, 31141 Hildesheim, Germany

Madagascar has great potential to study the diversification of species due to its numerous endemic radiations and steep environmental gradients. Here, we reconstruct the phylogeographic history and patterns of gene flow in the critically endangered mouse lemur *Microcebus gerpi* to understand the principles underlying the diversification of small mammals in Madagascar's rainforests. Using genome wide RADseq data of 67 individuals across seven locations, we infer that *M. gerpi* diversified in the Late Pleistocene, potentially through cycles of connectivity and isolation during paleoclimatic fluctuations. Populations in different inter-river systems are well differentiated and do not show signs of admixture. The deepest divergence (~ 206 kya) is found between *M. gerpi* populations north and south of two major rivers with headwaters at high altitudes and is comparable to that between its two sister species. These rivers have likely long been a major barrier to gene flow that cannot be crossed by the lowland specialist *M. gerpi*. Two other rivers coincide with more recent divergences (< 50 kya), potentially because their smaller size or lower headwaters permitted higher migration rates at mid elevations. Our findings provide empirical evidence for the interacting effects of rivers, altitude, and paleoclimate in shaping the evolution of biodiversity in Madagascar. We further highlight important conservation implications considering extreme habitat loss and fragmentation in the region.

16:45 – 17:00 | Laura Hagemann[1], N. Grow[2], Y. E.-M. B. Bohr[3,4], D. Perwitasari-Farajallah[5,6], Y. Duma[7], S. L. Gursky[8], S. Merker[1] - **Small, odd and old - the most basal Sulawesi tarsier lives in the mountains**

1. Department of Zoology, State Museum of Natural History Stuttgart, Germany; 2. Department of Anthropology, Washington State University, USA; 3. Institute of Ecology, Diversity and Evolution, Johann Wolfgang Goethe-Universität Frankfurt, Germany; 4. Institute of Zoology, Animal Ecology and Conservation, Universität Hamburg, Germany; 5. Primate Research Center, IPB University, Bogor, Indonesia; 6. Department of Biology, Faculty of Mathematics and Natural Sciences. IPB University, Bogor, Indonesia; 7. Faculty of Animal Husbandry and Fisheries, Universitas Tadulako Palu, Indonesia; 8. Department of Anthropology, Texas A&M University, College Station, USA

The evolutionary history of Sulawesi (or Eastern) tarsiers is closely linked to the island's complex geological past in the collision zone between major tectonic plates. Phylogeographic studies suggested that the predecessor of Eastern tarsiers arrived in southern Sulawesi in the early Miocene from proto Java. The following split into two major lineages was dated to the early Pleistocene, leaving a gap of at least 13 MY between initial colonization and further diversification. But one piece of the puzzle was missing: the mysterious mountain or pygmy tarsier Tarsius pumilus. Unlike all other recent tarsiers it occurs exclusively above 1800 m asl and exhibits morphological and behavioral peculiarities, most prominently its reduced size. For the longest time, T. pumilus was only known from museum specimens and its phylogenetic position remained highly speculative. Here we present results of the first genetic study on this elusive tarsier. We show that T. pumilus is not an aberrant lowland tarsier but represents the sister taxon to all other Sulawesi tarsiers, with nearly 10 MY of independent evolution. The proposed split date coincides with the deepening of marine environment between the eastern and western parts of Sulawesi and predates the existence of permanent mountains in the west by at least 4 MY. The shift to mountain habitat was thus not linked to the formation of the T. pumilus lineage.

17:00 – 17:15 | Samantha Lopez Clinton[1,2], Rachel A. Voyt[3], Axel Jensen[1], Gideon Erkenswick Watsa[2], Mrinalini Erkenswick Watsa [2,4], Katerina Guschanski[5] - **Developing saddleback and emperor tamarin SNP set for in situ genotyping using the MinION portable sequencer**

1: Department of Ecology and Genetics - Animal Ecology, Uppsala University, Norbyvägen 18D, SE-75236, Uppsala, Sweden; 2: Field Projects International; 3: Department of Anthropology, University of Texas at Austin, 2201 Speedway, Austin, TX-78712, United States of America; 4: San Diego Zoo Wildlife Alliance, 15600 San Pasqual Valley Drive, CA-92027, Escondido, United States of America; 5: University of Edinburgh, Ashworth Laboratories, Charlotte Auerbach Road, EH9 3FL, Edinburgh, United Kingdom

Non-invasive samples are a valuable source of genetic data, particularly for wildlife biologists studying rare and elusive animals. Processing and analyzing such samples on-site is ideal to avoid exportation to foreign, and often expensive, laboratory facilities as well as to preserve sample quality. We constructed an in-situ genotyping by sequencing pipeline for two free-ranging tamarin species (*Leontocebus weddellii* and *Saguinus imperator*) in Southeastern Peru. It can be applied to non-invasive samples and the MinION portable sequencer. Using 26 high coverage genomes from both species, we bioinformatically identified single nucleotide polymorphisms (SNPs) that allow distinguishing between species, individuals within each species and determining individudal sex. We designed primers that are amenable to multiplexing all of these loci in a single reaction and sequencing the resulting amplicons on both the Oxford Nanopore Technologies MinION portable sequencer as well as Illumina short reads, with an aim to have ~200 working primer pairs in total. We will evaluate the success rate of our genotyping approach with differing genetic samples (hair and blood) and platforms (Illumina and Nanopore). The pipeline, in particular the process to obtain the informative SNPs, will be adapted with modular workflow tools to facilitate its use in other species by a multitude of users.

Thursday 2 June 2022 – *Room D - Canopy Lodge*

16:00 – 17:30 | Session **D3** – **Symposium:** Is it time to phase out lab research on non-human primates?

Symposium 5: Is it time to phase out lab research on non-human primates?
Organizers: Simone Pollo (Sapienza University of Rome) & Augusto Vitale (Istituto Superiore di Sanità)

16:00 – 16:15 | Claudio I. Bernardi[1] - **Perspectives from the Pharma environment and Regulatory Agencies**
1. Accelera Srl. NMS Group, Italy

Based on the most recent data generated by the EU Commission (EU Statistics on the use of animals for scientific purposes in the Member States, July 2021), non-human primates (NHP) represented in2018 the 0,12% of the total number of animals used for biomedical purposes in Europe, showing a minimal (+4%) increase compared with the previous reports. Although more than 3,000 NHP are used every year for basic research projects, the largest majority (68%) of animals belonging to this species is still used within the Pharma environment to characterize the safety profile of drug candidates according to the requirements of the international regulatory agencies. Rationale for the current use of NHP during the preclinical development of innovative therapeutic drugs and vaccines, new experimental approaches, objectives reached so far and future programs to further adopting the3Rs Principles in the Pharma environment will be introduced and discussed.

16:15 – 16:30 | Luca Bonini[1] - **The biggest dilemma: nonhuman primates in neuroscientific basic research**
1. University of Parma - Dept of Medicine and Surgery

Non-human primates (NHP) are still considered a small but indispensable component of biomedical research in western countries. Eastern countries, where most of the species used in the laboratories of all over the world are endemic, are increasingly aware of their invaluable relevance for scientific

progress in medicine, and this awareness is at the basis of the post-COVID19 shortage in the availability of non-human primates for western countries' laboratories, creating important difficulties in EU and US translational and regulatory studies. Yet, if a sizeable part of the public opinion is somehow inclined to accept that NHP are still necessary to test vaccines and drugs immediately useful to treat human-threatening diseases, ethical acceptability of NHP in neuroscientific research is more problematic: its impact on human health seems less immediate, NHP suffering appears to be high and, therefore, the cost-benefit ratio does not result immediately evident. In this talk, I will try to analyze the neuroscientific and social reasons that makes NHP in basic neurosciences "the biggest dilemma" in the animal research field. I will argue that an untimely fade out of their use would seriously damage western and EU countries' scientific progress, and that a careful application of the 3Rs principles and transparency on the research activities may help to improve both the acceptability of this fundamental branch of biomedical research and the welfare of NHP housed in EU facilities.

16:30 – 16:45 | Jan A.M. Langermans[1,2] - **Replacement and reduction of non-human primate use inbiomedical research: opportunities and challenges**

1. Biological Primate Research Center, Rijswijk, The Netherlands; 2. Population Health Sciences, Unit Animals in Science and Society, Veterinary Faculty, Utrecht University, Utrecht, The Netherlands

The use of non-human primates (NHP)in biomedical research is a sensitive topic and needs thorough scientific and ethical justification. In biomedical research, non-human primates (NHP) are predominantly used in regulatory studies (safety and toxicity), infectious diseases and neuroscience. Although NHP are still essential in various research areas, their use comes with ethical and practical problems. Therefore, development of methods to replace, reduce and refine the use of NHP in biomedical research is essential and must be a continuous effort. Approaches that can be used toreplace and reduce their use include the development of advanced invitro models, human studies, increase in genomic information and new technologies. Despite an increasing interest, researchers often encounter several barriers limiting the implementation of these new approaches. Progress of the development of reduction and refinement methods will be of benefit for the animals but has also a positive effect on the scientific quality. In addition, it will also help to combat the campaign groups that call for a ban on the use of NHP in biomedical research. By using an optimal combination of issues such as increasing awareness, knowledge, dissemination and support of reduction and refinement policies both NHP and research will benefit. In this presentation several opportunities and challenges will be discussed.

16:45 – 17:00 | Simone Pollo[1] - **Are NHPs a special case for the reform of scientific use of animals?**

1. Department of Philosophy - Sapienza University of Rome

Philosophical and public discussions about the ethics of using animals in research dates back to the 19th Century, but it is in the second half of the 20th that such discussions started to produce substantial and constantly developing reforms of animals' scientific use in many countries. The basic moral justification of such reforms is the sentient nature of animals – as stated, for example, by the EU Directive on the scientific use of animals. Beside the general recognition of animal sentience, not all species are regarded in the same way both by the law and the public (i.e. invertebrates are not protected by the EU, with the exception of cephalopods). In this scenario NHPs seem to be a special case. Some of them, the great apes, are the only species that are excluded from scientific use by the EU (with the exception of very special circumstances). Furthermore, the other NHPs (together with cats and dogs) can be used but are granted more restrictions than other species. Are these special restrictions morally justified? The answer is yes. Reasons motivating such an answer show that sentience is not the only criterion to protect animals used in research. NHPs are not specially protected just because of a higher degree of sentience. Other moral reasons come into play and they regard many aspects of the human/animal relationships. Reflecting on the special case of NHPs' treatment in research highlights some key ideas for the discussion of the ethics of animal experimentation.

17:00 – 17:15 | Valeska Stephan[1] - **The role of non-human primates in research and development – an (historical) overview**
1. UM Rostock/ DFG Senate Commission on Animal Protection and Experimentation

Non-human primates (NHPs) make only a small fraction of the animal models used in research. Yet, they are key to some areas of research in particular and many medical breakthroughs could not have been accomplished without the use of NHPs. This talk aims to assess the role of NHPs as a key model in research and development by providing a brief (historical) overview about NHPs as an animal model, highlighting some examples along the way. In addition, the talk will be looking at the impact of our changing understanding of animal welfare concepts on the use of NHPs in the laboratory, with a focus on husbandry and handling. Finally, this talk will review how the role of NHPs in research and the changes in animal welfare standards are mirrored in guidelines, frameworks and legislation in Europe.

17:15 – 17:30 | Augusto Vitale[1] - **Critical issues in the evaluation of Non-Human Primates lab research**
1. Center for Behavioural Sciences and Mental Health, Istituto Superiore di Sanità, Rome

Non-Human Primates (NHP) are still used in basic and applied research in the Member States of the EU, as well as in Asia and United States. As a matter of fact, the number of NHP utilised in Europe has steadily increased in the last few years. This increase in mainly due to the use of these animals in regulatory context. In Italy the proposals of projects which include the use of NHP are evaluated by a special working group of the Consiglio Superiore di Sanità (CSS), on behalf of the Italian competent authorithy, that is, the Minister of Health. In this presentation I will outline some of the challenges than an evaluator within the CSS encounters when dealing with NHP project proposals. In particular, the two main difficulties are related to the assignment of severity classification in regulatory research, and the details of training procedures both in basic and regulatory protocols. I will also show how a continuous dialogue between researchers and evaluators increases the quality of the submitted protocols, hopefully resulting in a better quality of life for the NHP still used in laboratory research.

Friday 3 June 2022 - *Room – A - Auditorium*

10:30 – 12:30 | Session **A4** – **Symposium:** Meaning, context and function: Studies on flexibility versus specificity in primate communication / Communication

Symposium 6: Meaning, context and function: Studies on flexibility versus specificity in primate communication.
Organizers: Marlen Fröhlich (University of Tübingen) & Kirsty E. Graham (University of St Andrews)

10:30 – 10:45 | Nancy Rebout[1,2,6], Arianna De Marco[2,3], Andrea Sanna[2], Jérôme Micheletta[4,5], Jean-Christophe Lone[1], Reinier F. van den Berg[1], Elisabeth H.M. Sterck[6,7], Jan A.M. Langermans[7,8], Bernard Thierry[1], Alban Lemasson[9,10] - **Testing the association between social complexity and contextual call flexibility in four species of macaque**
1. Physiologie de la Reproduction et des Comportements, CNRS, INRAE, Université de Tours, Nouzilly, France; 2. Fondazione Ethoikos, Radicondoli, Italy; 3. Parco Faunistico di Piano dell'Abatino, Poggio San Lorenzo, Italy; 4. Centre for Comparative and Evolutionary Psychology, Department of Psychology, University of Portsmouth, Portsmouth, UK; 5. Macaca Nigra Project, Tangkoko Reserve, Batu Putih, Indonesia; 6. Department of Biology, Animal Behaviour & Cognition, Utrecht University, Utrecht, Netherlands; 7. Animal Science Department, Biomedical Primate Research Center, Rijswijk, Netherlands; 8. Department Population Health Sciences, Veterinary Faculty, Utrecht University, Utrecht, Netherlands; 9. EthoS (Éthologie Animale et Humaine), Université de Rennes, Normandie Université, CNRS, Rennes, France; 10. Institut Universitaire de France, Paris

The social complexity hypothesis posits a link between social and communicative complexity. We studied the uncertainty as a measure of complexity in the context specificity of vocal signals at 2 different levels: the degree of overlap between acoustic structure and their emission context, and the degree of differentiation of commenting calls (calls emitted after a social interaction by an individual not involved in that social interaction).Macaque species are known to differ in their level of uncertainty in their social interactions according to their level of social tolerance (the higher the degree of social tolerance, the higher the degree of uncertainty). We compared vocalizations in 3 social contexts (affiliative, agonistic, and neutral) in 2 intolerant species, Japanese macaques (*Macaca fuscata*) and rhesus macaques (*M. mulatta*) and in 2 tolerant species, Tonkean macaques (*M. tonkeana*) and crested macaques (*M. nigra*) using cluster and discriminant function analyses performed on acoustic variables. Our results showed a lower degree of overlap between acoustic structure of calls and emission context of calls and a higher degree of differentiation of commenting calls in tolerant macaques compared to intolerant macaques. Thus, tolerant macaques, the more socially complex species are also those with a higher degree of freedom in the association between acoustic structure and emission context (i.e. vocally complex), which support the social complexity hypothesis.

10:45 – 11:00 | Catherine Crockford, Cedric Girard-Buttoz, Emiliano Zaccarella, Tatiana Bortolato, Angela Friederici, Roman Wittig - **The patterning and ontogeny of chimpanzee vocal sequences**
1. Institute of Cognitive Sciences, CNRS, Lyon, France; 2. Max Planck Institute for Human Cognitive and Brain Sciences; 3. Tai Chimpanzee Project, Ivory Coast

Most animals, including humans, have small vocal repertoires, so the ability to encode many meanings must be predicated on combining sounds into diverse and rule-based sequences. But, outside of song, most primate species are reported to produce few and short vocal sequences, offering little potential to generate new meanings beyond the number of calls in the repertoire. We assessed whether this holds for chimpanzees, known to combine vocalisations. Analysing 4826 vocal utterances of 46 wild adult chimpanzees, Tai Chimpanzee Project, Ivory Coast, we found that chimpanzees produced 390 unique vocal sequences. Most vocal units emitted singly were also emitted in two-unit sequences (bigrams), which in turn were embedded into three-unit sequences (trigrams). Bigrams showed

positional or transitional regularities within trigrams, such that certain bigrams predictably occurred either in head or tail positions in trigrams. We also asked when these diverse and structured vocal sequences emerge in ontogeny, adding vocalisations from 52 immature Tai chimpanzees. We found that vocal sequences emerge slowly, reaching adult levels in terms of length and diversity after 8 years old. A next step is to assess whether vocal sequences alter contextual usage and meaning. From a purely structural perspective, the capacity to organize single units into structured and diverse sequences offers a versatile system, potentially suitable for expansive meaning generation.

11:00 – 11:15 | Guillaume Dezecache[1] - **Vocal functional flexibility: what it is and why it matters for primatologists**
1. Université Clermont Auvergne, LAPSCO, CNRS

A central feature of human communicative abilities is that virtually every signal can fulfill any function, albeit by pure cultural convention. For example, I can use the strings 'the train is late' to express my joy of spending more time with my family or signal my impatience to the station staff. This decoupling between 'signal' and 'function' in human communication appears early in ontogeny, and has been termed 'functional flexibility'. To which extent is functional flexibility unique to human communication? There has been little work with other primates. This might be due to a lack of clarity of the original framework and its apparent inapplicability to communicative systems outside humans. In this talk, I will clarify what functional flexibility is, why it is important, and what we would need to look for. To illustrate this, I will discuss data from chimpanzees, suggestive of the presence of functional flexibility in this species in the vocal domain.

11:15 – 11:30 | Peter Clark[1,2,3], Bridget Waller[1], Jerome Micheletta[2,3] - **Matching crested macaque facial signals to social interaction outcomes**
1. Nottingham Trent University, Nottingham, UK; 2. University of Portsmouth, Portsmouth, UK; 3. Macaca Nigra Project, North Sulawesi, Indonesia

In order to understand the function of facial displays and to create valid facial expression repertoires for comparative study, detailed analysis of facial movements is necessary. In this study of crested macaques (*Macaca nigra*), we utilised the Facial Action Coding System for macaques (MaqFACS) to examine the subtle facial movements present in facial displays that are commonly categorised as the same. We then used discriminant function analysis to link the appearance of displays to the social interactions they were used in. We first investigated the silent bared-teeth (SBT), finding that different movements were present in expressions preceding different behavioural outcomes. Second, we looked at expressions used by instigators in agonistic encounters, and found that facial movements were not predictive of the outcome of these interactions. We explain these contrasting results as an indication 1) that facial signals can be good indicators of future behaviour, while recognising that 2) receivers can also affect behavioural outcome by responding flexibly to the same signal. Overall our results indicate the value of examining facial expressions in fine detail, and indicate that facial communication may be more complex and subtle than had been appreciated to date. When investigating the evolutionary history of facial communication, or building repertoires of displays, we should acknowledge the potential presence of subtle variability.

11:30 – 11:45 | Juliette Aychet[1], Catherine Blois-Heulin[1], Alban Lemasson[1] - **Signal sequences in captive mangabeys: flexible communication in a non-hominoid primate?**
1. University of Rennes 1, UMR6552 EthoS (Animal and human ethology)

The question of whether non-hominoid monkey communication is flexible with respect to social contexts and signal meanings is of great interest in the study of the evolutionary origins of language. Although studies on primate communication have mainly focused on single communication systems (gestural, facial or vocal), describing the communication of our closest relatives with a more integrative

approach may help to better address this issue. In the present study, we aimed at systematically describe multiple signal use in the spontaneous communication of captive red-capped mangabeys, *Cercocebus torquatus*, taking into account the association of several types and modalities of signals (i.e. multicomponent and multimodal communication). We observed twenty-five mangabeys and reported all the vocalisations, gestures and facial expressions they produced on different sensory modalities (audible, tactile or visual only). We then applied sequence analysis tools, based on dissimilarity measures, to identify their typical signal sequences, and network analysis to describe dyadic signal associations among these sequences. In addition, we investigated the effect of social context on sequence complexity, and evidenced that captive mangabeys frequently associated signals of all types and modalities in a flexible way with regards of the context. Our results give perspectives to test for current hypotheses regarding the function of multimodal and multicomponent communication.

11:45 – 12:00 | Carel van Schaik[1], Marlen Fröhlich[1] - **The meanings of 'meaning' of primate signals**
1. Department of Anthropology, University of Zurich, Schwitzerland

Signals evolved so as to optimize the sender's fitness and therefore include the recipients' responses. The traditional approach to signals assumes that they are emitted without voluntary control and reflect the sender's internal state. Meaning is therefore not represented by the communicators; there is only the evolved effect. Once communicators signal intentionally, meaning emerges as the intended change in the recipient's behavior. In addition to such demand signals (commands or requests), animals also produce functionally referential signals that inform the recipient about a state of the environment. Provided they are used intentionally, their meaning is fundamentally different: it is referential (lexical), even if pragmatically additionally disambiguated by context. Finally, there can be meaning in compositional sequences of signals. We discuss different methods to infer these different kinds of meaning, including the criterion of 'apparently satisfactory outcome' as operationalization for meaning of demand signals (in particular for difficult signals, such as "contact" calls). We also briefly discuss the taxonomic distribution of these types of meaning in relation to repertoire types and evidence for volitional, intentional use, as well as the transition of meanings in animal communication to meanings of language.

12:00 – 12:15 | Alexandra Langehennig-Peristenidou[1], Daniel Romero-Mujalli[1,2], Tjard Bergmann[1], Marina Scheumann[1] - **From simple to complex: vocal development of the trill call in grey mouse lemurs**
1. Institute of Zoology, University of Veterinary Medicine Hannover, Hannover, Germany; 2. Zoological Institute and Museum & Institute for Botany and Landscape Ecology, University of Greifswald, Greifswald, Germany

During language acquisition, human infants undergo a developmental phase of high vocal plasticity. Infant calling bouts of high vocal plasticity occur also in a strepsirrhine primate species. This study aims to investigate how these variable calling bouts contribute to the development of the complex advertisement call (Trill), not present at birth, in the grey mouse lemur. We used 180 infant calling bouts (N=9 families) recorded during four age classes representing different infant developmental stages and 50 adult Trills (N=42) as reference. Temporal and spectral acoustic parameters were measured for each syllable of a bout. To define syllable types, dimensionality reduction techniques combined with unsupervised cluster analysis were performed. Transition networks were established to visualise the sequential order of the syllable types within a bout for each age class. Several syllable types were obtained, which differed in their occurrence across age classes. Syllables with almost no frequency modulation occurred mainly around birth, whereas frequency-modulated syllables occurred in the later age classes. The sequential order of syllable types reflected the adult Trills when infants start to leave the nest box on their own. This suggests that adult Trills develop during infancy by increasing frequency modulation of syllables and by combining specific syllable types into a complex sequence. Further studies will address whether this is due to maturation or vocal learning.

12:15 – 12:30 | Kirsty E. Graham[1], Marlen Fröhlich[2,3] - **A discussion on meaning, context and function**
1. School of Psychology and Neuroscience, University of St Andrews, UK; 2. Department of Anthropology, University of Zurich, Switzerland; 3. Palaeoanthropology, Senckenberg Centre for Human Evolution and Palaeoenvironment, University of Tübingen, Germany

The aim of this symposium has been to come together and share approaches for determining what primate signals "mean", as well as the findings that these approaches yield. In this discussion, we will respond to the seven papers presented here on meaning, context, and function. These papers highlight diverse ways of studying the context and function (or meaning) of primate signals, as well as representing a wide range of primate species. We also bring our own research on orang-utan and bonobo gestures to the table. We reflect on the current state of our field and draw on each paper to propose new ways of moving forward and bridging gaps between research groups. This is by no means the end of the debate, but (we hope) a way of advancing the conversation.

Friday 3 June 2022 – *Room B - Kilimanjaro Lodge*

10:30 – 12:30 | Session **B4** - Cognition

10:30 – 10:45 | Edwin J.C. van Leeuwen[1,2,3,4], N. Staes[1,2], S. Kordon[5], J. Brooker[5], S. Nolte[4], Z. Clay[5], M. Eens[1], JMG Stevens[1,6] - **Timbres of tolerance: bonobos and chimpanzees do not systematically differ in their expressions of co-feeding tolerance**
1. Behavioral Ecology and Ecophysiology Group, Department of Biology, University of Antwerp, Belgium; 2. Centre for Research and Conservation, Royal Zoological Society of Antwerp, Antwerp, Belgium; 3. Department for Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 4. Animal Behaviour and Cognition Group, Utrecht University, the Netherlands; 5. Psychology Department, Durham University, United Kingdom; 6. SALTO Agro- and Biotechnology, Odisee University College, Sint Niklaas, Belgium

The human species exhibits a remarkable level of social tolerance which has propelled a plethora of behavioural expressions pivotal to our biological success. To date, however, the evolutionary origins of humans' "ultra-sociality" remain unclear, despite a substantial research focus on our closest living evolutionary relatives, the great apes. While bonobos (*Pan paniscus*) and chimpanzees (*Pan troglodytes*) are evolutionarily closely related, bonobos are typically portrayed as being more socially tolerant than chimpanzees and consequentially sometimes presented as a better model to study the evolutionary roots of human sociality. Yet, the current evidence supporting such a species-level categorization remains equivocal. To improve our understanding of Pan "typical" tendencies, a higher resolution of inter- and intraspecific variation in our closest living relatives is needed. Here, we experimentally tested 16 independent Pan groups living in zoo (n=9) and sanctuary (n=7) settings with validated group-level co-feeding tasks. Both in the zoo and sanctuary populations, species' expressions of social tolerance substantially overlapped, thus precluding categorical inference at the species level. Instead, marked differences were observed between groups, with some bonobo groups exhibiting higher social tolerance than chimpanzee groups, and vice versa. We conclude that the pervasive dichotomy between the tolerant bonobo and the belligerent chimpanzee requires more quantitative nuance.

10:45 – 11:00 | Shona Duguid[1], Esther Herrmann[2], Michael Tomasello[3] - **How do chimpanzees coordinate actions to solve a pure coordination problem?**
1. School of Psychology and Neuroscience, Unviversity of St Andrews, UK; 2. Department of Psychology, University of Portsmouth, UK; 3. Department of Psychology and Neuroscience, Duke University, USA

Coordinating decisions is a vital aspect of living in a group for social species such as chimpanzees (*Pan troglodytes*). Yet, we still have limited knowledge of how chimpanzees successfully coordinate. In the

current study we presented four pairs of chimpanzees with a pure coordination task in which they could release food from one of four identical apparatuses by both pulling on strings attached to the same apparatus. All apparatuses contained the same reward and were spaced far enough apart so that the chimpanzees could potentially use the position of their partner to infer their decision. Thus, in the simplest form of the task, the chimpanzees could solve the problem by following each other's actions. We tested this by granting access to the task either simultaneously or with a slight delay (5s) between partners, predicting that in the latter case following a partner should be easier. All pairs were highly successful at releasing the food in both conditions. Notably, they all converged on using the same apparatus, despite showing differing preferences in individual training. Thus, we explored the flexibility of their coordination in a second phase of the study by only baiting two of four options per trial. The chimpanzees were able to maintain success in this phase, even after changing partners. We discuss these results in contrast to a previous pure coordination task in which body position could not be used as an indicator of choice and chimpanzees struggled to coordinate.

11:00 – 11:15 | Isabelle Laumer[1], Shubhangi Kansal [1], Anais van Cauwenberghe[1], Marlen Fröhlich[1], Tatang Mitra Setia[1], Caroline Schuppli[1] - **The development of object manipulations in free-ranging and captive orangutans**

1. Max Planck Institute of Animal Behaviour

In human infants, object manipulations are one of the main mechanisms to learn about objects and the physical principles connected to them. With this project, we looked at the development of exploratory object manipulations and object play in captive and wild Sumatran orangutans (*Pongo abelli*). Our aim was to investigate similarities in object manipulations in orangutans and humans, as well as to look at the developmental plasticity of this behaviour. Our data included 518 videos on 7 captive focal individuals housed at the Leipzig Zoo and 16 wild individuals at the Suaq Balimbing population in South Aceh, Indonesia. We found similar age trajectories of object manipulation rates at both sites, which closely resemble the ones found in humans. However, throughout their development and into adulthood, zoo orangutans show significantly higher exploration and object play rates than their wild peers. At both sites, we found an increase in the number of manipulations per event overage as well as a decrease in mouthing of the objects, which again resembles the human pattern. In sum, our results suggest that just as human infants, immature orangutans use object manipulations to learn about objects. Our results suggest that the conditions under which individuals grow up significantly affect object manipulations. Furthermore, whereas object manipulations in zoo orangutans proved not to be representative of the species' natural behaviour, they show the species' exploration potential.

11:15 – 11:30 | Lara Southern[1], Simone Pika[1], Tobias Deschner[2] -**Turn-taking in the grooming interactions of chimpanzees in the wild**

1. Osnabrück University; 2. Max Planck Institute for Evolutionary Anthropology

Intraspecific aggression is a common phenomenon in the animal kingdom. Patterns of this behaviour have been explained by kin selection and evolutionary game theory, where aggressors increase their fitness through enhanced access to resources, mates and territory. In contrast, lethal interspecies interactions have mainly been investigated in the context of predation and received most research attention in carnivores. Here, we report first observations of two lethal coalitionary attacks of chimpanzees (*Pan troglodytes troglodytes*) on another hominid species, gorillas (*Gorilla gorilla gorilla*) living in Loango National Park in Gabon. Across a 10-month period, we witnessed two lethal coalitionary attacks of chimpanzees on gorillas, that resulted in the death of two infant gorillas. The chimpanzees significantly outnumbered the gorillas in both events (27 chimpanzees vs. five and seven gorillas respectively) and the attacks took place in months of low-fruit availability and higher dietary overlap between the two sympatric ape species. We discuss these novel observations in light of the two most widely accepted theoretical explanations for interspecific violence, predation and competition, and combinations of the two —intraguild predation and interspecific killing.

Furthermore, given the parallels between these events and encounters between neighboring chimpanzee communities, we discuss similarities and differences to chimpanzee intergroup encounters and their territorial nature.

11:30 – 11:45 | Kopp[1], Sonja J. Ebel[1,2], Roman M. Wittig[1,3], Daniel B. M. Haun[1], Catherine Crockford[1,3]
- **Mirror, mirror in my hand... A simple method to improve MSR tests in chimpanzees**
1. Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 2. University of Leipzig, Germany; 3. Institute of Cognitive Sciences, CNRS, Lyon, France

Mirror self-recognition (MSR) is widely considered an indicator of self-awareness. Standardized mirror tests reveal compelling evidence for MSR in a few non-human species, including the great apes. However, evidence for MSR varies substantially across individuals within species. An ongoing methodological controversy, therefore, questions the appropriateness of standard MSR tests for cross-species comparisons. Lack of motivation, in particular, is discussed as one possible cause for false-negative results. Addressing this criticism, we introduced a modified method that used shatterproof, freely manipulatable handheld mirrors instead of stationary, body-sized ones. We predicted that the monopolisability and maneuverability of small mirrors increase the chances of identifying MSR across a larger proportion of individuals. To test this, we compared the spontaneous behavioural response of 47 zoo-housed chimpanzees (*Pan troglodytes*) to body-sized, stationary mirrors and small, portable hand mirrors, respectively. As predicted, chimpanzees both revealed a substantially higher frequency of general mirror-related behaviours and engaged in significantly more and longer behaviours indicating MSR when provided with small mirrors compared to a large mirror. Handheld mirrors offer a more sensitive measure for MSR in chimpanzees and likely other primate species than the traditional large mirrors and thereby are a potentially valuable tool for studying selfawareness across species.

11:45 – 12:00 | André Gonçalves[1], Yuko Hattori[2], Ikuma Adachi[1] - **Strange yet familiar? Chimpanzees' interest towards conspecific skulls, an eye-tracking experiment**
1. Language and Intelligence Section, Primate Research Institute, Kyoto University; 2. Center for International Collaboration and Advanced Studies in Primatology, Primate Research Institute, Kyoto University

While chimpanzees exhibit a variety of behaviors surrounding their dead (physical interactions, stationing around and revisiting the corpse), considerably less is known about how they behave towards or if they show any interest for conspecific skeletons. We tested seven captive chimpanzees' visual attention to images of conspecific and non-conspecific skulls (cat, chimp, dog, rat). These were shown simultaneously in four corners of a screen in distinct orientations (frontal, diagonal and lateral). Additionally, both faces and skull-shaped stones of these animals were presented following the same methods. We conjectured that chimpanzee skulls retain face-like features thus being perceived similarly to chimpanzee faces and showing the same biases (towards conspecific stimuli, frontal orientations and teeth). Overall, supporting our hypotheses, the results showed that chimpanzees attended: 1) significantly longer to conspecific stimuli (faces and skulls) particularly in frontal-diagonal orientations; 2) significantly longer to conspecific faces, followed by skulls and lastly by skull-shaped stones; 3) similarly to elephants, chimpanzees exhibited significant longer interest in teeth (compared to eye sockets). The results support our "degraded face assumption", suggesting chimpanzee skulls still retain relevant, albeit impoverished, face-like features that arguably activate a domain specific face-module in the chimpanzee's brain, guiding their attention.

12:00 – 12:15 | Marta Panunzi[1,2], Elsa Addessi[1], Gabriele Schino[1] - **Capuchin monkeys flexibly coordinate in a Snowdrift game**
1. Istituto di Scienze e Tecnologie della Cognizione, CNR, Roma; 2. Dipartimento di Filosofia Comunicazione e Spettacolo, Università degli studi Roma Tre, Roma

Social dilemmas play an important role in the study of cooperative behaviors. Our experiment tested the strategies adopted by capuchin monkeys (*Sapajus* spp.) when faced with a cooperative situation

involving a conflict of interest, simulating a Snowdrift game. We tested six pairs of capuchin monkeys in two experimental conditions: Snowdrift and Competition. Monkeys had the possibility to pull a rope in order to move a "rotating blade" and obtain a reward, while delivering a different reward to their partner. Pulling in the Snowdrift condition delivered a smaller reward to self and a larger reward to the partner, while the opposite happened in the Competition condition. If none of the monkeys pulled within 30 s no reward was delivered to either monkey. Monkeys were also individually tested in a self-control task to assess whether this could be predictive of the subjects' choices. Capuchin monkeys successfully coordinated (i.e., obtained a reward) in 100% of trials and flexibly adapted their behavior to the different experimental conditions, by pulling earlier in the Competition and later in the Snowdrift condition. Dominance rank and self-control had no effect on the latencies to pull. A variety of behaviors, but no alternation strategy based on cost-benefit calculation, have been observed. Our results suggest that capuchin monkeys can solve a conflict of interest using different strategies without engaging in complex calculations.

12:15 – 12:30 | Jessie E.C. Adriaense[1,2], Judith M. Burkart[1,2] - **Joint action in common marmosets (*Callithrix jacchus*) and the role of joint commitment**

1. Evolutionary Cognition group, Dept. of Anthropology, University of Zürich, Switzerland; 2. [2]NCCR Evolving Language

Social interactions require motoric and mental coordination from both actors to achieve a succesful joint outcome. In that regard, *joint actions* have been investigated for their shared mental states such as *joint commitment* (i.e. a sense of reciprocal obligation). Comparative research can shed light on its evolution in humans, by investigating whether other cooperative breeders such as common marmosets also have this skill and how it aids them in their social life. As such, this study focusses on the role of joint commitment when marmosets participate in a highly important and risky joint action, namely infant transfers between parents. Joint commitment can be investigated as a *process* (i.e. combined motor efforts in an interaction framework) rather than (merely as) a *product* (i.e. feeling obligated). Specifically, through the former approach I study whether infant transfers consist of multiple phases (opening, main, and exit), as well as the necessary coordination signals such as mutual gaze and touch. Moreover, I am interested in how these signals define a further succesful outcome of the joint action. Upon abstract submission, I collected 30 hours of observational data from 3 family groups, recording infants daily from age 0 to 30 days. Preliminary results show repeated mutual gaze between parents before infant transfer occurs, and at the conference I will present additional results and a complete analysis of the remaining research questions.

Friday 3 June 2022 – *Room C - Mount Kenia Lodge*

10:30 – 12:30 | Session **C4 – Symposium:** Exchanging methods in the ethological study of human and non-human primates / Social behaviour

Symposium 7: Exchanging methods in the ethological study of human and non-human primates.
Organizer: Virginia Pallante (Netherlands Institute for the Study of Crime and Law Enforcement)

10:30 – 10:45 | Marie Rosenkrantz Lindegaard[1,2] - **Does Danger Level Affect Human Bystander Intervention in Real-Life Conflicts? Evidence from CCTV Footage**

1. Netherlands Institute for the Study of Crime and Law Enforcement; 2. University of Amsterdam

In real-life violence, bystanders can take an active role in de-escalating conflict and helping others. Recent meta-analytical evidence of experimental studies suggests that elevated danger levels in conflicts facilitate bystander intervention. However, this finding may lack ecological validity because ethical concerns prohibit exposing participants to potentially harmful situations. Using an ecologically valid method, based on an analysis of 80 interpersonal conflicts unobtrusively recorded by public

surveillance cameras, the present study confirms that danger is positively associated with bystander intervention. In the presence of danger, bystanders were 19 times more likely to intervene than in the absence of danger. It extends this knowledge by discovering that incremental changes in the severity level of the danger (low, medium, and high), however, were not associated with bystander intervention. These findings confirm the importance of further investigating the role of danger for bystander intervention, in larger samples, and involving multiple types of real-life emergencies.

10:45 – 11:00 | Peter Ejbye-Ernst[1] - **Does third-party intervention matter? A video-based analysis of the effect of third-party intervention on the continuation of interpersonal conflict behaviour**
1. Netherlands Institute for the Study of Crime and Law Enforcement

The paper investigates whether third party intervention influences the continuation of antagonist conflict behaviour in interpersonal conflicts. The analysis is based on a systematic coding of video-footage of real-life conflicts from the streets of Amsterdam. A panel data analysis shows that intervention leads to discontinuation of conflict behaviour. The analysis furthermore finds that while physically forceful intervention stops conflict behaviour, expressions of disapproval have no noticeable effect. The social relationship between third-parties and antagonists does not appear to matter for this effect. Third-parties thus play an integral part in the development of interpersonal conflicts but this influence depends on how they intervene. Future preventive efforts should emphasize that intervention works but must be performed in certain ways to be effective.

11:00 – 11:15 | Hans Myhre Sunde[1,2], Marie Rosenkrantz Lindegaard[1,2], Don Weenink[2] - **What goes on before the conflict goes off? A systematic video analysis of conflict in police-citizen encounters**
1. Netherlands Institute for the Study of Crime and LawEnforcement; 2. Universiteit van Amsterdam

The purpose of the study is to systematically analyze "what goes on before the conflict goes off". The project sees conflict escalation as something that needs to be analyzed situationally, emphasizing the actions and reactions in human interactions. By using systematic video analysis the project has developed an inductive ethogram. Thereafter, this ethogram has been employed on 78 videos. In this talk, we focus on the methodological process, and argue that it bring something new to the research on police force and encounters between police and citizens. We provide a new way of understanding the concept of citizen demeanor and its effects on police behavior, and we are able to move from general codes such as "citizen was disrespectful" to more concrete, behavior-based codes such as citizen pointed directly at the officer". Methodologically, using video analysis has its strengths and limitations. Being able to pause, rewind and play in slow motion is something that has yet to be exploited fully in the research of police-citizen encounters. Issues with the lack of sound potentially weakens the analysis, as goes for the bias of camera positioning. Thus, the research cannot fully generalize and conclude, without certain assumptions taken for granted, and factors discussed and controlled for by other methodological perspectives. We also present our findings from the analyses based on the coding.

11:15 – 11:30 | Carlijn van Baak[1], Evelien Hoeben[1], Don Weenink[1], Marie Rosenkrantz Lindegaard[1] - **What do they do? Video analysis of actions by men and women as bystanders in public conflicts captured on CCTV**
1. Netherlands Institute for the Study of Crime and Law Enforcement, University of Amsterdam

Recent studies indicate that human bystanders often intervene in public conflicts. Research on prosocial behavior suggests that men are generally more likely to engage in help that requires physical strength, and women to engage in communal and relational prosocial behaviors. Studies on human and non-human primates suggest that consolation in post-conflict situations is more common among females as a result of evolutionary driven differences in levels of empathy. While the available evidence suggests that men and women may take on different roles in helping situations, we are yet

to discover the exact role that sex plays in terms of how bystanders act during conflict situations. To this extent, this study aims to analyze how men and women act as bystanders during public conflicts. The empirical data consists of CCTV footage of real-life, public conflicts captured by camera operators of the municipality of Amsterdam. Video analysis will be used to analyze over 70 videos, including approximately 1600 bystanders, followed by quantitative analyses consisting of multilevel models. The current study aims to advance our understanding of behavioral similarities and differences between men and women in conflict situations.

11:30 – 11:45 | Marjolijn Das[1,2,3] - **Using administrative register data to study human behaviour**
1. Statistics Netherlands; 2. Erasmus University Rotterdam; 2. LDE Centre for BOLD Cities

Many questions about the behaviour of nonhuman primates apply to humans as well. In fact, two of the three "main questions of sociology" (Ultee, Arts & Flap 1996) have their direct pendant in basic questions about primate behaviour: the question of inequality (why/how are people unequal in terms of social status, wealth, opportunities) and the question of social cohesion (why/how do people live in social groups). Historically, the study of animal behaviour and the social sciences are worlds apart. Differences in methodology, especially with respect to data collection, add to the gap. Nowadays more crossover research is being conducted, for instance studies of human conflict management with ethological methods or studies that take an evolutionary perspective on human behaviour. This presentation aims to contribute to this development by discussing the potential of large-scale non-observational data, specifically administrative registers. The data are suitable for comparative research and for testing evolutionary hypotheses, e.g. on the influence of social status or the influence of social relationships on life outcomes like health, fertility, and longevity. In addition, ethological data could be linked to administrative registers for more in-depth analyses that include background characteristics of the person and their environment. In sum, more crossover regarding data and methodology can bring valuable insights for the social sciences and for ethology.

11:45 – 12:00 | Richard Philpot[1], Lasse Suonperä Liebst[1], Marie Rosenkrantz Lindegaard[1], Peter Verbeek[1], Mark Levine[1] - **Reconciliation in human adults: A video-assisted naturalistic observational study of post conflict conciliatory behaviour in interpersonal aggression**
1. Psychology - Lancaster University

Reconciliation is an aspect of conflict resolution, with similar behavioural patterns documented in non-human primates, human children, and human adults of hunter gather societies. Reconciliation amongst adults of industrialized societies has rarely been studied. We observed naturally occurring conflicts between adults, captured by public security cameras in England. Reconciliation was found in one-quarter of all conflicts and was more prevalent in milder conflicts. Reconciliation typically occurred spontaneously between opponents – and was found within friendship groups and across stranger groups. Reconciliation between opponents also appeared to be facilitated by peers, law enforcement, or shared objects. In some instances, reconciliation extended beyond the initial conflict dyad toward victimized third-party mediators. These findings add to growing cross-cultural and cross-species evidence demonstrating the presence and function of post-conflict reconciliation. We extend the repertoire of reconciliatory behaviour and introduce a typology of five reconciliation types that are central to the study of adult peacemaking.

12:00 - 12.15 | Virginia Pallante[1], Marie Rosenkrantz Lindegaard[1] - **From primatology to the social sciences and back: exchanging methods for a shared research**
1. Netherlands Institute for the Study of Crime and Law Enforcement

The adoption of different approaches and research methods to face similar problems frequently characterizes a strict separation between disciplines, leading to a partial perspective and a fragmented picture of a potentially shared research. For instance, in the study of man, social sciences traditionally

adopted surveys and interviews as methodological standards, relegating the direct observation of the behavior outside their toolbox. On the other hand, ethology based its methods on a systematic observation of the behavior that, despite its potential in answering questions on human nature from an evolutionary perspective, has rarely been applied to our species. Recently, new approaches and techniques combining ethology with the social sciences have been advanced to conduct real-life observations of human adult behavior during interpersonal conflicts. Here, we examine how primatology contributed to the development of this novel approach and how it might still offer in the human behavioral research. Furthermore, focusing on conflict management strategies, we argue that video analysis techniques developed in the social scientific field have the potential to improve in turn the research on nonhuman primates' aggressive behavior, addressing unresolved issues and advancing theories. We advocate a consistent interdisciplinary communication not only for a discipline's self-improvement, but as a practice to build a shared perspective when different disciplines meet similar questions.

12:15 – 12:30 | Elizabeth T. Hallers-Haalboom[1], Vermande, M. M. [1], Van Leeuwen, E. J. C. [2,3,4], Sterck, E. H. M. [4] - **Food sharing in human children**

1. Department of Clinical Child and Family Studies, Faculty of Social and Behavioural Sciences, Utrecht University, the Netherlands; 2. Behavioral Ecology and Ecophysiology Group, Department of Biology, University of Antwerp, Belgium; 3. Centre for Research and Conservation, Royal Zoological Society of Antwerp, Belgium; 4. Department of Biology (Section Animal Behaviour and Cognition), Faculty of Science, Utrecht University, the Netherlands

As part of a larger project on elucidating the evolutionary roots of human social tolerance and cooperation, we replicated and extended Birch and Billman's (1986) classical study on preschoolers' sharing of preferred and non-preferred food with friends and acquaintances. Participants included 91 Dutch children (3-6 years, 52.7% boys, 93.4% Western European). Children shared more non-preferred than preferred food with others, but boys gave more non-preferred food to friends, whereas girls more to acquaintances. No effect of relationship was found for preferred food. Older children shared more preferred and non-preferred food than younger children. Compared to acquaintances, friends made more active attempts to get food. No effect of previous experience on sharing was found. In sum, few results were replicated, but support for some unconfirmed hypotheses of the original study was found. The findings of our study will be compared with the results of a replication of the highly influential ape study by Jaeggi and colleagues (2010). Of particular interest are comparisons between children, chimpanzees, and bonobos regarding relationship status (friends versus acquaintances) and initiative for food sharing (spontaneous versus elicited). In conjunction, these replications enable the possibility to identify similarities and differences in food sharing dynamics between humans and nonhuman apes that help pinpoint the evolutionary onset of behavioral mechanisms conducive to cooperation.

Friday 3 June 2022 – *Room D - Canopy Lodge*

10:30 – 12:30 | Session **D4 – Symposium:** Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions

Symposium 8: Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions. Part 1

Organizers: Karline Janmaat (University of Amsterdam) & Miguel de Guinea (The Hebrew University of Jerusalem)

10:30 – 10:45 | Shelly Masi[1], Silvia Miglietta[1,2], Giulia Bardino[1,2], Terence Fuh[3], Paco Bertolani[4], Benjamin Robira[1,5] - **Frugivory triggers goal-directed travel in wild western gorillas**

1. Anthropologie et Ethnobiologie, UMR 7206 CentreNational de la Recherche Scientifique/Muséum national d'Histoire naturelle, Univ. Paris Diderot, Sorbonne Paris Cité, F-75005, Musée del' Homme, 17 place du Trocadéro, 75116 Paris, France; 2. Department ofAnimal and Human Biology, University of Rome "La Sapienza", viale dell'Università 32, 00185

Rome, Italy; 3. Dzanga-Sangha Protected Areas, WWF, BP 1053 Bangui, Central African Republic; 4. Primate Models for Behavioural Evolution Lab, Institute of Cognitive and Evolutionary Anthropology, University of Oxford, Oxford, UK; 5. Centre d'Écologie Fonctionnelle et Évolutive, Université de Montpellier &CNRS, Montpellier, France

Animals generally forage efficiently by optimizing foraging efforts and nutritional intakes. However, seasonal fluctuations in food availability can challenge animal nutrition. Dispersed locations and fairly predictable fruit tree productivity may have promoted cognitive complexity. Whether primates plan for future is a critical question in primate evolution. Seasonality in fruit availability affects western gorilla (*Gorilla gorilla*) nutrition, ranging but not their energy budget. We investigate the presence of goal-directed spatial foraging movements in two habituated groups (N=7, N= 9) during the high frugivory season (May–November 2016) in Central African Republic. Integrating focal animal sampling, GPS records, and the Change Point Test, 43% of direction changes (N=370) of gorilla daily ranging corresponded to patchy resources, resting sites or intergroup interactions. Approximately 60% of the changes associated to patchy resources occurred at fruiting trees. Our study helps to shed light on the evolutionary role played by the environment in shaping animal cognition.

10:45 – 11:00 | Karline Janmaat[1,2], Miguel de Guinea[3], Julien Collet[4], Richard W. Byrne[5], Benjamin Robira[6,7], Emiel van Loon[8], Matthias Allritz[9], Haneul Jang[10], Andrea Presott[1], Cody Ross[12], Gabriel Ramos-Fernandez[13], Shauhin Alavi[14], Dora Biro[15], Sarie Van Belle[16] - **Comparing cognition among wild primates: linking primate movement decisions to information gradients in natural habitats**

1. Institute for Biodiversity and Ecosystem Dynamics, Faculty of Science, University of Amsterdam, The Netherlands; 2. Department of Cognitive Psychology, Faculty of Social Sciences, Leiden University, The Netherlands; 3. Department of Social Sciences, Oxford Brookes University, UK; 4. Department of Zoology, Oxford University, UK; 5. Centre for Social Learning and Cognitive Evolution and Scottish Primate Research Group, School of Psychology, University of St Andrews, UK; 6. Institute de biologie de l'Ecole normale supérieure (IBENS), CNRS, PSL Research University, France; 7. Département Hommes, Natures, and Sociétés, Muséum National de l'Histoire Naturelle, Museée de l'Homme, UMR 7206-CNRS/MNHN, France; 8. Theoretical and Computational Ecology, Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, The Netherlands; 9. Centre for Social Learning and Cognitive Evolution and Scottish Primate Research Group, School of Psychology, University of St Andrews, UK; 10. Department of Human Ecology, Max Plank Institute for Evolutionary Anthropology, Germany; 11. Department of Geography and Geosciences, Salisbury University, USA; 12. Department of Human Ecology, Max Plank Institute for Evolutionary Anthropology, Germany; 13. Department of Mathematic Modelling of Social Systems, Universidad Nacional Autónoma de México, Mexico; 14. Department for the Ecology of Animal Societies, Max Plank Institute of Animal Behaviour, Germany; 15. Department of Zoology, Oxford University, UK; 16.: Department of Anthropology, University of Austin at Texas, USA

Within primatology, two main approaches have been followed to understand the evolution of primate cognition. First, indirect measures of cognitive abilities, such as relative brain size, have been compared across species. Second, batteries of decision-making experiments were designed to compare the inferred cognitive abilities of a small number of primate species in captivity. Here we introduce a third approach: inferring and comparing cognitive abilities through observational field records of natural information gradients and the associated variation in decision-making outcomes, using the ranging behavior of wild primates. To demonstrate the feasibility of our approach, we first present the results of a worldwide survey conducted to assess the current availability of long-term ranging datasets in wild primates and the willingness of primatologists to share their data. Second, we introduce ideas for future comparative phylogenetic studies that can be conducted with the currently available ranging data of wild primates, with or without the associated behavioral and ecological data often collected by primatologists. Finally, we suggest how ecological complexity may be best incorporated into comparative analyses. We aim to facilitate future comparisons of cognitive abilities, both between species and between populations living in the wild and captivity, to gain insight into cognitive plasticity, and at the same time provide deeper insight into the adaptive value of cognition.

11:00 – 11:15 | Bryndan van Pinxteren[1], Karline R.L. Janmaat[1], Martijn Egas[1] - **Foraging in Fear: the effect of an intra-guild predator on the foraging behavior of sooty mangabeys**
1. University of Amsterdam

Predation can change the behaviour of prey, including the ranging behavior. Prey will avoid areas where encounter rates with predators are higher. The potential mental representation of predation risks throughout the home range is called the ecology of fear. The "ecology-of-fear" effect is mostly tested in animal species that are preyed upon by an apex predator. How an intraguild predator, which also feeds on the same food source as the prey, affects the ecology of fear has received little attention. Mangabey monkeys and chimpanzees are intraguild prey and predator, respectively, with a large overlap in diet. Mangabeys have to decide where to forage while avoiding predation by chimpanzees. In this study, we tested if feeding tree selection and vigilant behavior at feeding sites was affected by potential chimpanzee predation. We expected that mangabeys would select feeding trees with lower chances of encountering chimpanzees, and would show elevated levels of vigilance at feeding trees with a larger chance of encountering chimpanzees. We found that mangabeys selected smaller trees than chimpanzees when fruits of this species are eaten by both species, but selected large trees when these are not eaten by chimpanzees. Vigilance was not affected by potential chimpanzee predation. This study indicates that the ecology of fear affects choice of feeding site rather than vigilance, suggesting that the danger of a small meal is discounted against thedanger of a predator attack.

11:15 – 11:30 | Emma S. McEwen[1], Matthias Allritz[1,2], Josep Call[1], Ken Schweller[3], Miguel de Guinea[4], Karline R. L. Janmaat[5,6,7], Charles R. Menzel[8], Daniel Haun[2], Francine L. Dolins[9] - **Chimpanzee navigation in a virtual environment**
1. School of Psychology and Neuroscience, University of St Andrews, St. Andrews,Fife KY16 9JP, UK; 2. Department of Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6,04103 Leipzig, Germany; 3. Ape Cognition and Conservation Initiative, Des Moines, IA, USA; 4. Movement Ecology Lab, Department of Ecology, Evolution and Behavior, The Hebrew University of Jerusalem, Edmond J. Safra Campus, Givat Ram, Jerusalem, 9190401, Israel; 5. Evolutionary and Population Biology, Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, The Netherlands; 6. Department of Cognitive Psychology, Faculty of Social Sciences, Leiden University, The Netherlands; 7. ARTIS Amsterdam Royal Zoo, Amsterdam, The Netherlands; 8. Language Research Center, Georgia State University, Atlanta, GA, USA; 9. Department of Behavioral Sciences, College of Arts, Sciences & Letters, University of Michigan Dearborn, Dearborn, MI, USA

Studying non-human primate navigation in captive settings often presents logistical challenges, given the limits on the spaces available for free exploration. Previously, many spatial cognition studies in these setting have been limited to relatively small-scale foraging or memory tasks. In recent years, virtual environment (VE) software has been successfully implemented in nonhuman primate research. VEs provide an opportunity for larger range foraging and other spatial cognition experiments often only possible infield settings, whilst maintaining the experimental control afforded by captive research settings. We presented zoo-housed chimpanzees with an open VE which they navigated through using a touchscreen. We found that chimpanzees were able to use a virtual landmark to locate food from different distances, orientations, and starting locations, and improved travel efficiency over time. Furthermore, when the original food location was later found to be empty, chimpanzees demonstrated flexibility and were able to navigate to a second hidden food location.VE studies can implement similar analyses to field studies of navigation, including assessments of path linearity and direction of travel, allowing for comparisons between virtual and real-world movement. In ongoing work, we are continuing to probe chimpanzees' navigational strategies and landmark use in VEs, and investigate their uses of egocentric and allocentric frames of reference.

11:30 – 11:45 | Bethany Watkins[1] *, Miguel de Guinea[1,2] *, Stephanie A. Poindexter[3], Jörg U. Ganzhorn[4], Giuseppe Donati[1], Timothy M. [5,6] - **Routes matter: the effect of seasonality on bamboo lemur navigational strategies**

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Highly seasonal environments can challenge animals' foraging abilities. While species with Euclidean sophisticated spatial skills memorize, recall and locate food resources, other species develop less cognitively demanding strategies to secure access to food resources, such as route navigation. We explore the ability of combining navigational strategies under varying seasonal conditions in a mainly folivorous primate, Southern Bamboo Lemur (*Hapalemur meridionalis*). Bamboo lemurs showed a tendency to navigate using route networks that fluctuated across an annual cycle being more frequently used during periods of food scarcity and less frequently used during periods of food abundance. Contrary, nodes (i.e., intersections among habitual routes where directional decisions are made), which are typically associated with route navigation, were used to navigate throughout the entire year. Travel linearity increased during periods of food abundance to feed on energy-rich items and during periods of food scarcity to reach latrines. Our results suggest that while route navigation is particularly beneficial during periods of food scarcity to minimize the cost of traveling, bamboo lemurs are cognitively able to optimize their travel bouts under increasing urgency of reaching specific locations. By combining navigational strategies, bamboo lemurs likely maximize their energy intake during periods of food abundance while minimizing the expenditure of energy during lean periods.

11:45 – 12:00 | Jorin Veen[1], Bryndan O.C.M. van Pinxteren[1], Vidrich Kandza[2], Haneul Jang[2], Patrick G. Meirmans[1], Karline R.L. Janmaat[1,3,4] - **Examining the diet, foraging behaviour, and botanical knowledge of Mbendjele BaYaka children**

1. Institute for Biodiversity and Ecosystem Dynamics (IBED), University of Amsterdam, Amsterdam, The Netherlands; 2. Max Planck Institute for Evolutionary Anthropology, Department of Human Behavior, Ecology and Culture, Leipzig, Germany; 3. Department of Cognitive Psychology, Leiden University, Leiden, The Netherlands; 4. ARTIS Amsterdam Royal Zoo, Amsterdam, The Netherlands

Modern hunter-gatherers use a wide variety of foraging skills and knowledge to obtain their food. It has been hypothesized that the extended juvenile period has enabled humans to acquire these skills and knowledge. Here, we examined the foraging behaviour and botanical knowledge in relation to the diet composition of Mbendjele Ba Yaka forager children in the Republic of Congo. Our nearly year-round data, based on full-day focal sampling methods, indicated that fruits, tubers, and seeds were predominantly foraged and eaten, and that the diet composition changed throughout the year. Fruit and seed species tended to be eaten more when more boys and men were in the foraging group, and agricultural species had a higher probability of being eaten compared to wild species. In contrast, tuber species had a higher probability of being collected by girls, showing an early onset of specialisation of foraging skills similar to the sexual division in foraging activities observed in adults. A botanical knowledge test showed that the children especially use features of fruits and trunks, but not leaves or bark, to identify species. Overall, our results provide insight into the process of knowledge acquisition in forager children, as well as non-human primates, who forage in similar environments. Based on the diet composition, the Mbendjele furthermore seem to be in a transition into a more horticultural lifestyle, which might have consequences for the development of their foraging cognition.

12:00 – 12:15 | Tamara Vallina[1], Martijn Egas[1], Haneul Jang[2], Lucy Bates[3], Heather Cohen[4], Jorin Veen[1], Karline R. L. Janmaat[1,5,6] - **Examining the navigational toolbox of the Mbendjele BaYaka forager children**

1. Institute for Biodiversity and Ecosystem Dynamics (IBED), University of Amsterdam, Amsterdam, the Netherlands; 2. Department of Human Behavior, Ecology and Culture, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 3. School of Psychology, University of Sussex, Brighton, UK; 4. Department of Primatology, Max Planck Institute for Evolutionary Anthropology, 04103, Leipzig, Germany; 5Department of Cognitive Psychology, Faculty of Social Sciences, Leiden University, Leiden, the Netherlands; 6. ARTIS Amsterdam Royal zoo, Amsterdam, the Netherlands

This study focuses on the ecological challenges influencing human foraging cognition, concentrating on the navigational toolbox. Fieldwork was carried out in the tropical forest hunter-gatherer society of the Mbendjele Ba Yaka (Republic of the Congo), who have a lifestyle that characterizes how humans have lived for most of our species' history. We investigated the results of a honey finding game, which is a spatial navigation experiment in which children were encouraged to employ a large variety of cognitive skills to find boxes (all containing honey and some additionally containing chocolate or beads) hidden in a forest. We tested spatial orientation in 18 Mbendjele children, with estimated ages of 4.6 to 16.9 years, by measuring their pointing accuracy to boxes that they had previously visited during the honey finding games. Pointing accuracy was higher for boxes with chocolate or beads than honey alone, confirming the hypothesis that our memory favors rare locations with higher caloric densities. No differences in performance between the sexes were found. Although children of all ages perform well, orientation ability seems to increase with age, suggesting brain maturation is crucial in developing this skill. These results provide new insights into the cognitive toolbox used by human tropical forest foragers, which can inspire primatologists to make novel predictions about the cognitive processes involved in the foraging decisions of non-human primates.

12:15 – 12:30 | Kavel Ozturk[1], Martijn Egas[1], Karline R. L. Janmaat[1,2,3] - **For Mandrills, timing is everything**

1. Institute of Biodiversity and Ecosystem Dynamics, Faculty of Science, University of Amsterdam, Science Park 904, 1098 XH Amsterdam, The Netherlands; 2. Department of Cognitive Psychology, Faculty of Social Sciences, Leiden University, Pieter de la Court, Wassenaarseweg 52, 2333 AK Leiden, The Netherlands; 3. ARTIS Amsterdam Royal Zoo, Cluster Plant & Dier, Plantage Kerklaan 38-40,1018 CZ Amsterdam, The Netherlands

When searching for food, primates need to know what, where, and when to look for. Especially challenging for primates is successfully finding food in time due to the ephemerality of most tropical fruits. Remembering the elapsed time since a specific event at a specific location with a specific food may provide primates first access to ripe fruit. With this knowledge, they can decide when to revisit trees that previously held unripe fruits in order to return to these potentially ripe fruit sources before competitors. Here, we used a cognitive enrichment procedure with renewable food sources to examine if captive mandrills were able to learn time intervals. Two food rewards, carrot and grapes, were hidden with renewal intervals of 2 and5 days, respectively. The first choice of each individual was monitored. We found that throughout the study, the likelihood of mandrills searching at carrot locations increased on carrot days and decreased on days without carrots. Cues provided by conspecifics that could indicate the availability of the food sources at other locations did not seem to affect the foraging choice of the focal mandrills. Our results indicate that mandrills are able to remember elapsed time of at least 2 days and can base their decisions on this information. Thereby, this study shows how temporal cognitive abilities can be used by mandrills to overcome the temporal challenges of food-finding.

Friday 3 June 2022 - *Room – A - Auditorium*

14:00 – 15:30 | Session **A5** - Communication

14:00 – 14:15 | Alexandra B. Bosshard[1,2], Maël Leroux[1,2,3], Nicholas A. Lester[1,2], Balthasar Bickel[1,2], Sabine Stoll[1,2], Simon W. Townsend[1,2,4] - **Using linguistic methods to quantify call combinations in chimpanzees (*Pan troglodytes schweinfurthii*)**

1. Department of Comparative Language Science, University of Zürich, Zürich, Switzerland; 2. Center for the Interdisciplinary Study of Language Evolution (ISLE), University of Zürich, Zürich, Switzerland; 3. Budongo Conservation Field Station, Masindi, Uganda; 4. Department of Psychology, University of Warwick, Warwick, U.K.

Emerging data in a range of nonhuman animal species have highlighted a latent ability to combine certain pre-existing calls into larger structures. Such evidence suggests that the capacity to string meaning-bearing units together, a key feature of language also known as syntax, could be evolutionary more ancient than previously thought. Currently, however, there exists no objective quantification of call combinations. This is problematic since animal calls can co-occur with one another simply through chance alone. One common approach applied in language sciences to identify recurrent word combinations is collocation analysis. Through comparing the cooccurrence of two words with how each of them combines with other words within a corpus, collocation analysis can highlight above chance, two-word combinations. Here, we demonstrate how this approach can also be applied to non-human animal communication systems by implementing it on a vocal dataset of our closest-living relative, the chimpanzee, *Pan troglodytes*. Specifically, we recorded 37 different two-call combinations but following the application of collocation analyses only 15 of these were found to occur at levels significantly above chance. We argue that collocation analysis therefore represents a promising tool for identifying non-random, communicatively relevant call combinations in animals and, ultimately, helps to further our understanding of the evolutionary progression of our own combinatorial communication system.

14:15 – 14:30 | Tom S. Roth[1,2], Mariska E. Kret[1,3] - **An experimental investigation of attention to and preference for flanges in orangutans**

1. Cognitive Psychology Unit, Institute of Psychology, Leiden University, the Netherlands; 2. Apenheul Primate Park, Apeldoorn, the Netherlands; 3. Leiden Institute for Brain and Cognition (LIBC), the Netherlands

It is well known that facial characteristics affect social cognition across species. For example, humans immediately attend to and look longer at attractive faces. Similarly, female rhesus macaques look longer at masculine male faces and prefer viewing dominant faces. Such findings illustrate that subtle facial characteristics can profoundly affect social cognition. Orangutans are characterised by male bimaturism: flanged males have a larger body size, a developed throat sack, and flanges on the side of the face, while unflanged males look similar to adult females. The presence of flanges on a male provides relevant information for other orangutans. Females prefer to mate with flanged males around ovulation, so distinguishing between flanged and unflanged males might be important for their reproductive success. For males, flanged conspecifics might pose a threat. Therefore, they should be more vigilant towards flanged males. To test whether the presence of flanges affects orangutan visual cognition, we performed three experiments with zoo-housed Bornean orangutans (*Pongo pygmaeus*). First, a dot-probe task to determine whether orangutans immediately attend to flanged males. Second, a preferential looking task to determine whether orangutans look longer at flanged males. Third, a preference task to determine whether orangutans prefer viewing flanged males. We discuss the outcomes of these experiments and link them to previous studies in primates.

14:30 – 14:45 | Sandro Sehner[1], Carel van Schaik[1,2], Judith Maria Burkart[1] - **The evolutionary origin of information donation: a targeted comparison between marmosets and squirrel monkeys**
1. Department of Anthropology, University of Zurich, Switzerland; 2. Center for the Interdisciplinary Study of Language Evolution (ISLE), University of Zurich, Switzerland

An important element of teaching is information donation, including when adults are more likely to share items that immatures don't know how to access, which may be more prevalent in cooperatively breeding species. We used the approach of a targeted comparison between the cooperatively breeding marmosets and the closely related, but independently breeding squirrel monkeys to test this prediction. Prior to the birth of immatures, adults learned to solve a series of food extraction tasks. Once the newborn infants were sufficiently mobile, the tasks were reintroduced to the groups, and we compared how information was transmitted to immatures. We were particularly interested whether food sharing interactions were higher for these difficult to access items that only adults could retrieve, compared to a baseline where food was easily accessible to adults only. We found that during baseline, marmosets shared substantial amounts of food whereas food sharing in squirrel monkeys was virtually absent. Moreover, marmosets further increased food sharing when it was difficult to access, but squirrel monkeys did not. Thus, marmoset food sharing cannot be explained by the nutritional hypothesis only, as experienced adults take the skill level of immatures into account. These results support the idea that the propensity to share food is a psychological precursor to evolve the motivation to share information and have implications for the evolution of teaching in humans.

14:45 – 15:00 | Alice Bouchard[1,3], Klaus Zuberbühler[1,2,3] - **Male chimpanzees communicate to mediate competition and cooperation during feeding**
1. Institute of Biology, University of Neuchatel, Switzerland; 2. School of Psychology and Neuroscience, University of St Andrews, Scotland (UK); 3. Budongo Conservation Field Station, Masindi, Uganda

An ongoing debate in animal behaviour research is whether food calls function to cooperatively inform others or provide the caller with competitive advantages. When feeding, chimpanzees produce two types of calls: context-specific, close-range 'rough grunts' and context-general, long-range 'pant hoots'. We investigated this dual signalling behaviour by wild male chimpanzees who were either actively joining others or passively being joined in food trees, considering the effects of the audience composition and the type of food encountered. For arriving individuals, we found that pant hoot production was best explained by the absence of socially important individuals (i.e., social bond partners and/or high-ranking males), suggesting that callers were cooperatively informing them about food availability, probably to strengthen social relationships. In contrast, rough grunts were mostly produced by low-ranking individuals, suggesting they were part of competitive interactions to avoid aggression. For individuals already in a tree, we found that both rough grunt and pant hoot production was most common in low-ranking individuals reacting to the arrival of high-ranking males and there was no significant effect of the presence, or absence, of social bond partners. We discuss these patterns and conclude that, when chimpanzees enter a food tree, their vocal behaviour functions to mediate both cooperative and competitive interactions.

15:00 – 15:15 | Julián León[1,2], Constance Thiriau[2], Klaus Zuberbühler[1,2,3] - **Development of alarm call comprehension in sooty mangabeys**
1. Institute of Biology, University of Neuchâtel, 2000 Neuchâtel, Switzerland; 2. Taï Monkey Project, Centre Suisse de Recherches Scientifiques, 01 BP1303 Abidjan 01, Cote d'Ivoire ; 3. School of Psychology and Neuroscience, University of St. Andrews, KY16 9JP Saint Andrews, Scotland (UK)

Primates understand the meaning of alarm calls of other species, but not much is known about how they acquire such knowledge. Attending to other species' alarm calls is particularly important for young individuals as they suffer from high predation risk. Here, we experimentally studied the development of con- and heterospecific alarm call recognition in sooty mangabeys, *Cercocebus atys*. We exposed subjects belonging to three age classes (adults, old and young juveniles) to alarm calls to leopards,

crowned eagles and non-predatory dangers (vipers, falling trees) by conspecifics and heterospecific Diana monkeys. Overall, young (but not older) juveniles had lower response rates compared to adults in both con- and heterospecific conditions. Conspecific leopard alarm calls elicited the strongest responses across age groups, suggesting that substantial leopard predation and mangabeys' terrestrial habits may have led to high recognition of these signals as reference to an elevated threat. Additionally, we found an age effect for alarm calling and social referencing, across conditions, with only adults responding vocally and older subjects being less likely than younger subjects to gaze towards another individual before responding to stimuli. In conclusion, our results show gradual development of alarm call comprehension and responses with no differences in learning rate of con- and heterospecific signals, suggesting that mangabeys acquire predator knowledge equally well from these.

15:15 – 15:30 | Adrian Soldati[1,2,3], Pawel Fedurek[3,4], Guillaume Dezecache[3,5], Geresomu Muhumuza[3], Klaus Zuberbühler[1,2,3], Josep Call[1] - **The ontogeny of behavioural responses to pant hoots in chimpanzees**

1. School of Psychology and Neuroscience, University of St Andrews, St Andrews, UK; 2. University of Neuchâtel, Department of Comparative Cognition, Neuchâtel, Switzerland; 3. Budongo Conservation Field Station, Masindi, Uganda; 4. University of Stirling, Faculty of Natural Sciences, University of Stirling, Stirling, UK; 5. Université Clermont Auvergne, CNRS, LAPSCO, Clermont-Ferrand, France

Vocal development in non-human primates has received relatively little empirical attention, especially that of great apes. Our aim was to study the acquisition of chimpanzee vocal behaviours in a natural setting. We examined the behavioural responses associated with received pant hoots, a complex and longdistance vocalisation characteristic of chimpanzees, in 13 immature male and female chimpanzees (*Pan troglodytes schweinfurthii*) of the Sonso community (Uganda). Specifically, we were interested in how biological and social factors affect the development of responses. Vocal responses occurred rarely in young individuals, however, more subtle responses such as head movement towards the caller were more frequent. We observed that individuals increasingly directed their attention towards received calls as they mature, reaching adult levels when approaching independency from their mother. Immature males were more likely to direct their attention towards calls than immature females and the offspring of more gregarious mothers showed greater responsiveness. Despite vocal production being exhibited rarely, early infants showed the capacity to produce pant hoots in response. Overall, immature chimpanzees were more likely to respond vocally after visually attending calls and always chorused with their mother when responding to conspecifics' calls. Our study provides evidence for a flexible and socially mediated vocal ontogeny in our closest living relatives.

Friday 3 June 2022 – *Room B - Kilimanjaro Lodge*

14:00 – 15:30 | Session **B5** -Cognition

14:00 – 14:15 | Mathieu Malherbe[1,3], Liran Samuni[3,4], Catherine Crockford[2,3], Roman Wittig[2,3] - **Developmental trajectories of tool grasping complexity during tooluse in wild chimpanzees (*Pan troglodytes verus*)**

1. Max-Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 2. Institut des Sciences Cognitives-Marc Jeannerod, UMR5229, CNRS/Université Claude Bernard, Lyon, France; 3. Taï Chimpanzee Project, Côte d'Ivoir; 4. Harvard University, Department of Human Evolutionary Biology, Cambridge, MA, United States

Using a suitable tool grasp to efficiently perform a tool use develops slowly through human childhood, as motor control and planning capacities develop. We would expect the same through chimpanzee ontogeny, where adult chimpanzees use sticks to access several highly nutritious, but otherwise inaccessible, foods. Here, we examined the developmental trajectories of grasping types during stick tool-use behavior in 66 wild chimpanzees between the ages 1-55, at the Taï National Park, Côte

d'Ivoire. In Taï, chimpanzees use at least three hand grasp types, which varied according to the number of digits used, with higher number of digits representing a more complex and precise hand grasp type. We predicted that grasps that offer greater precision in tool use movement develop later during ontogeny. We tested this prediction using a Bayesian regression model to determine developmental trajectories of each grasp use. In line with our prediction, we found that the most precise hand grasp type, showed a clear developmental pattern with its use increasing with age. We also found clear flexibility in hand grasp types depending on the resources the individuals were attempting to access - with resources that require more accuracy also involving more complex grasping types than resources that do not necessitate precision. Our results demonstrate that the mastering of tool-use techniques is a slow process in wild chimpanzees potentially driven by motor control, learning, and planning mechanisms.

14:15 – 14:30 | Edwin J.A.M. Laat[1], Jorg J.M. Massen[1], Elisabeth H.M. Sterck[1,2] - **Tolerance and prosociality in long-tailed macaques**
1. Utrecht University, Utrecht, the Netherlands; 2. Biomedical Primate Research Centre, Rijswijk, the Netherlands

Previous research on prosocial behaviour in long-tailed macaques showed successful providing of food to others, when the actors were also rewarded. These macaques are known as despotic, therefore we do not expect them to selflessly favour others in a group service task. The aim is to investigate if long-tailed macaques can act prosocial, understand the consequences of their actions, and to unravel which characteristics are determinant when they benefit each other. We presented a swing to test for tolerance and prosociality in three groups of long-tailed macaques (N=4; 9; 19). One animal can pull a rope and take a reward during training and motivational trials, or provide a reward to another at the left side in test trials, when the reward is out of reach to the actor. This was contrasted in trials without rewards and blocked access for the receiver. Many individuals took part in this experiment. Contrary to our expectation, social tolerance in all groups was relatively high. In test trials, several individuals pulled more when others were able to obtain a reward, compared to the control trials. This suggests understanding of the task and prosocial intentions. Tolerance seemed an important factor for allowing a group member to take a reward. Individual differences indicated personality and mutual relationships. Long-tailed macaques seem to be prosocial as a consequence of their eagerness to earn a reward themselves; they tolerate the group members who are in close relation.

14:30 – 14:45 | Louise Loyant[1], Bridget Waller[2], Jerome Micheletta[1], Hélène Meunier[3,4], Sébastien Ballesta[3,4], Marine Joly[1] - **Social tolerance and inhibitory control skills in macaque species**
1. Centre for Comparative and Evolutionary Psychology, University of Portsmouth, United Kingdom; 2. Department of Psychology, Nottingham Trent University, Nottingham, United Kingdom; 3. Centre de Primatologie, Université de Strasbourg, Niederhausbergen, France; 4. Laboratoire de Neurosciences Cognitives et Adaptatives, CNRS and Université de Strasbourg, Strasbourg, France

Living in a complex social environment requires primates to manage their emotions and inhibit impulsive behaviours. Such cognitive processes are defined as inhibitory control. To date, little is known about the selective forces that favour the evolution of inhibitory control. One route by which social problem solving might evolve is through selection for increased social tolerance. In which case, an individual living in a more tolerant context, with more relaxed relationships, higher reconciliation rates and fewer conflicts might experience more diverse and complex social interactions and should exhibit better inhibitory strategies. Hence the aim of this project was to compare inhibitory control skills in three closely related macaque species which differ in their degree of social tolerance. For that purpose, we tested 66 macaques (28 *Macaca mulatta*: low tolerance, 19 *M. fascicularis*: medium tolerance and 18 *M. tonkeana*: high tolerance) in a battery of touchscreen tasks requiring inhibition of an impulsive action (Go/No-go task), an emotional reaction (distraction task) and a learned cognitive set (reversal learning task). We first demonstrated that high and medium tolerant species were less distracted by pictures, less impulsive and better at learning a rule than low tolerant species. However,

medium and low tolerant species were showing similar emotional reactions. This project will help to get more insight into the evolution of cognitive control of behaviours in primates.

14:45 – 15:00 | Kai Caspar[1], Fabian Pallasdies[2], Larissa Mader[1], Heitor Sartorelli[3], Sabine Begall[1] - **The evolution and biological correlates of anthropoid primate hand preferences**

1. Department of General Zoology, University of Duisburg- Essen, Essen, Germany; 2. Department of Computational Neurophysiology, Institute for Theoretical Biology, Humboldt-Universität zu Berlin, Berlin, Germany; 3. Independent researcher, Sao Paulo, Brazil

Human population-level righthandedness has fascinated researchers for decades but its evolutionary origins remain debated, since no other primate species appears to approach the hand preference patterns found in our lineage. Although numerous theories about the evolution of primate hand preferences exist, none of them has so far been tested within a quantitative phylogenetic framework. We attempted to reconstruct the evolution of hand preference direction (left vs. right) and strength (weakly to strongly expressed preferences regardless of direction) for object manipulation across anthropoid primates. For this, we analyzed data from a bimanual manipulation task for 1806 individuals from 38 species. To compile our dataset, we tested 501 zoo-housed subjects and drew 1305 additional individuals from the literature. Our analyses reveal a strong phylogenetic signal for lateralization strength but not for direction. PGLS modelling revealed arboreal primates to display significantly stronger hand preferences than terrestrial ones but arboreality has no effect on lateralization direction. Habitual tool use and brain size do not predict measures of hand preferences. Our results do not support established hypotheses on primate handedness evolution and call for a refocus of research attention on preference strength rather than direction. Finally, human handedness indeed appears to be unique in many regards and its evolutionary origins remain enigmatic.

15:00 – 15:15 | Valentina Truppa[1], Ilaria Soraci[1,2], Luca Marino[1,3], Patrícia Izar[4], Dorothy M. Fragaszy[5], Elisabetta Visalberghi[1] - **Bimanual coordination and laterality in extractive foraging by wild capuchin monkeys**

1. Institute of Cognitive Sciences and Technologies, National Research Council (CNR), Rome, Italy; 2. Department of Life Sciences and Systems Biology, University of Torino, Turin, Italy; 3. Department of Sciences, Roma Tre University, Rome, Italy; 4. Department of Experimental Psychology, University of São Paulo, São Paulo, Brazil; 5Department of Psychology, University of Georgia, Athens, Georgia

Experimentally induced tasks requiring bimanual coordination elicit hand preferences at a population level in most of the nonhuman primate species tested so far in captive settings. At present, very little research has been done on hand preferences for bimanual natural foraging tasks in the wild, especially on platyrrhine taxa. We assessed hand preference in a bimanual coordinated extractive foraging task by wild bearded capuchin monkeys (*Sapajus libidinosus*) living in the Cerrado/Caatinga ecotone, North East Brazil. These monkeys regularly extract embedded food from resistant matrices. Twenty-two individuals were filmed during nuts consumption for four months. A detailed video-coding analysis was conducted on their hand movements to extract the kernel(s) from four different species of nuts. Most capuchins showed significant individual hand preferences and, as a group, they significantly preferred their right-hand fingers for extracting the kernel, thus suggesting a specialization of the left hemisphere for fine fingers movements. The comparison with captive capuchins previously tested in our lab with a bimanual coordinated task revealed that the direction of the preference did not differ between wild and captive individuals, though the latter tended to use their preferred hand more frequently. Our findings add to the growing body of evidence suggesting that bimanual coordination might have played a major role in the evolution of limb preference for motor action in primates.

15:15 – 15:30 | Johanna Henke-von der Malsburg[1,2,3], Peter M. Kappeler[1,2], Claudia Fichtel[1,3] - **Linking interspecific cognitive variation to ecological factors in wild sympatric mouse lemur species**
1. Behavioral Ecology and Sociobiology Unit, German Primate Centre, Leibniz Institute for Primatology, Göttingen, Germany; 2. Department of Sociobiology/Anthropology, Johann-Friedrich-Blumenbach Institute of Zoology and Anthropology, Georg-August-University Göttingen, Germany; 3. Leibniz Science Campus 'Primate Cognition', Göttingen, Germany

Cognitive abilities covary with social as well as ecological factors across animal taxa. Specifically, ecological generalists have been suggested to possess enhanced cognitive abilities compared to more specialized species. Yet, to examine this potential covariation and evolutionary advantages of selected cognitive abilities, we applied an experimental test battery (2 personality, 10 cognitive tests; N=1,104 tests) to wild individuals of two sympatric mouse lemur species. The two species vary in their ecological adaptations while sharing key features of their social systems. *Microcebus murinus* is a habitat and dietary generalist, whereas *M. berthae* is more specialized and currently suffers from a dramatical decrease in population size. We found *M. murinus* (N=120) to be more innovative and to exhibit better spatial learning abilities; cognitive advantages in responding adaptively to dynamic environmental conditions. The more specialized *M. berthae* (N=34) were faster in learning associative reward contingencies; providing relative advantages in stable environmental conditions. Hence, our study results support a link between cognitive performance and ecological adaptations, while rejecting the hypothesis of generalists consistently outperforming specialists. Additionally, the examined cognitive constraints of specialists may help explain why they face a greater extinction risk in face of current environmental changes.

Friday 3 June 2022 – *Room C - Mount Kenia Lodge*

14:00 – 15:30 | Session **C5** – Social Behaviour

14:00 – 14:15 | Jens Mudde[1], S Nolte[1], EJC van Leeuwen[1,2], EHM Sterck[1,3] - **Comparing bonobo and chimpanzee strategies to obtain food from a food owner in a group provisioning paradigm**
1. Utrecht University, Utrecht, the Netherlands; 2. Behavioral Ecology and Ecophysiology Group, Department of Biology, University of Antwerp, Wilrijk, Belgium; 3. Biomedical Primate Research Centre, Rijswijk, the Netherlands

Food sharing is thought to play a major role in primate evolution and can be observed across the order. Even though in our closest relatives, bonobos and chimpanzees, food sharing has been researched extensively, studies usually neglect what happens before the food is transferred. Using a group food provisioning paradigm, we investigated which individuals come into proximity of a food owner, how they behave towards the owner, and how many food transfers they received. Characteristics such as rank, sex, relationship quality, and maternal relatedness were analysed to gain more insight into what preceded and supported food sharing. We found that female bonobos approached female food owners more compared to chimpanzees. Interestingly, dyad characteristics greatly influenced the frequency of different behaviour types for bonobos, but not for chimpanzees. Nevertheless, we found that chimpanzee females show most subtle requests towards male food owners. Consequently, male chimpanzee food owners shared significantly more with females than with other males. In contrast, female bonobos associated most with other females, i.e. they approached, interacted, and obtained food more than males. Taken together, bonobos seem more strategic than chimpanzees with regard to whom they show certain behaviours to. While for bonobos food sharing may function to reinforce the strong female bonds, for chimpanzees our results possibly indicate underlying motives such as trading food for sex.

14:15 – 14:30 | Lauren Seex[1], Tommaso Saccà[1], Charlotte K. Hemelrijk[1] - **How to measure inter-sexual dominance?**
1. University of Groningen

Male-dominance over females is often assumed when males are larger than females, but sometimes females dominate males. Currently, there are several measures of inter-sexual dominance. To identify the pros and cons of different measures, we need to compare them to the real degree of inter-sexual dominance in a group. Measuring the real inter-sexual dominance is not possible empirically, but is in the agent-based model DomWorld. Here, each agent's 'real' internal dominance value (its fighting power) determines its probability to attack and win fights. It increases after a win and decreases after a loss (representing the winner-loser effect). We study the correlation between the degree of inter-sexual dominance in a group derived from observations of wins and losses and from the internal dominance values. We examine common measures, such as the Female Dominance Index (FDI, relative position of females in a hierarchy), proportion of inter-sexual fights won and proportion of intersexual dyads in which a female wins more. We show that the accuracy of all measures decreased for larger group size, a higher proportion of males and shorter observation times. Interestingly, measures excluding intra-sexual fights had increased robustness to fewer observations. We recommend to represent dominance relationships between the sexes by both the Female Dominance Index and the proportion of inter-sexual fights won. For solitary animals, the measures at the dyadic level also performed well.

14:30 – 14:45 | Roy Hammer[1], Mathieu Stribos[1], Pia Böhm[2], Michael A. Huffman[3], Jorg J.M. Massen[1,4], Lena S. Pflüger[2,4] - **How to bring structure to a monkey-jumble? - Introducing a novel methodological framework for group classification during fission in semifree ranging Japanese macaques (*Macaca fuscata*)**
1. Animal Behaviour and Cognition, Department of Biology, Utrecht University, The Netherlands; 2. Department of Behavioral and Cognitive Biology, University of Vienna, Austria; 3. Primate Research Institute, Kyoto University, Japan; 4. Austrian Research Center for Primatology, Ossiach, Austria

The split of a social group, known as fission, occurs when the costs of sociality outweigh the benefits. Previous studies on fissions in Japanese macaques (*Macaca fuscata*) assigned individuals to newly branched groups mainly using personal observations. Here, we present a novel framework for group classification that uses quantifiable behavioural variables and statistical analyses, which we tested on a fission at Affenberg Landskron (Austria) where ~160 semi-free ranging Japanese macaques were housed. We collected behavioural data on this group for 6 months. We analysed 3 behavioural developments recurrent in fissions in Japanese macaques; the emergence of independence of behaviour, participation in group movements, and separation of nomadic ranges. These analyses were combined to assign individuals to different groups. To test the validity of our framework, we compared the observed fission with fissions in wild populations and analysed the demographics and stability of the Affenberg groups. Our results showed that the fission was similar to those in wild populations. The framework resulted in a main-group (N=33) and a sub-group (N=36), which were stable over time, and 61 individuals were labelled as undefined. The demographics of these groups were comparable to branched groups in wild populations. Our framework is thus applicable to study social dynamics during fission and provides a valid group classification in Japanese macaques, which may be applicable to other primates.

14:45 – 15:00 | Jana Muschinski[1], Dora Biro[2,3], Susana Carvalho[1,4,5,6] - **Filling gaps in the primate greeting story: a video-based analysis of proximity events in chacma baboons (*Papio ursinus*)**
1. Primate Models for Behavioural Evolution Lab, Institute of Human Sciences, School of Anthropology and Museum Ethnography, University of Oxford, Oxford, UK; 2. Department of Zoology, University of Oxford, Oxford, UK; 3. Brain and Cognitive Sciences, University of Rochester, Rochester, NY; 4. Gorongosa National Park, Sofala, Mozambique; 5. Interdisciplinary Center for Archaeology and Evolution of Human Behaviour (ICArEHB), Universidade do Algarve, Faro, Portugal; 6. Centre for Functional Ecology (CEF), Coimbra, Portugal

Greetings are an important part of the primate behavioural repertoire. They assist with navigation of rank, social bond reinforcement, and testing of cooperative potential. Baboons are a particularly valuable test case as they show variation in philopatry, social system, male-male (M-M) cooperation, and greeting across the genus. M-M greetings in Guinea, hamadryas, yellow and olive baboons are well studied, but work on chacma baboons is limited. Across the genus, much of the traditional "greeting" literature focuses on M-M interactions, with female greetings usually being mentioned tangentially in relation to other topics (e.g., friendships). Here we present data collected from video footage of chacma baboons (*Papio ursinus*) from Gorongosa National Park, Mozambique. We analysed all instances in which an approaching adult baboon reduces the distance to a recipient adult baboon from over five meters to less than two meters (n = 428). This allows for collection of behavioural data on events traditionally termed "greetings," as well as events where close proximity is achieved but no traditional "greeting" exhibited. We investigate co-occurrences of behaviours and effects of approacher and recipient sex using network analysis (NetFACS R Package). Our results shed light on the contexts in which behaviours are expressed across all types of approaches and contribute valuable information on greeting in chacma baboons.

15:00 – 15:15 | Angela Stojan[1], Bernard Wallner[1,2], Lena S. Pflüger[1,2] - **Male-male social relationships during times of social unrest in a semi-free ranging group of Japanese macaques (*Macaca fuscata)***

1. Department of Behavioral and Cognitive Biology, University of Vienna, Djerassiplatz 1, 1030 Vienna, Austria Wallner; 2. Austrian Research Center for Primatology, Ossiach 16, 9570 Ossiach, Austria

Japanese macaques (*Macaca fuscata*) live in despotic societies with a strict linear dominance hierarchy. The Austrian population of semi-free ranging Japanese macaques at the Affenberg Landskron expressed a stable pattern of male dominance for the first 23 years since the establishment of the park. This changed recently when the group underwent a fission and a subgroup was formed. The male hierarchical order collapsed resulting in a still ongoing instability of the dominance hierarchy. This unique event offers the possibility to investigate the social mechanisms underlying male rank acquisition, change and maintenance during times of social unrest. The focus of this study lies on affiliative relationships between sexually mature males (N = 42) and their influence on male social status. We hypothesize that high- as well as low-ranked male Japanese macaques engage in affiliative relationships among each other by showing proximity, grooming, and agonistic support. Furthermore, we hypothesize that high-ranking males need to form and maintain relationships with other central males to uphold their position in the dominance hierarchy. Results of detailed focal protocols and scan samplings will show whether young males during periods of social unrest hold a higher chance to set foot in the hierarchy by forming reoccurring (quantitative) and intense (qualitative) relationships with already established central males.

15:15 – 15:30 | Veera Riihonen[1], Taru Niittynen[1], Océane Lehrmann[1], Michael Briga[1], Sonja E. Koski[1*] - **Personality in horse-human interaction in young horses (*Equus caballus*)**

1. University of University of Turku, Department of Biology University of Helsinki, Organismal and Evolutionary Biology Unit

Horses exhibit personality variation, most markedly in reactivity and novelty responses. Traits exhibited in horse-human interaction may be important in welfare and learning, particularly in young age when horses are being trained for the various tasks with humans. In this study we tested personality in 19 young (1-3 year old) horses and whether these traits correlate with their social behaviour with conspecifics. We assessed personality with repeated behavioural tests, comprised of responses to an unfamiliar human presence and communication, easy cooperative tasks, and a standard novel object test. We also conducted focal observations of the same individuals on pastures when the horses were unhandled and living in groups, recording social proximity, affiliation and aggression data. Repeatability of the test responses was tested with Bayesian GLMMs; among-

individual correlations were assessed with multi-response models. We found that less than half of the responses in the tests were repeatable, indicating considerable within-individual variance. Consequently, among-individual correlations between responses were not statistically significant within or across test situations. Moreover, none of the test responses correlated with behaviour with conspecifics, suggesting that social personality traits with humans and conspecifics may be unassociated. We conclude that personality traits concerning orientation to and cooperation with humans appear unstable in young age.

Friday 3 June 2022 – *Room D - Canopy Lodge*

14:00 – 15:30 | Session **D5** - **Symposium:** Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions & Behaviour ofwild primates

Symposium 8: Getting into the mind of the forager - Studying cognition in humans and other primates under natural foraging conditions. Part 2
Organizers: Karline Janmaat (University of Amsterdam) & Miguel de Guinea (The Hebrew

14:00 – 14:15 | Miguel de Guinea[1], Hanlan Fei[2,3], Li Yang[2], Colin A. Chapman[4,5,6,7], Pengfei Fan[2] - **Where to sleep next? Evidence for spatial memory associated to sleeping sites in Skywalker gibbons (*Hoolock tianxing*)**

1. Movement Ecology Lab, Department of Ecology Evolution and Behavior, Alexander Silverman Institue of Life Science, The Hebrew University of Jerusalem, Jerusalem 91904, Israel; 2. Department of Ecology, School of Life Sciences, Sun Yat-sen University, Guangzhou 510275, China; 3. College of Life Science, China West Normal University, Nanchong 637002, China; 4. Wilson Center,1300 Pennsylvania Avenue NW, Washington, DC 20004, USA; 5. Department of Anthropology, The George Washington University, Washington DC, 20037, USA; 6. School of Life Sciences, University of KwaZulu-Natal, Scottsville, Pietermaritzburg, 3209, South Africa; 7. Shaanxi Key Laboratory for Animal Conservation, Northwest University, Xi'an, 710127, China

Finding suitable sleeping sites is highly advantageous but challenging for wild animals. While suitable sleeping sites provide protection against predators and enhance sleep quality, these sites are heterogeneously distributed in space. Thus, animals may generate memories associated with suitable sleeping sites to be able to approach them efficiently when needed. Here, we examined traveling trajectories (i.e., direction, linearity, and speed of traveling) in relation to sleeping sites to assess whether Skywalker gibbons (*Hoolock tianxing*) use spatial memory to locate sleeping trees. Our results show that nearly half of the sleeping trees were efficiently revisited by gibbons during the study and the recursive use of trees was higher than a randomly simulated visited pattern. When gibbons left the last feeding tree for the day they traveled in a linear fashion to sleeping sites out-of-sight (> 40 m away). In addition, traveling speed to out-of-sight sleeping trees increased as sunset approached but also with increased Euclidean distance in between the last feeding tree and sleeping tree. These results suggest that gibbons optimized their trajectories to reach sleeping sites under increasing conditions of predatory risk (i.e., nocturnal predators). Our study provides novel evidence on the use of spatial memory to locate sleeping sites, which sums up an already extensive body of literature linking cognitive processes and sleeping patterns in human and non-human animals.

14:15 – 14:30 | R. Adriana Hernandez-Aguilar[1,2], Trond Reitan[2] - **What ecological variables do chimpanzees (*Pan troglodytes*) evaluate before selecting a place to spend the night?**

1. Department of Social Psychology and Quantitative Psychology, Faculty of Psychology, University of Barcelona, Barcelona, Spain; 2. Centre for Ecological and Evolutionary Synthesis, Department of Biosciences, University of Oslo, Oslo, Norway

Although the cognitive abilities that allow primates to select sleeping sites that serve to avoid predation are assumed to be critical for survival, they remain largely unknown. To investigate which cognitive abilities may be involved in the selection of sleeping sites by wild chimpanzees, we used data

collected in a savanna habitat where predators were present, in Issa, Tanzania. We examined which potential explanatory variables (physical characteristics of trees) affected chimpanzee nesting selection on two spatial levels: sleeping sites and individual sleeping trees. After a model search, we found that several variables affected selection on each spatial level, but that the effects were strongest on the site level. The most important variables for both sleeping site and tree selection were those that likely protect against predation (e.g. tree height). Our results suggest that chimpanzees evaluated several variables at the same time in each of the two separate spatial levels we investigated, this is, when they selected sleeping sites and when they chose individual trees. Our results further suggest that the cognitive skills involved in selecting sleeping sites and trees included the ability to compare the physical dimensions of groups of trees on the landscape and of individual trees within a sleeping site. We discuss the potential of comparatively studying sleeping site selection in primates for contributing to our understanding of the evolution of cognition in this order.

14:30 – 14:45 | Zoë Goldsborough[1,2,3], Claudio M. Monteza-Moreno[1,2,3,4], Margaret C. Crofoot[1,2,3], Brendan J. Barrett[1,2,3] - **Tool use and tidal cycles: Activity patterns in island-living whitefaced capuchin monkeys (*Cebus capucinus imitator*)**

1. Department for the Ecology of Animal Societies, Max Planck Institute of Animal Behavior, Konstanz, Germany; 2. University of Konstanz, Konstanz, Germany; 3. Smithsonian Tropical Research Institute, Ancon, Panama; 4. Estación Científica COIBA-AIP, Ciudad del Saber, Clayton, Panamá, Panama

Island-living mammals face challenges like reduced diet breadth and increased competition. However, intertidal zones provide structurally protected marine prey (e.g. snails), which are differentially accessible during fluctuating points in the tidal cycle. White-faced capuchin monkeys living on islands in Coiba National Park, Panama (Coiban capuchins) frequently forage on the ground in the forests and intertidal zone. Two known groups of Coiban capuchins habitually use stone tools for extractive foraging; the only evidence of habitual tool use in the genus and a highly localized behavior. While capuchins in continental coastal areas also exploit tidal resources, it is unclear if or how typically forest-dwelling, ecological generalists like capuchins adjust their activity patterns to these cyclically available resources. Furthermore, activity patterns may vary within and between islands at coastal and non-coastal sites. Do tool-using populations' activity patterns differ from non-tool-using populations? To answer this question, we use data from ~50 camera trap locations deployed on 2 islands in CNP over 3+ years. We score occurrences and behavior of Coiban capuchins to estimate activity patterns. Using multilevel Bayesian models, we compare 1) tool-using capuchins to non-tool-using capuchins, 2) inland to coastal capuchins, and 3) capuchins on different islands to see if and how activity patterns differ as a function of tidal cycle, temperature, and time of day.

14:45 – 15:00 | Sylvain Lemoine[1,2,4], Catherone Crockford[3,4], Roman Wittig[2,3,4] - **Tactical use of high elevation by wild chimpanzees to detect hostile neighbours**

1. Department of Archaeology, Univeristy of Cambridge; 2. Max Planck Institute for Evolutionary Anthropology, Leipzig; 3. Institute of Cognitive Sciences Marc Jeannerod, CNRS, Bron; 4. Taï Chimpanzee Project

In human warfare, a common territorial tactic is the usage and occupation of areas highly elevated in the landscape, for protection against and early detection of enemies and preparation of ambushes. Elevated areas are thus assumed to confer tactical advantages in inter-group conflicts. Chimpanzee inter-group conflicts resemble in many aspects to small-scale human primitive warfare, including out-group hostility, lethal aggressions and border patrols. Despite this resemblance, whether chimpanzees use topography to gain tactical advantages over enemies remains unclear. We investigate this possibility in wild Western chimpanzees (*Pan troglodytes verus*) from the Taï National Park, in Côte d'Ivoire, using behavioural and ranging data on two habituated neighbouring communities, the South and East groups. After reconstructing the topographic landscape, using elevation recorded from GPS locations, we identify the highest inselbergs in the overlap border area between the two communities and analyze whether information related to neighbours affect movement patterns of the community stopping at these high spots. Our results show that, from high but not from low areas, imbalance of

power, rivals' current location and movement predict subsequent risk-reduction advance or retreat decisions, suggesting that chimpanzees' elevation usage in the territory border facilitates early detection of rival groups and confers tactical territorial advantages in out-group conflicts.

15:00 – 15:15 | Benjamin Robira[1,2], Simon Benhamou[1,3], Erlich Obeki Bayanga[4], Thomas Breuer[5,6], Shelly Masi[2] - **How do primates decide where to go? Insights from wild western gorilla cognitive foraging**

1. Centre d'Écologie Fonctionnelle et Évolutive, Université de Montpellier & CNRS, Montpellier, France; 2. Eco-anthropologie (EA), Muséum National d'Histoire Naturelle, CNRS, Université de Paris, Musée de l'Homme, Paris, France; 3. Associated to Cogitamus Lab; 4. Mondika Research Center; Nouabalé-Ndoki National Park, Wildlife Conservation Society; Congo Program, Republic of Congo; 5. Wildlife Conservation Society, Global Conservation Program, New-York, USA; 6. World Wide Fund for Nature Germany, Berlin, Germany

Animal movements are shaped by locomotion, sensory, and memory abilities, as well as by resource distribution and availability. Because of the power law distribution of fruit quantity expected from fruit trees, foraging movements of frugivorous primates living in tropical forests should give rise to Lévy walk (LW)-like patterns if they optimised their movements based on a perfect spatio-temporal knowledge. Yet, as their knowledge about "when a given tree yields ripe fruits at the individual level" is likely to be imperfect, they may rely on a simple movement heuristic such as targeting the nearest feeding site without knowing how much resource it currently provides. Using two years of tracking and behavioural observations on two groups of wild western gorillas (*Gorilla gorilla*), we determined whether their movements between feeding sites may be represented by a LW, or may be explained by a less cognitively demanding movement heuristic. Based on both statistical and mechanistic modelling, we showed that gorilla did not move in a LW-like way, but tended to follow a nearest-neighbour heuristic. The fit was even better when the long-term patch interest was taken into account. Our results therefore suggest that gorillas well know "where" to find food, but are only able to roughly infer what quantity of resource can be found at a given site and time, presumably based on some knowledge of the long-term plant-species phenology and attributes (e.g. crop size).

15:15 – 15:30 | *Discussion / summary Symposium: Getting into the mind of the forager*

Friday 3 June 2022 - *Room – A - Auditorium*

16:00 – 17:30 | Session **A6** - Communication

16:00 – 16:15 | Adam Zeeman[1], Jorg Massen[2], Karline Janmaat[1,3,4], Debottam Bhattacharjee[2] - **How animal personality shapes human-animal interactions: A visitor-effect study on crested macaque**

1. Evolutionary and Population Biology, Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, Amsterdam, the Netherlands; 2. Animal Behaviour and Cognition, Department of Biology, Utrecht University, Utrecht, The Netherlands; 3. ARTIS Amsterdam Royal zoo, Amsterdam, the Netherlands; 4. Department of Cognitive Psychology, Faculty of Social Sciences, Leiden University, Leiden, the Netherlands

Animal personality describes inter-individual differences in behavior that are consistent across time and context. Personality is known to affect survival and reproductive success in animals. Among group-living species, personality can shape social dynamics such as mate choice and friendships. Personality can also influence interspecific interactions, including predation dynamics and human-animal interactions. Given that non-human animals are increasingly subjected to humans due to habitat loss and climate change, it is imperative that we improve our understanding of how factors like personality shape human-animal interactions. Studies on the link between personality and animal responses to humans in a captive setting can also provide relevant knowledge for improving breeding programs and animal welfare. Here, we used long-term behavioral observations and repeated non-invasive

experiments in a bottom-up analysis to assess the personality traits in three groups of captive crested macaques. In addition, we assessed enclosure use and frequency of social behavior under varying zoo-visitor densities and activity levels. We then modelled the relationship between relevant personality traits and the macaques' response to visitors. By providing detailed insight into crested macaque personality and its role in human-animal interactions, this study can offer useful contributions to conservation efforts and inform on the evolution of primate personality.

16:15 – 16:30 | Yuri Kawaguchi[1,2], Koyo Nakamura[2,3,4], Masaki Tomonaga[5], Ikuma Adachi[6] -**The role of infantile coloration on face recognition in chimpanzees**

1. Messerli Research Institute, University of Veterinary Medicine Vienna, Vienna, Austria; 2. Japan Society for the Promotion of Science, Japan; 3. Faculty of Psychology, Department of Cognition, Emotion, and Methods in Psychology, University of Vienna, Austria; 4. Faculty of Science and Engineering, Waseda University, Japan; 5. Inuyama, Japan; 6. Primate Research Institute, Kyoto University, Japan

Impaired face recognition for certain face categories, such as faces of other species or other age class faces, is known in both humans and non-human primates. A previous study found that it is more difficult for chimpanzees to differentiate infant faces than adult faces. Infant faces of chimpanzees differ from adult faces in shape and colour, but the latter is especially a salient cue for chimpanzees. Therefore, impaired face differentiation of infant faces may be due to a specific colour. In the present study, we investigated which feature of infant faces has a greater effect on face identification difficulty. Adult chimpanzees were tested using a matching-to-sample task with four types of face stimuli whose shape and colour were manipulated as either infant or adult one independently. Chimpanzees' discrimination performance decreased as they matched faces with infant colouration, regardless of the shape. This study is the first to demonstrate the impairment effect of infantile colouration on face recognition in non-human primates, suggesting that the face recognition strategies of humans and chimpanzees overlap as both species show proficient face recognition for certain face colours.

16:30 – 16:45 | Nick C.P. Dam[1], Meike K. Zemihn[1], Carel J. ten Cate[2] - **Reproductive cues in trill calls of captive and wild female common marmosets (*Callithrix jacchus*)**

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Female primates may produce acoustic cues to signal their reproductive state to conspecifics. Female common marmosets (*Callithrix jacchus*) are not known to emit a specific call type to signal their reproductive state to conspecifics and their vocal repertoire is limited in this sense. A strategy to convey more information in a limited vocal system is to encode information in subtle variations within call types. Therefore, we investigated whether subtle acoustic variations within trill calls of female marmosets contain information about reproductive state. We conducted daily audio recordings 15 days before until 15 days after parturition. Data were collected for a total of nine females. We compared acoustic variations within trills between reproductive phases. Acoustic analyses were conducted using a custom R code. We used principle component analyses and created several prediction models to predict each reproductive phase separately. We found that the pre-ovulatory phase could statistically be predicted based on variation within trills. However, it remains unclear whether male marmosets would be able to distinguish between trills from the pre-ovulatory phase and the other phases. Dominant males will typically only hear trills from one reproductive female. Males could possibly distinguish between reproductive phases by generalising across acoustic features between phases. Therefore, it may be possible that trill calls are used to extract information about reproductive state.

16:45 – 17:00 | Tatiana Bortolato[1,2,3], Cédric Girard-Buttoz[1,2,3], Marion Laporte[4], Mathilde Grampp[2,3], Klaus Züberbuehler[5], Roman M. Wittig[1,2,3], Catherine Crockford[1,2,3] - **Call order varies systematically across chimpanzee populations in a greeting vocal sequence**

1. The Ape Social Mind, Institut des Sciences Cognitives, CNRS, 67 Boulevard Pinel, 69675 BRON, Lyon, France; 2. Department of Human Behavior, Ecology and Culture, Max Planck Institute for Evolutionary Anthropology, 04103 Leipzig, Germany; 3. Taï Chimpanzee Project, Centre Suisse de Recherches Scientifiques, Abidjan, Ivory Coast ; 4. UMR 7194 - « Histoire Naturelle de l'Homme Préhistorique », Muséum national d'Histoire naturelle (HNHP), Palais de Chaillot, 17, Place du Trocadéro 75116 Paris, France. 5Universite de Neuchatel, Institut de Biologie, Cognition Compare, Neuchatel, Switzerland

Vocal learning is key to human language acquisition. Whilst other primates are limited in vocal production learning (inventing new sounds), they show capacity to learn the usage of calls in new contexts. But, what set human and other primates' vocal production apart is not the number of sounds or calls produced but the ability to flexibly recombine these into sequences. The potential for vocal usage learning in vocal sequences has been barely studied but can be assessed by documenting consistent between-population differences in call order within a sequence. Here, we investigated population differences in call order of a greeting vocalisation in wild chimpanzees. We examined long-term cross-population variation in the greeting hoo in four communities of wild chimpanzees from two populations (Taï and Budongo). A greeting hoo is a combined call of a pant hoot (PH) and a pant grunt (PG) emitted when greeting dominants during fusion events. Our results indicate flexibility and clear population differences in call ordering. Taï chimpanzees consistently produced PH first whereas Budongo chimpanzees produced PG first in the greeting hoo sequence. Intra-group aggression threat is much more severe in Budongo than in Taï and we hypothesise that population-level variation in the costs of aggression may mediate call order, with urgency to signal submission promoting PG first sequences in Budongo. We tentatively suggest this as a case of call sequence usage learning.

17:00 – 17:15 | Brigitte Weiß[1,2], Michelle Roderer[1], Anja Widdig[1,2] - **Visual information modulates sniffing behaviour of Barbary macaques at Affenberg Salem**

1. Behavioural Ecology Group, University of Leipzig, Germany; 2. Research Group Primate Behavioural Ecology, Max-Planck-Institute for Evolutionary Anthropology, Leipzig, Germany

Most Old World primates are considered to be strongly visually oriented animals, obtaining information about conspecifics and their environment from a diversity of visual cues. Other sensory modalities may provide information that is redundant and/or complimentary to visual cues. When cues from multiple sensory modalities are available, these may reinforce or suppress each other, as recently shown in birds, New World primates and humans. In the present study we tested how the presence and ambiguity of visual information affects the use of olfactory cues for exploring food and non-food items in Barbary macaques at Affenberg Salem, Germany. In experiment 1 we presented monkeys with pipes containing food (peanuts, popcorn), non-food (stones, feces) or no items. The ends of the pipes were either transparent or opaque, and we assessed whether animals looked, sniffed and/or grabbed into the pipes depending on visibility of the contents. In experiment 2 we manipulated the visual appearance of familiar food items (popcorn) with food colourant and scored if monkeys sniffed at and/or ate the popcorn depending on whether it was uncoloured or dyed blue. In both experiments the probability to use olfaction increased when items were not visible or ambiguously coloured, respectively. Hence, reliance on the olfactory sense was modulated by the available visual information, emphasizing the interplay between different sensory modalities for obtaining information about the environment.

17:15 – 17:30 | Claire Pérez[1], Jérôme Micheletta[1], Alexander Mielke[2], Bridget M. Waller[3], Julie Duboscq[4], Alan Rincon[1] - **Use of NetFACS to describe the repertoire of Barbary macaques' facial behaviour**

1. Department of Psychology, University of Portsmouth, Portsmouth; 2. Primate Models for Behavioural Evolution Lab, University of Oxford; 3. Department of Psychology, Nottingham Trent University; 4. UMR7206 Eco-Anthropology, CNRS-MNHN, Université de Paris

Facial signals are important social communication tools in primates that allow them to navigate their social world. Analyses of the complexity of coordinated movements of facial muscles, reflected by the quantity and quality of their relationships, are necessary to apprehend the face as a communication system and investigate the evolution of communication. Macaques facial movements are often classified in broad categories and not systematically described in a standardized way. This subjective clustering prevents us from exploring the subtleties of the morphology of facial displays. The Macaque Facial Action Coding System (MaqFACS) is an anatomically based objective tool used to describe facial behaviour. FACS datasets have features that make traditional statistical models unsuitable for reliable analyses. Network science is one way to overcome these issues. NetFACS is a statistical package combining FACS and network analysis, where the face is conceptualised as a network of interconnected Action Units (AU: the smallest unit of facial communication). AUs are represented as nodes, their combinations as edges that can be weighted to indicate their strength, all visualized in graphs. We coded 1233 videos of interactions in 43 Barbary macaques (*Macaca sylvanus*). We used MaqFACS to report variability, diversity and subtlety to provide a fine-grained repertoire of Barbary macaques' facial behaviour, and NetFACS to define and quantify the communicative complexity of the signals.

Friday 3 June 2022 – *Room B - Kilimanjaro Lodge*

16:00 – 17:30 | Session **B6** - Cognition

16:00 – 16:15 | Vedrana Šlipogor[1,2,3,4], Markus Stasek[2], Camila Rezende[4], Nicola Schiel[3], Antonio Souto[4], Thomas Bugnyar[2] - **Common marmosets (*Callithrix jacchus*) learn socially via video demonstrations under captive and natural conditions**

1. Department of Zoology, Faculty of Science, University of South Bohemia, Budweis, Czechia; 2. Department of Behavioral and Cognitive Biology, University of Vienna, Vienna, Austria; 3. Department of Biology, Federal Rural University of Pernambuco, Recife, Brazil; 4. Department of Zoology, Federal University of Pernambuco, Recife, Brazil

Social learning, defined as learning influenced by observing or interacting with a conspecific, is especially important for gregarious species, as obtaining information about the environment from others can have fitness consequences. Mechanistic aspects of social learning have been studied in various species in captivity, but less work has been done in well-controlled field experiments. We tested common marmosets (*Callitrix jacchus*), highly social neotropical primates, in both the laboratory in Austria (N=22), as well as in the semi-arid forests of Northeast Brazil (N=15). In both settings, we provided video demonstrations of unfamiliar conspecifics solving a novel foraging task (i.e., opening an artificial fruit in one of two ways, with one of two different techniques), before offering the task to observers themselves. We found that overall, the monkeys learned from the virtual demonstrators, irrespective of the lab or the field setting. However, we found pronounced individual differences in whether, and how well and fast different individuals acquired this social information. In particular, shyer and more active individuals followed the demonstrated choice in captivity, whereas more sociable individuals paid more attention to the video demonstrations in the wild. We will further discuss our findings that the variation in cognitive performance seems to be best explained by both attention and consistent interindividual differences in coping with challenges.

16:15 – 16:30 | Sofia Forss[1], Erik Willems[2] - **Great Ape curiosity compared: implications for socially triggered curiosity in hominids**

1. ETH Zurich/ Collegium Helveticum 1 Department of Evolutionary Biology and Environmental Studies, University of Zurich; 2. Department of Anthropology, University of Zurich

Curiosity involves behavioural expression of interest in new information. Modern humans - lacking natural predators - thrive with curiosity, which is key to our creativity and learning. In contrast, our ancestors faced more hazardous environments that not necessarily favour individual curiosity. Thus, being curious may have undergone selection in interaction with sociality. Our closest living relatives, the great apes have evolved facing conditions more like human ancestors and as such, can help us understand the functions of curiosity and its evolutionary history. Here we compared curiosity under similar captive environments across four ape species (N=101): *Pan troglodytes, Pan paniscus, Pongo abelii* and *Pongo pygmaeus*. With a subset of the sample (N=46) we further examined the link between curiosity and creative problem-solving skills. Results revealed that curiosity followed a linear gradient across all four species in accordance with their sociality. We propose the social curiosity hypothesis to explain the observed pattern, reflecting those individuals in highly social species, like bonobos and chimpanzees, regularly are accompanied by conspecifics, and thereby accustomed to an abundance of social cues, leading to inhibited curiosity when alone, compared to more solitary orangutans. Our results support the theory that hominin curiosity evolved as a socially triggered mechanism. Further, our data suggest that within species curious individuals are better problem-solvers.

16:30 – 16:45 | Elisa Bandini[1], Johannes Grossmann[2], Martina Funk[3], Anna Albiach Serrano[4], Claudio Tennie[1] - **Naïve orangutans (*Pongo abelii* and *Pongo pygmaeus*) individually acquire nut-cracking using hammer tools**

1. Department for Early Prehistory and Quaternary Ecology, The University of Tübingen, Tübingen; 2. Max Plank Institute for Evolutionary Anthropology, Leipzig, Germany; 3. Independent researcher; 4. Ethology and Animal Welfare Section, Universidad Cardenal Herrera- CEU, CEU Universities, Valencia, Spain

Nut-cracking with hammer tools is considered one of the most complex non-human primate tool-use behaviours observed to date. So far, only capuchins (*Sapajus* spp.), macaques (*M.f.aurea*) and chimpanzees (*P.t.verus*) have been reported to crack nuts using tools, and the mechanisms driving this behaviour are still debated. The aim of our study was two-fold. Firstly, we wanted to investigate the extent of nut-cracking in primates by testing orangutans, who despite having the second most extensive toolkits after chimpanzees, have not (yet) been observed cracking nuts in the wild. Secondly, we aimed to identify the individual and/or social learning mechanisms driving the acquisition of nut-cracking in orangutans. To do so, we tested four naïve, unenculturated orangutans housed at Leipzig Zoo (*P.abelli*; Mage = 16; 4F) in a baseline condition, in which the materials of the behaviour (wooden hammer tool, encased nuts and an anvil) were provided with no other social information. After testing, we found a similar unpublished study that provided nut-cracking materials to eight orangutans housed at Zürich Zoo in a baseline condition (*P. abelii* & *P. pygmaeus*; Mage = 14; 5F). Across the two studies, at least four orangutans spontaneously used the hammers provided to crack open the nuts. These findings suggest that despite being a complex behaviour, nut-cracking can be acquired by naïve orangutans through individual learning, supported by non-copying social learning mechanisms.

16:45 – 17:00 | Rahel K. Brügger[1], Erik P. Willems[1], Judith M. Burkart[1] - **Looking out for each other – patterns of synchronization and turn taking in marmoset vigilance**

1. Department of Anthropology, University of Zurich, Switzerland

Marmosets are highly susceptible to predation in the wild and gathering information about potential threats in the environment is crucial to their survival. As cooperative breeders, marmosets are able to coordinate helping behaviour (e.g., infant carrying, food sharing) but little is known about the organization of vigilance behaviour at the group level. This can either be achieved by synchronizing vigilance, i.e., adjusting to vigilance levels of group members, or by coordinating vigilance, i.e., stepping

up when others are unable to be vigilant themselves. To investigate what drives individual differences in marmoset vigilance and feeding behavior as well as the organization of those behaviors at the group level, we collected behavioral data on marmosets (N = 14) in a feeding context where feeding and vigilance were mutually exclusive. We first investigated drivers of individual vigilance and found marmosets increased vigilance and decreased feeding with the presence of infants. At the pair level, we found evidence for both synchronization and coordination. Interestingly marmosets increased vigilance when their pair mate was feeding and unable to be vigilant itself resulting in a turn taking like pattern of vigilance and feeding. This flexibility in vigilance is consistent with marmosets' sensitivity to others' needs in the food sharing context, where individuals share more when food is more difficult to obtain.

17:00 – 17:15 | Alba Motes Rodrigo[1,2], Shannon P. McPherron[3], Will Archer[3,4], R. Adriana Hernandez-Aguilar[5], Claudio Tennie[2] - **Experimental investigation of orangutans' lithic percussive and sharp stone tool behaviours**

1. Department of Ecology and Evolution, University of Lausanne, Lausanne, Switzerland; 2. Department of Early Prehistory and Quaternary Ecology, University of Tübingen, Tübingen, Germany; 3. Department of Human Evolution, the Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 4. Department of Archaeology and Anthropology, National Museum, Bloemfontein, South Africa; 5. Department of Social Psychology and Quantitative Psychology, University of Barcelona, Barcelona, Spain

Early stone tools, and in particular sharp stone tools, arguably represent one of the most important milestones in human evolution as they widened the ecological niche of our ancestors. However, it is still unclear how these early lithic technologies evolved and which behaviors served as stepping-stones for the development of systematic lithic production and use in early hominins. One approach to answer this question is to collect comparative data on the stone tool making and using abilities of our closest living relatives, the great apes, to reconstruct the potential stone-related behaviours of early hominins. To this end, we tested both the individual and the social learning abilities of five unenculturated orangutans to make and use sharp stone tools. Although the orangutans tested did not make sharp stones initially, three individuals engaged in lithic percussion, and sharp stone pieces were produced under later experimental conditions. Furthermore, when provided with a human-made sharp stone (a flake), one orangutan spontaneously used it as a cutting tool. Contrary to previous experiments on ape flaking, social demonstrations did not considerably improve the stone tool making and using abilities of the orangutans tested. Based on our results, we conclude that two proposed pre-requisites for the emergence of early lithic technologies – lithic percussion and the recognition of sharp-edged stones as cutting tools – are spontaneously present in extant orangutans.

17:15 – 17:30 | Claudio Tennie[1], Alba Motes-Rodrigo[1,2] - **Which ape behavioural forms might require copying? Introducing the Method of Local Restriction**

1. Department of Early Prehistory and Quaternary Ecology, University of Tübingen, Tübingen, 72070, Germany; 2. Evolutionary Genetics and Ecology of Social Life Group, Department of Ecology and Evolution, University of Lausanne, Switzerland

Wild ape cultures are traditionally inferred via the "method of exclusion": after controlling for genetics and environment, ape populations show a residual pattern that is likely due to some variant(s) of social learning. Nevertheless, "behaviour copying" (aka know-how copying) does not necessarily underlie these patterns. Other, non-copying social learning variants, may merely trigger behavioural reinnovations that are within individual reach. And since apes do not spontaneously copy novel behaviour in controlled experiments, an account based on such triggering alone would be the most parsimonious explanation of ape culture, unless ape culture showed additional patterns that could not be explained by mere triggering. We introduce the "Method of Local Restriction", designed to detect the most likely candidates of form copying in animal cultures. If such learning were present, copying error (which is unavoidable) should have, over time, led to locally restricted, i.e. to "population-specific forms". Noticing frequent claims for local restriction in the literature, we systematically collected and

compared candidate behavioural forms across domains, locations and ape species (Tennie & Motes-Rodrigo 2021 Biol Rev). However, the vast majority of these forms proved to occur elsewhere. We argue that the few cases that are (currently) locally restricted should be prioritised as future targets of observational and experimental investigations.

Friday 3 June 2022 – *Room C - Mount Kenia Lodge*

16:00 – 17:30 | Session **C6** – Social behaviour

16:00 – 16:15 | Charlotte Hemelrijk[1], Matthew Cooper[2], Delphine de Moor[3], Julia Ostner[4], Oliver Schülke[4], Bernard Thierry[5], Gerrit Gort[6] - **Adult sex ratio, sexual dimorphism and partial female dominance over males in macaques**

1. Groningen Institute for Evolutionary Life Sciences, GELIFES; University of Groningen, the Netherlands; 2. Department of Psychology, University of Tennessee Knoxville, USA; 3. Centre for Research in Animal Behaviour, University of Exeter, UK; 4. Dept. Behavioral Ecology, University of Goettingen, Germany; 5. Physiology of Reproduction and Behaviour, CNRS, INRAE, University of Tours, France; 6. Biometris, Wageningen University, The Netherlands

Dominance over males is advantageous for females for getting access to food and preventing sexual harassment. Although in most group-living primates females are often assumed to be subordinate to males, because they are smaller, in some species females partially dominate males. A computational model, DomWorld, explains this by the self-reinforcing effects of winning and losing fights; the model shows that stronger female dominance arises when the dominance style is despotic, sexual dimorphism in body size and fierceness is male-biased, and the proportion of males in the group is greater. These patterns have been confirmed in macaques, vervet monkeys and capuchin monkeys. In the present study, we investigate in several species of macaques the model prediction that female dominance increases with the proportion of males, particularly in more despotic species. We confirm such an increase to be significant only in the most despotic species, the rhesus monkey and long-tailed macaque and in the somewhat more egalitarian species (stump-tailed macaques, and Assamese macaques) this increase is lower and nonsignificant. Probably due to small samples sizes (low statistical power), there were no significant differences among the four species. Besides, female dominance is greater, when male-biased sexual dimorphism is weaker. This suggests that both sexual dimorphism and the self-reinforcing effects of winning and losing fights affect the dominance of females over males.

16:15 – 16:30 | Sophia Daoudi-Simison[1,2], Eoin O"Sullivan[4], Phyllis Lee[3], Hannah Buchanan-Smith[3] - **Social networks in mixed-species groups of capuchin and squirrel monkeys**

1. Newcastle University, School of Psychology, Faculty of Medical Sciences, Newcastle upon Tyne NE2 4DR, England, UK; 2. the University of Stirling, Psychology, Faculty of Natural Sciences, FK9 4LR, Scotland, UK; 3. the University of Stirling, Psychology, Faculty of Natural Sciences, FK9 4LR, Scotland, UK; 4. School of Psychology and Neuroscience, University of St Andrews, St Andrews, KY16 9JP, Scotland, UK

Mixed-species groups are recorded in a number of different primate species, including tufted capuchin (*Sapajus* sp.) and squirrel (*Saimiri* sp.) monkeys. However, measures of their associations are generally based on arbitrary distances (e.g. ≤50m in the wild; ≤50cm in captivity). Our understanding can be enhanced by a shift in analytical focus to social network analysis (SNA). Here we present data on a mixed-species exhibit housing two groups (East & West) of *Sapajus apella* (n=35 individuals) and *Saimiri sciureus* (n=26) at the Living Links to Human Evolution Research Centre, RZSS, Edinburgh Zoo, Scotland. Focal point-sampling was used, with 1-minute intervals for 10 minute sessions, resulting in 183 hours of focal observations (3 hrs/ind). We calculated network parameters based on proximity data (≤40cm - distance determined as body length of the largest monkey). Network diagrams for both mixed-species groups showed distinct clusters separating *Sapajus* and *Saimiri*. There were also distinct differences between the East and West groups suggesting several factors affect association patterns.

We conclude that the application of SNA, combined with data on behavioural synchrony and space use, will enable us to address questions about associations among heterospecifics and the role of individuals within mixed-species groups, providing a richer description of the evolution and function of mixed-species societies.

16:30 – 16:45 | Rachel Harrison[1], Jennifer Botting[2,3], Erica van de Waal[1,2] - **Social trajectories following early maternal loss in wild vervet monkeys**

1. Department of Ecology and Evolution, Biophore, University of Lausanne, CH-1015 Lausanne, Switzerland; 2. Inkawu Vervet Project, Mawana Game Reserve, Swart Mfolozi, KwaZulu Natal, South Africa; 3. Pan African Sanctuary Alliance, Portland, Oregon, USA

Social status is a phenotypic trait which can have important fitness consequences in group-living animals. In many mammalian species, the social position acquired by offspring at adulthood is similar to that held by their mother (i.e. rank inheritance). In such species, maternal loss before adulthood is expected to have longterm effects on the social position of offspring. Using a ten-year observational dataset, we examined the impact of maternal loss prior to adulthood on 47 wild vervet monkeys from four social groups. Compared to age and rank-matched controls, we found no significant difference in orphans' grooming social network centrality over the year following maternal loss, nor was there an increase in the frequency with which orphans were involved in conflict following maternal loss. Importantly, female orphans who had reached adulthood at the time of this study (N=11) were no less likely to achieve their expected adult rank than matched controls. These results indicate that, in vervet monkeys, offspring social status is not dependent upon the mother's social interactions, at least after early infancy, and offspring are not socially disadvantaged by their mother's absence even from an early age (with the youngest in our sample being 4 months old at maternal loss). These findings highlight the resilience of social inheritance in this species and invoke questions about the mechanisms through which rank inheritance may be maintained in the absence of maternal support.

16:45 – 17:00 | Karlijn Gielen[1], A.L. Louwerse[2], E.H.M. Sterck[1,2] - **Male infanticide in captive long-tailed macaques (*Macaca fascicularis*)**

1. Animal Behaviour & Cognition, Utrecht University, Utrecht, the Netherlands; 2. Animal Science Department, Biomedical Primate Research Centre, Rijswijk, the Netherlands

To prevent inbreeding in captive groups of primates, new males have to be introduced regularly. These introductions are not without any risk, because newly introduced males may commit infanticide (the killing of young infants). In addition, resident males that gain the alpha position may also form a risk. Infanticide is seen as a reproductive strategy for males, since killing the offspring of lactating females will shorten the interbirth interval after which he can sire her next offspring. Yet, not all males commit infanticide and not all young infants are killed during an introduction. Therefore, it is necessary to gain more knowledge of infanticidal males and their victims. In our research we investigated several risk factors of infanticide in captive long-tailed macaques (*Macaca fascicularis*) using a 23-year period of demographic data of our colony. In this period 31 males gained the alpha position either by being introduced in a new group, or by gaining the alpha position in their resident group. From these 31 males, eight committed infanticide resulting in 13 infant kills. Infanticidal males were on average more than two years younger than non-infanticidal males. Moreover, only infants young enough to decrease the interbirth interval were at risk of being killed, being younger than 210 days. In conclusion, the age of both males and infants are related to infanticidal risk, and need to be taken into account when new males have to be introduced.

17:00 – 17:15 | Olga Feliu[1], Marti Masip[1], Carme Maté[2], Sonia Sànchez[3], Dietmar Crailsheim[1], Elfriede Kalcher-Sommer[4] - **Development of social competence in three former pet chimpanzees after living at the Mona sanctuary for 10 years**

1. Fundació MONA, Girona, Spain; 2. Department of Animal Rights, Barcelona City Council, Barcelona Spain; 3. Instituto de Investigaciones Biológicas, Universidad Veracruzana, Xalapa, Veracruz, México. Av. Luís Castelazo Ayala s/n, C.P. 91190, Xalapa, Veracruz, México; 4. Institute of Biology, University of Graz, Universitätsplatz 2, 8010 Graz, Austria

Chimpanzees living as pets and performing in circuses suffer from adverse rearing and housing conditions. The best option for these chimpanzees is to be transferred to a sanctuary where they are socialized and live the rest of their lives in a naturalized environment with conspecifics. In this case study we obtained behavioural data of three chimpanzees while still living as pets and compared it with data collected when they were living at the MONA sanctuary for about 10 years. The three individuals were exposed to close human contact and housed in cages while living as pets. We evaluated the changes in their behaviours by comparing their activity budgets and associations while still housed as pets, to those when living at the sanctuary. As expected, the results showed that the activity budgets changed substantially between the two conditions, mostly in directions desired by the sanctuaries' rehabilitation objectives. Allogrooming became the predominant interaction type and agonistic interactions disappeared almost completely. Resting replaced time spent on vigilance at the sanctuary compared to when living as pets. All three subjects expanded their allogrooming as well as close proximity networks by including new group members as social partners. Results suggest that transfer to the sanctuary was a good option for these rescued chimpanzees, namely Bea, Coco and Tom as they improved not only their social competence but as it seems to be conducive to their well-being as well.

17:15 – 17:30 | Mulati Mikeliban[1], Belinda Kunz[2], Tri Rahmaeti[3], Natalie Uomini[4], Caroline Schuppli[1,2] - **Orangutan mothers reactively facilitate learning opportunities for their offspring during food solicitations**

1. Development and Evolution of Cognition Research Group, Max Planck Institute of Animal Behavior, 78467 Konstanz, Germany; 2. Department of Anthropology, University of Zurich, CH- 8006 Zurich, Switzerland; 3. Department of Biology, Graduate School, Universitas Nasional, 12520 Jakarta, Indonesia; 4. Department of Linguistic and Cultural Evolution, Max Planck Institute for Evolutionary Anthropology, 04103 Leipzig, Germany

In the wild, young orangutans need to learn to recognize and process more than 200 different food items before they become independent from their mothers. Previous studies showed that immature orangutans learn about food items by soliciting them from their mothers. However, up to date, it has remained uninvestigated to what extent orangutan mothers are actively involved in this learning process. It is likely in the mother's interest to facilitate her offspring's feeding skill acquisition to help it reach independence faster so that she can get ready for her next offspring. To investigate the level of maternal involvement during feeding skill acquisition through food solicitations, we analysed 1390 food solicitation events between 21 immature Sumatran orangutans (*Pongo abelii*) and their mothers at the Suaq Balimbing orangutan population in South Aceh, Indonesia. We found that orangutan mothers showed the highest levels of tolerance to food solicitations when the offspring were at the age at which they acquire most feeding skills. Furthermore, mothers were more likely to tolerate their offsprings' food solicitations for more processing intense items and stayed tolerant for these items the longest. These results suggest that orangutan mothers adjust their behaviour during food solicitations in a way that likely facilitates their offspring's feeding skill acquisition. Mothers thus seem to have a more active role in the skill acquisition of their offspring than previously assumed.

Friday 3 June 2022 – *Room D - Canopy Lodge*

16:00 – 17:30 | Session **D6** – Behaviour of wild primates

16:00 – 16:15 | Odd Jacobson[1,2,4], Meg Crofoot[1,2], Susan Perry[3,4], Brendan Barrett[1,2,4] - **Using sleep site locations to investigate historical space-use patterns of capuchin groups**

1. Department for the Ecology of Animal Societies, Max Planck Institute of Animal Behavior, Konstanz, Germany; 2. University of Konstanz, Konstanz, Germany; 3. University of California Los Angeles, USA; 4. Lomas Barbudal Monkey Project, Guanacaste, Costa Rica

Measuring space-use patterns over longitudinal time frames can offer insights into how animal groups respond to social and environmental change. Advancements in GPS tracking technology has allowed locational data to be collected more accurately and at much higher resolution. However, understanding long-term trends in space-use requires looking back in time by comparing modern tracking data with historical locational data. Many longitudinal studies, especially in field primatology, may have access to untapped historical data by keeping records of sleep site locations. In this study, I assess the utility of low-resolution data from sleep sites for measuring home ranges using data from the Lomas Barbudal Monkey Project, an ongoing 30-year project on white-faced capuchins (*Cebus capucinus imitator*) in Costa Rica. To achieve this, I compare home range estimates using sleep sites with those from high-resolution GPS tracking data to determine the appropriate metrics that should be used to analyze data of varying resolution. These findings provide researchers with the analytical tools for properly measuring home ranges, as well as a means for investigating how animals respond to demographic and/or environmental change.

16:15 – 16:30 | Harmonie Klein[1], Gaelle Bocksberger[1], Pauline Baas[1], Sarah Bunel[1], Erwan Théleste[1], Simone Pika[2], Tobias Deschner[1] - **Hunting behavior in central chimpanzees (*Pan troglodytes troglodytes*) in the wild**

1. Max Planck Institute for Evolutionary Anthropology, Department of Primatology Deutscher Platz 6, 04103 Leipzig Germany; 2. University of Osnabrück, Institute of Cognitive Science, Comparative BioCognition, Artilleriestrasse 34, 49076 Osnabrück Germany

Across their distribution range in Africa, chimpanzees frequently hunt and consume mammals. So far, however, hunting behavior in central chimpanzees (*P. t. troglodytes*) has not yet been investigated. Here, we carried out the first investigation of mammal predation by the Rekambo chimpanzee community in the Loango National Park, Gabon and compare our findings to patterns reported from other sites. We observed hunting behavior across a period of 23 months and recorded a total of 61 predation events. We found that hunting of mammals is customary in this community, and occurred all year-round. Hunting rates peaked during the dry season, coinciding with a period of high fruit availability at Loango. The chimpanzees hunted nine different species, comprised of monkeys, ungulates and rodents. Several species, such as *Cercocebus torquatus, Cercopithecus nictitans* and *Cephalophus silvicultor* had never been reported as chimpanzee prey. Hunting occurred in parties averaging eight individuals and success increased with participant number and participation from dominant males. The results suggest that, similarly to observations of other East African populations (e.g., Mahale, Tanzania; Ngogo, Uganda), hunting in the Rekambo community may not be triggered by a lack of other food resources. In addition, despite the absence of red colobus monkeys (*Piliocolobus* spp.), hunting rates were comparable to sites where this species is present and higher than at sites where they are also absent.

16:30 – 16:45 | Shawn M. Lehman[1], Malcolm S. Ramsay[1,2], Fernando M. Mercado-Malabet[1], Hajanirina N. Ravelonjanahary[3], Andriamahery Raz[3] - **Spatial patterns of roadkill within Ankarafantsika National Park, Madagascar**

1. Department of Anthropology, University of Toronto, Canada; 2. Institute of Zoology, University of Veterinary Medicine, Hannover, Germany; 3. Centre Valbio, Madagascar

Road crossing represents a potentially dangerous form of movement in animals, particularly for arboreal primates unaccustomed to vehicles. Consequently, vehicular mortality associated with roads (roadkill) may be a global conservation concern for many species. However, there are few data on how animals respond to roads in tropical forest regions. We investigated various ecological and spatial factors in relation to road crossings and roadkill along Route National 4 (RN4), which bisects Ankarafantsika National Park (ANP) in NW Madagascar. We conducted our study during the 2015 dry season at the Ampijoroa Forest Reserve within ANP. A team of 3-5 researchers walked a 2.5 km stretch of RN4, scanning for signs of road crossings and remains of roadkill. When roadkill was found a GPS-point and photograph was taken and the organism was identified. We observed three species of reptiles, one rodent, and four species of lemurs (*Eulemur fulvus, Propithecus coquereli, Microcebus* spp., and *Lepilemur edwardsi*) crossing the road. Herpetofauna dominated roadkill (67/80 cases, 84%), but we did observe remains of one mouse lemur (*Microcebus ravelobensis*). We found significantly less roadkill surrounding two speedbumps present on RN4 in ANP. Our study shows the effectiveness of speedbumps for reducing roadkill that also have positive benefits to the people living along the road. Including additional speedbumps along the length of RN4 could potentially reduce the amount of animal roadkill.

16:45 – 17:00 | Franziska Grathwol[1], C. Roos[2], D. Zinner[3,4,5], C. Ottoni[6], W Van Neer[7,8], N Dominy[9], G. H. Kopp[1,10,11] - **Baboons in Ancient Egypt: Geographic origin of mummified baboons as revealed by ancient DNA analysis**

1. Department of Biology, University of Konstanz, Konstanz, Germany; 2. Gene Bank of Primates and Primate Genetics Laboratory, Deutsches Primatenzentrum, Göttingen, Germany; 3. Cognitive Ethology Laboratroy, Deutsches Primatenzentrum, Göttingen, Germany; 4. Department of Primate Cognition, Georg-August-University of Göttingen, Göttingen, Germany; 5. Leibniz-ScienceCampus Primate Cognition, Göttingen, Germany; 6. Dept. of Oral and Maxillofacial Sciences, Sapienza University, Rome, Italy; 7. Royal Belgian Institute of Natural Sciences, Brussels, Belgium; 8. Dept. of Biology, KU Leuven, Leuven, Belgium; 9. Depts. of Antrhopology and Biological Sciences, Dartmouth College, Hanover, United States; 10. Zukunftskolleg, University of Konstanz, Konstanz, Germany; 11. Dept. of Migration, Max Planck Institute of Animal Behavior, Konstanz, Germany

Ancient Egyptians mummified different kinds of animals, which can provide insights into Egyptian religion, culture, trade, and environment. Votive mummies were dedicated to one of the Egyptian deities: Each god:dess had at least one animal that was his/her totem. Thoth, god of wisdom and writing, was embodied by a hamadryas baboon. Baboons are widespread in sub-Saharan Africa and parts of the Arabian Peninsula, but have not naturally occurred in Egypt. They were probably imported from south or southeast, with one hypothesis being that they were imported from the land of Punt. The location of Punt, however, is a big mystery in Egyptology. Unravelling the geographic origin of mummified baboons has the potential to shed light on the location of Punt and important trading routes in ancient Egypt. We extracted aDNA from baboon mummy and museum specimen with known provenance and used shotgun sequencing and capture enrichment approaches to obtain complete mitochondrial genomes. Based on phylogenetic reconstructions and assuming geographical stability of phylogenetic clades, the Red Sea coast of Sudan and Eritrea is identified as the geographic origin of a baboon mummy, dating to the Late Pharaonic Period (664-332BC), excavated in Gabbanat El-Qurud "Valley of the Apes". Our study narrows down the geographic origin of mummified baboons proposed by stable isotope analysis and provides further evidence for the location of Punt at the African shores of the southern Red Sea.

17:00 – 17:15 | Mélissa Berthet[1,2], Geoffrey Mesbahi[3,4], Guilhem Duvot[1], Klaus Zuberbühler[5,5], Cristiane Cäsar[7], Júlio César Bicca-Marques[8] - **A population of titi monkeys declined by 80% after the 2016-2018 yellow fever outbreak in Brazil**

1. Institut Jean Nicod, Département d'études cognitives, ENS, EHESS, CNRS, PSL Research University, 75005 Paris, France; 2. Department of Comparative Language Science, University of Zürich, Zürich, Switzerland; 3. Université de Lorraine, Inrae, LAE, F-54000 Nancy, France; 4. Parc Naturel Régional des Vosges du Nord, 67290 La Petite Pierre, France; 5. Department of Comparative Cognition, University of Neuchatel, 2000, Neuchâtel, Switzerland; 6. School of Psychology and Neuroscience, University of St Andrews, St Andrews, UK; 7. Vale S.A., Brazil; 8. Escola de Ciências da Saúde e da Vida, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil

From 2016 to 2018, the southeast of Brazil faced one of the worst sylvatic yellow fever outbreaks of the century. Platyrrhini are highly vulnerable to the virus, and it is likely that this outbreak killed thousands of primates. We evaluated its potential impact on a population of wild black-fronted titi monkeys (*Callicebus nigrifrons*) at the Santuário do Caraça, Minas Gerais, Brazil, by comparing demographic data collected before and after the outbreak. From 2008 to 2016, we extensively monitored the population (11-12 groups, 53-57 individuals), and found that home ranges and group sizes were stable. In 2019, we conducted monitoring and playback surveys, and found that the population had decreased by 80% (3 groups, 12 individuals). The severe decline of a previously stable population combined with the absence of major ecological changes suggest that this loss was caused by the YF outbreak. The remaining population is at risk of extinction because of its small size and geographic isolation. A systematic population surveys of *C. nigrifrons* is needed to re-evaluate its current conservation status.

17:15 – 17:30 | Joanna M. Setchell[1,2], Barthélemy Ngoubangoye[1,2] – **Decolonising (European) primatology: why and how?**

1. Department of Anthropology, Durham University, UK Centre de Primatologie, Centre International de Recherches Médicales, Franceville, Gabon; 2. Save Gabon's Primates

'Western' science, including primatology and allied disciplines, developed in the context of colonialism, imperialism, and racism. Research in primatology is concentrated in the Global North, although other-than-human primates mainly inhabit the topics and subtropics. Much of modern primatology remains situated in a colonial science framework and replicates colonial models. We will consider what it means to 'decolonise', review why and how we need to decolonise primatology, and explore what we can all do better to create a more inclusive culture in our discipline. For example, we can: educate ourselves about colonial histories and the ongoing legacies of colonisation; recognise and reject colonial attitudes; reconsider the work we do (and don't) value; replace 'parachute' science with equitable collaboration; address linguistic imperialism; diversify our gatekeepers and decision-makers; make our findings accessible; and work to decolonise our institutions. These changes will benefit primatologists, primatology, and primates themselves. We thank the many people that we have already discussed this topic with and look forward to further discussions on the topic.

Posters - abstracts

Posters

Poster 1

Sara Fontani[1], Giovanna Marliani[2], Pier Attilio Accorsi[2], Gale Glendewar[3], Stefano Vaglio[1] - **Olfactory signals and fertility in captive Alaotran gentle lemurs**

1. School of Sciences, University of Wolverhampton, Wulfruna Street, Wolverhampton WV1 1LY, UK; 2. Department of Veterinary Medical Sciences, University of Bologna, via Tolara di Sopra 50, 40064, Ozzano dell'Emilia (BO), Italy; 3. Durrell Wildlife Conservation Trust, Les Augres Manor, La Profonde Rue, Trinity, Jersey, JE3 5BP, Channel Islands

The Alaotran gentle lemur (*Hapalemur griseus alaotrensis*) is one of the 25 most endangered primates in the world. In order to maintain captive healthy populations and guarantee genetic diversity, this lemur species is managed under the European Endangered Species Programme; however, it is currently showing a low success rate in captive breeding across European zoos. Our study aimed to assess the reproductive status of female gentle lemurs examining the relationship between sex hormones and olfactory behaviours in a captive troop (n=5) housed at Jersey Zoo. We measured faecal progesterone and oestradiol levels using Enzyme Immuno Assay technique and collected behavioural data via all occurrences sampling method. We found a significant positive correlation between profiles of oestradiol and progesterone (Spearman test: rs=0.46, p=0.01) and between oestradiol and male olfactory inspections followed by marking behaviours (Spearman test: rs=0.47, p=0.02). Our findings suggest a male behavioural response to the female ovarian activity. We also discuss the potential relationship between female anogenital odour, fertility and male behaviour. This study of olfactory signalling will improve our understanding of how female gentle lemurs advertise their sexual receptivity.

Poster 2

I. Kondova[1], T. Haaksma[1], B. Ouwerling[1], D. Adema[1], J.A.M. Langermans[1,2] , N.G. de Groot[3], R. E. Bontrop[3] - **Biobank of the Biomedical Primate Research Centre (BPRC): Implementation of 3Rs Principles**

1. Animal Science Department, Unit pathology and microbiology, Biomedical Primate Research Centre, Rijswijk, The Netherlands; 2. Department Population Health Sciences, Unit Animals in Science and Society, Veterinary Faculty, Utrecht University, Utrecht, The Netherlands; 3. Department of Comparative Genetics and Refinement, Biomedical Primate Research Centre, Rijswijk, The Netherlands

Tissue and genetic material obtained from non-human primates (NHP) are valuable assets in biomedical research. Biobanks are attractive alternative resource for testing scientific ideas, pathophysiological mechanisms, testing new vaccines and biologicals before proceeding to pre-clinical studies. However, offering and obtaining this type of material is often limited, time demanding and needs high expertise.The BPRC's Biobank is based on the principals of refinement, reduction and replacement (3Rs) and provides valuable primate specimens for biomedical research as well as for conservation studies. The primary focus is on the following species: *Macaca mulatta*, *Macaca fascicularis,* and *Callithrix jacchus*. Some samples from endangered species such as great apes - *Pan troglodytes*, *Pongo pygmaeus*- are also available. Organs and tissue samples from animals of various ages and different species are obtainable. This includes healthy tissue and tissue from spontaneously developed pathological or experimentally induced conditions. The collections include snap frozen tissue samples, samples fixed in 10 % neutral buffered formalin, and formalin fixed paraffin embedded tissues. Furthermore, for some of the species DNA, RNA, cDNA, ~~and~~ serum and plasma samples are adequately stored as well as PBMCs and/or immortalized B-cell lines of macaques, marmoset and chimpanzee. The species identity and the quality of the materials are tested by standard laboratory-based technologies.

Poster 3

Emile Bryon[1], Nicky Staes[2,3], Jeroen M. G. Stevens[2,3,4], Edwin J. C. van Leeuwen[1,2,3,5] - **Aggression in the *Pan* species: a multi-group comparison in zoohoused settings**

1. Animal Behaviour and Cognition Group, Utrecht University, the Netherlands; 2. Department of Biology, Behavioral Ecology and Ecophysiology group, University of Antwerp, Belgium; 3. Centre for Research and Conservation, Royal Zoological Society of Antwerp, Belgium; 4. SALTO, Odisee University College, Belgium; 5. Department for Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

In human psychology, aggression is seen as a multi-dimensional construct with differential functions and expressions in a variety of social contexts. To gain an understanding of the phylogenetic origins of humans' aggressive expressions, comparative studies on our closest living evolutionary relatives, the great apes, are warranted. Here, we investigated aggression in multiple groups of zoo-housed chimpanzees (*Pan troglodytes*) and bonobos (*Pan paniscus*) following the widely-held hypothesis that chimpanzees display higher rates of aggression than bonobos. We conducted observational and experimental (co-feeding) studies in three groups of chimpanzees (n=32) and three groups of bonobos (n=21) in which aggression was scored sensu all-occurrence and focal sampling techniques. The two Pan species did not significantly differ in their aggression rates, yet substantial variation was found across groups irrespective of species. Furthermore, higher aggression rates were observed by and towards males, by high-ranking towards low-ranking individuals (more so in bonobos), and within dyads close in age and with relatively strong grooming bonds. Inter-sex and intra-sex aggression rates did not differ in either species, and maternal kin bonds did not impact dyadic aggression rates. We conclude that in zoosettings chimpanzees are not more aggressive than bonobos and discuss the extent to which the restrictions of zoo-settings may affect the Pan species differently.

Poster 4

Natascha Riedel[1,2*], Julia Mörchen[1,2*], Puji Rianti[3], Caroline Schuppli[4], Anja Widdig[1,2] - **Measuring ecological competence in immigrant male orangutans**

1. Behavioural Ecology Group, University of Leipzig, Germany; 2. Research Group Primate Behavioural Ecology, Max-Planck-Institute for Evolutionary Anthropology, Leipzig, Germany; 3. Bogor Agricultural University IPB, Department of Biology, Bogor, Indonesia; 4. Development and Evolution of Cognition Research Group, Max-Planck- Institute of Animal Behavior, Konstanz, Germany *These authors contributed equally to the work.

While females orangutans are philopatric and settle close to their natal area, males disperse when reaching adulthood. When adapting to the local ecology of their new habitat, immigrant males are expected to show specific behavioural changes. Here we looked at how food processing competence of immigrant male orangutans develops after their arrival in a new local area. We analysed 1259 video of feeding events of Sumatran orangutan (*Pongo abelii*) unflanged males, flanged males and adult females, which were recorded at the Suaq Balimbing research area, in South Aceh, Sumatra, Indonesia between 2008 and 2020. We used the speed at wich food items are processed to assess food processing competence and adult females' processing speed as a baseline assuming that, because they grew up in the area, they are most competent. First, we found that females processed food items significantly faster than unflanged and flanged males. Second, immigrant males' processing speed significantly increased with increasing time they spent in the local area. Third, in relation to adult females, immigrant males fed slower on food items that are rare in the area compared to frequent ones. Our results suggest that as immigrant males spend an increasing amount of time in an area, their local knowledge increases. All in all, our findings indicate that newly immigrated males counterbalance their lack of knowledge by continuous learning, especially when confronted with a new feeding niche after dispersal.

Poster 5

Meike K. Zemihn [1,2], Miriam Kuspiel[1,2], Esther Clarke[3], Carel ten Cate[1] - **Variability of phee call combinations and related contexts in common marmosets**

1. Institute of Biology Leiden, Leiden University, Leiden, The Netherlands; 2. Universidade Federal de Pernambuco, Recife, Brazil; 3. Department of Linguistics and Philosophy, Massachusetts Institute of Technology, Cambridge MA, USA

Unlike most non-human primates, common marmosets (Callithrix jacchus) share their cooperative breeding system with humans. Studying their linguistic abilities can provide important cues to the evolution of human language. Common marmosets are known to combine distinct call types into call combinations. How these combinations are effected by context and whether they underly structural rules however remains unknown. We recorded vocalisations and behaviours in free-living animals in their natural environment. In this study, we focused on phee calls, longdistance contact calls which often elicit vocal responses from other animals, and combinations of phee calls and other call types. Phee calls were emitted as single calls, serial calls and in more than 56 different combinations with other call types. Call combinations consisted of two to seven calls, including one to four phee calls. While some combinations followed structural patterns, the order of calls in other combinations seemed flexible. Preliminary analyses of different combinations of phee and peep calls indicated differences in proportions of locomotor contexts. Similar analyses of combinations of phee and trill calls and of phee and twitter calls are ongoing. Nevertheless, we can already state that variation within call combinations of common marmosets is greater than previously known and that some call combinations follow structural rules.

Poster 6

Alma Nederlof[1], Anne Marijke Schel [1] - **Facial temperatures and vocal parameters as non-invasive measures of animal emotions**

1. Animal Behaviour & Cognition, Utrecht University

Measuring affective states, or emotions, in animals is not a trivial task. However, it is a valuable tool if we want to monitor whether an intervention undertaken with an animal has a positive or negative effect on its welfare, or if we want to better understand the natural interactions that occur amongst group members. Many methods developed to measure animals' affective states rely on invasive methods, such as monitoring heart rate or taking blood samples. However, the invasive nature of these methods may also affect the experienced affective states, potentially leading to biased views. More recently developed and less invasive methods for determining affective states include measurements of vocal parameters and the use of thermo-imaging techniques during emotional events. In a pilot study on a group of captive Barbary macaques, we correlated measurements of established parameters of affective state related to vocal expressions with measurements of facial temperature. We found that call duration was positively correlated with eye temperature during the play context. Furthermore, during the food related context a positive correlation was found between call duration and cheek temperature. The results of this pilot study show that both facial temperature and vocal parameters can thus be used independently as reliable noninvasive indicators of the affective state of animals.

Poster 7

Lisa-Claire Vanhooland[1,2], Thomas Bugnyar[1], Jorg J.M. Massen[2] - **Comparing the performances of chimpanzees in two selfawareness tasks**

1. University of Vienna; 2. Animal Behaviour & Cognition, Utrecht University

Self-awareness - having a concept of Self - has most commonly been studied in non-human animals by implementing mirror self-recognition studies. This ability of selfrecognition has been demonstrated among others in great apes, and has been most extensively studied in chimpanzees. The validity of such tasks as stand-alone methods has, however, been debated because of the high inter-individual

variation even in species deemed self-aware such as the chimpanzee (± 25% success rate), and because of its onefaceted all-or-nothing approach to a complex cognitive phenomenon. Recent years have therefore seen the emergence of new procedures to test for self-awareness like body self-awareness that contribute to the development of a more gradualist view of self-awareness. However, outside of children in which the age of emergence of both mirror selfrecognition and body self-awareness coincides, no studies to date have compared the performances of non-human animals between the two. In this study, we therefore presented a group of 15 chimpanzees with two tasks: 1) a mirror self-recognition task in which we investigated the spontaneous interactions of the chimpanzees with handheld mirrors; and 2) a body-as-obstacle task aiming to test the chimpanzee's awareness of their own body weight as an obstacle to an action they want to perform. We will here present how the chimpanzees' performances vary on a group and on an individual level between these two self-awareness tasks.

Poster 8

Annemiek Maaskant[1,2], Isabel Janssen[3], Inge Wouters[4], Frank van Eerdenburg[3], Edmond Remarque[5], Jan Langermans[1,2], Jaco Bakker[1] **- Indoor air quality evaluation of naturalistic housed macaques (*Macaca* spp.)**

1. Animal Science Department, Biomedical Primate Research Centre, Rijswijk, the Netherlands; 2. Department Population Health Sciences, Unit Animals in Science & Society, Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands; 3. Department Population Health Sciences, Farm Animal Health, Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands; 4. Department Population Health Sciences, Institute for Risk Assessment Sciences, Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands; 5. Virology Department, Biomedical Primate Research Centre, Rijswijk, the Netherlands

Indoor air quality is strongly associated with animal health and wellbeing. Therefore, animal housing facilities must be consistently and sufficiently ventilated to provide for the health and well-being of animals and caretakers. Although there are some publications concerning assessments and effects of suboptimal air quality in laboratory housed rodents, publications addressing this specific topic in macaques housed in naturalistic conditions are lacking. At the Biomedical Primate Research Centre (BPRC), the macaques in the breeding facility are housed in spacious and stimulating cages comprising both indoor and outdoor enclosures. The indoor air quality of group housed macaques at the BPRC was assessed to identify possible problems regarding air circulation and concentrations of inhalable dust, endotoxin, ammonia, fungi temperature and relative humidity in the indoor environment. In addition, the exposure of inhalable dust and endotoxin to caretakers was evaluated. The observed values for these air quality parameters in the animal enclosures did not exceed proposed human value limits, however, the caretakers were exposed to higher levels due to the nature of their tasks. This study provides practical tools that can be used to improve indoor air quality in group housed macaque enclosures. Moreover, the results show that preventative measurements are needed to reduce exposure to caretakers during daily work routine.

Poster 9

Juliette Morgan Berthier[1], Nicholas E. Newton-Fisher[1], Brandon C. Wheeler[1] - **Studying primates' emotions out of the lab: Adding an infrared thermographic camera in the basic fieldwork kit of primatologists?**

1. University of Kent, School of Anthropology and Conservation

In recent years, infrared thermography (IRT) has been pioneered as a fully non-invasive, contact-free technique to examine changes in emotional states of non-human animals in the lab or captivity. This method has been used successfully to measure emotion-related changes of surface skin temperature in many domestic species, and later in captive non-human primates, mainly to assess emotional reactions to stress or fear. IRT has been proven in captivity and it is time to go out of the lab to address new questions in more ecological-relevant contexts. A pioneer study successfully investigated emotional responses to naturally occurring vocalisations in wild chimpanzees, showing that the use of

this tool is reliable under tropical conditions. However, in the wild, and particularly in tropical areas where most non-human primates live, many environmental factors and constraints linked to a highly specific equipment can affect the accuracy of the IRT measurements. The aim of this study is to identify these factors and to provide guidelines and advices that can help minimizing the impacts of these factors when collecting IRT data in the field. Finally, examples of research questions regarding the role of emotions in primate sociality and communication that IRT could help answering, illustrated with real data collected on wild crested macaques in the rainforest of Indonesia, will be addressed to highlight the potentials of this technique for the field of primatology.

Poster 10

Cabo R[1,4], Muchlinski M[2], Casado A[3], Potau JM [3], Pastor JF[1] - **Ultrastructure of *Varecia variegata sublingual***

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Lemurs are a group of animals about which exist growing concerns for their survival. To increase the knowledge about them is an opportunity for understanding the compared anatomy these threatened species. We had the chance to study 5 specimens of Varecia variegata obtained through donations of naturally dead specimens from spanish zoos. We used histological general stains such are heamatoxilin & eosin, Masson tricromic and toluidin blue for optic microscopy together with scanning electron microscopy with microanalysis. Our work focuses on the study of sublingua, a structure present in some species of primates. Different authors have given it a mechanical function, acting as an instrument for cleaning the lower canine and incisor teeth (called "dental comb"). Previous studies of our group shows macroscopic images from the tip of the sublingua together with an encapsulated intralingual structure placed near the sublingua dorsal surface (Pastor et al, 2021; Animals 27;11(10):2811). This data encourage us to study deeply the Varecia variegata sublingua. Among prosimian primates, the presence of a sublingua is truly unique, a second tongue-like structure that is located below the primary tongue. Gross anatomy of the sublingua in some species has been fairly well documented among primates, but very little is known about tongue microanatomy. We show for the first time sublingua macroscopic and ultrastructural aspects from several specimens of *Varecia variegatta*.

Poster 11

Marit Vernes[1], Martina Stocker[1], Annet Louwerse[1], Jan Langermans[1,2] - **Group training in rhesus macaque breeding groups – feasibility and success rate**

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Animal training has increasingly become an integral part of daily husbandry procedures at many primate research facilities. The goal of the training is usually to enhance animal wellbeing by decreasing distress, establishing a more relaxed atmosphere, and facilitating cooperation in the course of experimental procedures. In most cases non-human primates are trained individually, whereas group training is not common practice. Training animals in breeding groups has several benefits including the lack of the need to separate individuals from the group and the early-on habituation of young group members to closer contact with humans. Little is known about the feasibility and success rate of non-human primate training performed in a group setting. The goal of the present study was, therefore, to determine the participation rate in group training sessions of rhesus macaque groups (*Macaca mulatta*). We trained 10 breeding groups (12 to 34 individuals, median = 26.5 individuals) to drink syrup from a syringe. Training sessions (11 to 49 sessions, median = 27) were performed by two trainers simultaneously who recorded which individual was actively participating. We found that 65% of all individuals participated in more than 25% of the sessions. The average participation rate in a

session was 50%. This demonstrates that group training allows a large part of the group to participate in training sessions and benefit from advantages such as mentioned above. Moreover, since group training also allows to determine the trainability of individual macaques, it facilitates the (pre-) selection of individuals for studies in which they might have to learn to perform specific tasks.

Poster 12

Megan Beardmore-Herd[1], Julia Fischer[2,3,4], Kaitlyn Gaynor[5], Meredith Palmer[6], Susana Carvalho[1,7,8,9] -
Effects of an extreme weather event on vervet monkeys in the impacted environment of Gorongosa National Park, Mozambique

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With contemporary, human-induced climate change at a crisis point, it is crucial that we better understand the immediate and long-term consequences of rapid and extreme ecological change on ecosystems. Non-human primates, adaptable as they may be as an order, are severely affected by climate change, yet few studies have directly investigated the ways they are impacted. This study aims to begin filling this gap by reporting the effects of an extreme weather event on a little-studied population of free-ranging primates in Gorongosa National Park, Mozambique. Cyclone Idai made landfall in central Mozambique in March 2019 causing fatalities in the hundreds and devastating consequences for millions more people. In Gorongosa National Park, the effects of the cyclone were also felt by the wildlife, with severe flooding across large areas home to a diverse array of animal species. Using data obtained from a camera trap grid of 60 cameras covering a 300 km² area of the Park, we analyse the effects of Cyclone Idai on the spatial and temporal activity of vervet monkeys (Chlorocebus pygerythrus), comparing pre- and post-cyclone activity in relation to flood severity. Our findings shed light on how a generalist and adaptable primate responds to extreme weather events, with implications of importance for wildlife conservation and anthropological research investigating the ways that rapid environmental change and major climatic events may have shaped early human evolution.

Poster 13

Kaja Wierucka[1], Nikhil Phaniraj[1,2], Yvonne Zürcher[1], Judith M Burkart[1]- **Machine learning and multiverse analysis approaches to studying marmoset vocal accommodation**

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Common marmosets are highly social and vocal primates. Their vocalisations show many similarities to human speech, making them excellent models for comparative studies of language. Experiments involving translocating marmosets to colonies with different dialects suggest that they can modify their calls with changing social environments. This phenomenon, known as vocal accommodation, has only been studied using a handful of pre-selected acoustic features. However, recent advances in machine learning algorithms (MLAs) allow for more comprehensive acoustic analyses. We used time-series analysis to extract >5000 acoustic features from each trill, phee, and food call of 20 marmosets and trained MLAs to determine sex, social status and identity from all call types. Next, we used different distance and behavioural metrics to calculate vocal distances and social bond qualities, respectively, between individuals, before and after translocation. We found a consistent decrease in vocal distance between partnered individuals after translocation across all distance metrics used, supporting the claim for vocal accommodation in marmosets. However, the extent of accommodation and bond quality scores varied with the distance and behavioural metric used – favouring the need for multiverse analyses. Our approach for extensive acoustic and behavioural analyses will aid future research on

marmoset vocalisations, contributing to understanding the evolutionary origins of human speech and language.

Poster 14

Animal Behaviour Collective **- Animal Behaviour Collective: Microgrants and mentorship for animal behaviour students**

Students from historically excluded groups face financial and social barriers to participation in academia. Students often take on debt to cover tuition, and maintenance costs, and full time study is often difficult to combine with employment. Access to support from teachers and supervisors can vary personally and institutionally. As a team of >30 international academics, we launched the Animal Behaviour Collective (ABC) in September 2020, to provide microgrants of up to £300 (or equivalent) to empower students in animal behaviour around the world to meet their basic financial needs. ABC is grounded in mutual aid principles of care and trust: students do not have to evidence their need. Alongside the microgrants, we also developed a mentorship programme in which students are matched with mentors according to criteria they set, to support career paths and improve accessibility to opportunities. For the successful implementation of both the microgrants and mentorship schemes, we rely on members of the global animal behaviour community for financial and informational support, respectively. To date, we have distributed over £7,000 in microgrants to 45 students, and matched 95 mentees to mentors. We hope to continue growing to be able to support many more applicants, and work to make the field of animal behaviour more inclusive

Poster 15

Kevin López-Leal[1], Arroyo, A. [2], Riba, D. [3] - **Termite mound behaviour in semi-captive chimpanzees**

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Tool use is a broadly studied field both in captivity and in the wild and it's well known that chimpanzees are the most prolific non-human primates tool users and the most proliferous as well amongst non-human great apes. Although several studies have been focused on stone tools or manual consistency across tool use tasks, our general objectives were to evaluate the behaviour of the termite mound in two groups of chimpanzees under semi-captive conditions. As specific objectives we evaluated if the social group, the use and type of tools and the posture or the type of substrate produced important modifications in the behaviour of the termite mound task. For this purpose, we analyzed recorded videos of the termite-fishing task performed by de individuals. Results revealed significant effects on the social group variable, as well as posture, substrate, and tool type variables. For the first one, individuals performed the behavior much more frequently in social context than individual. They adopted a sitting posture more frequently than a bipedal and/or quadrupedal one. They presented a significantly higher volume of actions on the ground than on elevated substrates. Finally, when using instruments, subjects chose and used a long stick type significantly more frequently than other stick types. Our study and its methodology can help to improve the understanding of the tool use on semi-captive chimpanzees and can be applied as a way to use as a data collection technique.

Poster 16

Claire Mawdsley[1], Marina Davila-Ross[2], Susan M Cheyne[1], Giuseppe Donatti[1], Magdalena S Svensson[1] - **The effect of age and sex on object play behaviour of chimpanzees (*Pan troglodytes*) in a sanctuary environment**

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Primates living in socially complex groups that create and use tools often engage in a high frequency of different types of play, which develops physical and social skills required for adult life. Object play,

a precursor to tool use, is evident in chimpanzees (*Pan troglodytes*) from an early age, both in and ex-situ. Female chimpanzees use tools more frequently, effectively and often learn from their mother at an early age unlike males. Understanding the effect of sex and age on object play could help us to understand more about differences in tool use behaviours with implications for other toolusing primates including humans. Five months behavioural data from three enclosures were collected using focal sampling at Chimfunshi Wildlife Orphanage, Zambia. All age categories were represented (n=86, F=50, M=35, UNK =1) and objects played with were natural and man-made (n=28). A generalised linear mixed model was used to ascertain whether an individual's age or sex affected object play frequency. Males played twice as much as females and more aggressively, feasibly related to adult sex-specific roles. Juveniles and infants played more than other age categories and whilst adult play was observed this was female-biased. If object play patterns are reflected in adult tool use this could help sanctuaries provide appropriate enrichment to develop applicable tool use for sub-species and increase our understanding of tool use development in primates however further research is required.

Poster 17

Martina Stocker[1,2], Leonie C. den Ouden[3], Jan Langermans[1], Jorg J.M. Massen[3] **- 2D:4D ratio in long-tailed macaques - not sexually dimorphic but stable during growth**

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It has been proposed that the second-to-fourth digit ratio (2D:4D ratio) reflects prenatal androgen exposure, with high *in utero* androgen concentrations causing low 2D:4D ratios. Therefore, the 2D:4D ratio is often used as a biomarker in correlational studies analysing associations between prenatal androgen exposure and behavioural traits as well as health related issues. In humans, the digit ratio is generally found to be sexual dimorphic, with men exhibiting lower 2D:4D ratios than women. However, literature suggests that the human 2D:4D ratio is not stable during postnatal development, making inferences about prenatal exposure levels difficult. In non-human primates, not much is known about the 2D:4D ratio due to a limited feasibility of digit measurements. This study, therefore, tests if the 2D:4D ratio of long-tailed macaques (*Macaca fascicularis*) is, like observed in humans, sexually dimorphic and unstable during a period of growth. During annual health check-ups at the Biomedical Primate Research Centre (NL) in 2018, we scanned the hands of 142 individuals (95 females, 47 males). 40 of these individuals were also examined in 2016 when they were still juvenile/sub-adult allowing us to determine the stability of the 2D:4D ratio during growth. Digit lengths were measured in Photoshop. We found no sexual dimorphism in the 2D:4D ratios of the long-tailed macaques. However, in contrast to humans, the 2D:4D ratio of the long-tailed macaques appeared to be rather stable during a period of growth. This study adds to the little knowledge about 2D:4D ratios in primates so far and to the general understanding of the use of the 2D:4D ratio as a proxy for the effects of prenatal androgen exposure.

Poster 18

Mathilde Grampp[1,2,3], Patrick Tkaczynski[1,2], José Julian **Leon Ortega[4,5]**, Catherine Crockford[1,2,3], Roman M. Wittig[1,2,3] - **Investigating the link between behavioural flexibility and social complexity in two sympatric primate species**

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The social intelligence hypothesis posits that more complex social environments require greater behavioural flexibility and communicative skills for individuals to more effectively manage their social interactions. To examine this hypothesis, we used ~3000h of behavioural observations of two groups of chimpanzees (38 individuals) and of mangabeys (51 individuals) from the Taï forest Ivory Coast.

Compared to mangabeys, chimpanzees display high fission-fusion dynamics, making it more challenging to anticipate the behaviours of social partners, and thus creating higher social uncertainty. We used a within and between species approach, collected signalling behaviours in dyadic approaches with socio-positive, tolerant and negative outcomes. We contrasted approaches during stable social contexts with those with greater social complexity (post-conflict, fusion and inter-party communication events, related to social uncertainty and social cohesion needs). We found that the use of combinations of different signal sensory modalities and categories depend on the complexity of the social context and the dyadic relationship between the approach partners (composite sociality index and dominance rank difference). We discuss our results with reference to the species differences in social systems and argue that fission-fusion dynamics in chimpanzees are an important driver of behavioural flexibility, and potentially social cognition, providing some support for the social intelligence hypothesis.

Poster 19

Shannon Slater-Johnson[1], Florence Rocque[1], Edwin van Leeuwen[1], Marina Davila-Ross[1] - **Social relationships in orangutans in rehabilitation, applying social network analysis and examining change over a 16 month period**

1. University of Portsmouth

Increasing our understanding of rehabilitant orangutans' social networks is vital as social relationships play a key role in the rehabilitation process. This study examines the social network of a group of 20 rehabilitant orangutans at Sepilok Orangutan Rehabilitation Centre and its stability over a 16-month period. One metre proximity data was used to create association networks and conduct social network analysis. Association rates varied, with some orangutans being more social than others. Centrality measures were used to compare the network across four time periods from April 2016 to July 2017. The social network varied across time periods demonstrating flexibility, with the most central individual changing per time period and significant differences in degree centrality (number of associations) and closeness centrality (closeness to others) between time periods. Following the introduction of a new group member associations increased significantly, suggesting changes in group membership may affect orangutan's social networks. Rehabilitation stage correlated with association and centrality measures, suggesting those in the earlier stages of rehabilitation were more social than those who had been in the semi wild stage of rehabilitation for a longer time. This study suggests the social network of orangutans in rehabilitation is flexible over short periods of time, echoing wild behaviour, with sociability declining as orangutans progress through the rehabilitation process.

Poster 20

Luca Di Vincenzo[1] - **Meta-representation in primates: a proposal for a multimodal approach in the study of language recursiveness**

1. Sapienza University of Rome

According to the representational theory of mind, the ability to monitor and control one's own cognitive states (meta-cognition), and the ability to monitor the others' mental states (theory of mind), are closely related to the conceptual ability to articulate representations in propositional form (meta-representation). Meta-representation, in order to be manifested, requires a language composed of hierarchically complex symbol systems which would allow the application of recursive rules to propositions. The lack of recursive language in primates still leads a huge number of researchers to argue that it is impossible for these animals to engage in both meta-cognitive or theory of mind activities. However, studies that state this impossibility are carried out with a unimodal approach and focus mainly on vocal and gestural signals, despite the fact that primates have a language that exploits different sensory channels and uses a wide range of signals (e.g. olfactory, tactile, gestural, facial and vocal). The aim of this research is proposing a study of language based on a multimodal approach and assisted by AI algorithms able to find correlations in the whole range of signals. This approach could

show evidence of recursiveness not within a single language channel, but within the entire communicative overall of primates, allowing to assign them both metacognitive and theory of mind abilities, so far considered as a prerogative of human species.

Poster 21

Juan Pablo Pimiento Valencia [1], Vedrana Šlipogor[1,2], Jorg JM Massen[1,3], Thomas Bugnyar[1] - **How do common marmoset respond to different video stimuli? A comparison between self, other and object**

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In 1970 Gordon Gallup showed that chimpanzees recognize themselves in the mirror as humans do. Since then, self-recognition has been increasingly studied. Previous research showed that apes passed the mirror mark-test, and both apes and some monkey species can discriminate conspecifics through visual stimuli (photos, digital images, and video). Nevertheless, this ability is still in debate, as mirror mark-test has been criticized and other designs had some methodological flaws. Our aim was to see whether common marmosets (*Callithrix jacchus*), a New World monkey species, show a different response according to the content in video, either from themselves or from conspecifics. We studied the behavioral reactions of 13 subjects to series of video displays: a self-live video (mirrored), a pre-recorded video of self, a video of an unfamiliar same-sex conspecific and a video of a moving object marmoset alike in color, pattern and size. We found that the subjects paid most attention to the control object condition, showed most fear responses towards the self-live condition, showed most aggressive reactions towards the unfamiliar conspecific and emitted most contact calls in the self-live condition. We will discuss the increased interest in the control object, avoidance of the visual gaze, territoriality, and discrimination between social and nonsocial condition. Our findings support the use of video tools in primate research and call for further questions in self-recognition.

Poster 22

Sara Cardoso[1], R. Adriana Hernandez-Aguilar[2,3], Laia Dotras[3], Nadia Mirghani[3], Manuel Llana[3], A. Barciela[3], Jordi G[4] - **Measuring body size of wild chimpanzees from camera trap photographs using a photogrammetric technique**

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Assessment of chimpanzee physical traits in their natural habitats is rare even though studies of growth and physical development contribute to a better understanding of their lifehistory. Recent studies have concluded that photogrammetry is a useful, non-invasive technique for obtaining measures of animal body parts remotely. In this study, we validated a photogrammetric technique using camera trap video footage for non-invasively measuring morphological traits in a wild population of *Pan troglodytes verus* living in a savanna habitat in Dindefelo, Senegal. Using a natural, nonvariable and permanent structure located within the camera trap frame as a scale, we were able to take back width (shoulder to shoulder, N=14) and body length (shoulder to rump, N=53) measurements in a standard position. Mean values of both measurements by age-class categories (infant, juvenile, subadult and adult) showed very low coefficient of variation, ranging from 0.0068 to 0.1830 (mean value=0.0666). We obtained reliable body size measurements for this chimpanzee population and detected significant differences between age classes for both measurements. We also found that adult chimpanzees showed higher percentage of sexual dimorphism for back width (19%) than for body length (6%). We concluded that this technique may have a great potential to measure body size in wild chimpanzees. Future research should consider individual identification of chimpanzees to allow for more precise results.

Poster 23

Marion Varga[1], Vedrana Šlipogor[1,2], Thomas Bugnyar[1] - **Individual differences in problem-solving in common marmosets (*Callithrix jacchus*)**

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Confronting animals with a novel problem and measuring their behavioral responses is one of the key methods to investigate intra- and interspecific variation. Recent research suggests that different personalities may have different problem-solving strategies. In this study, we aimed to explore the link between consistent inter-individual behavioral responses and performance in cognitive tasks by testing 26 common marmosets with three extractive foraging tasks (slide door, pull on string, press lever) using a test battery apparatus (TBA). We confronted individuals first with one opening mechanism per trial and then all three mechanisms simultaneously. We recorded the monkeys' approach latencies, stressand attention-related behaviors, and amount of time manipulating each mechanism. We predicted bolder, less neophobic, and more persistent individuals to have a higher success rate and shorter opening latency. We found an unexpected discrepancy in success of solving the TBA problems: half of the monkeys opened the TBA by using the "slide" mechanism, one individual opened the "pull" mechanism and none opened it by using the "lever". The observed floor effect in two out of three tasks restricted further analyses. Yet, we discuss our findings in relation to results from previously conducted personality studies on the same monkeys.

Poster 24

Fabio Crepaldi[1], Leanne Proops[1], Florence Rocque[1], Marina Davila-Ross[1] - **Examining orangutan's open-mouth faces during play and their relationship to friendship**

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Laugh faces play a crucial part in human nonverbal communication. They are used to build/maintain social relationships, and to judge the trustworthiness of others. However, one of their most important role is during playful interactions. Although data on nonhuman primate play expressions are increasing, little is known about their social use. In this study, we tested if orangutans (Pongo pygmaeus) produce the same type of openmouth/ play faces when interacting with friends compared to non-friends. Almost 200 dyadic play bouts of 17 individuals of different ages and sex were considered. We coded 327 play faces using OrangFACS, a tool that allows to identify the single muscles (Action Units) involved in a facial expression. We also coded possible confounds such as play intensity, biting, replication, gaze direction and age/sex of the individuals. Using almost 1500 videos, we then assessed the degree of friendship by coding social proximity at 1 meter. GLMMs analysis showed a strong correlation between a dyads' degree of friendship and the facial expressions complexity (i.e. number of AUs). Furthermore, the number of AUs was higher during intense play, and when older individuals played with younger ones. Our results provide evidence that play faces are correlated to social contexts in orangutans too and may be more complex among friends, suggesting a degree of flexibility previously not observed in this species, and perhaps as old as our last common ancestor with the genus Pongo.

Poster 25

Charlotte Kluiver[1], Jorg Massen[1], Debottam Bhattacharjee[1] - **Can inter-individual differences predict time-activity budget of liontailed macaques?**

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A wide range of species are forced to adapt to continuously changing habitats as a result of increasing anthropogenic activities. The situation can be more challenging for habitat specialists, i.e. species that thrive in specific habitat characteristics. The lion-tailed macaque (Macaca silenus) is an endangered and habitat specialist species experiencing severe anthropogenic pressure, resulting in habitat loss.

Consequently, novel behavioural strategies (both social and non-social) have been employed to overcome adversities. The strategies include altered time-activity budgets and affiliative-aggressive social interactions. However, the underlying mechanisms influencing such altered behaviours remain largely unknown. We highlight the importance of personalities in predicting behavioural changes in lion-tailed macaques. Using a multimethod approach of long-term behavioural observations and experiments, we determined the personality traits of macaques from two captive groups. Furthermore, we examined whether the observed traits match with macaques from the wild while predicting their behavioural strategies. The comparative approach may provide us with a better understanding of the processes of adaptation to changing habitats, vital to effective species conservation. Keywords: Lion-tailed macaques, anthropogenic pressure, personality, time-activity budget, habitat loss, conservation.

Poster 26

Stephanie Kordon[1], Christine Webb[2], Frans BM de Waal[3], Zanna Clay[1] - **Predictors of life success in sanctuary housed bonobos: A longitudinal approach investigating links among rearing, socioemotional skills, health and survivability**

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The early life trauma of maternal loss can have detrimental long-term effects in apes. There is evidence that maternal loss affects the fitness of orphan apes in the wild. Moreover, young orphaned bonobos in a forested sanctuary in DR Congo show deficiencies in their socio-emotional and empathic competences. Some of these rehabilitated individuals appear to face difficulties across development while others demonstrate strong social skills and good health. However, these differences in sanctuary housed bonobos have never been investigated systematically. The present study aims to longitudinally investigate whether socio-emotional and empathic competence varies depending on early life rearing environment (i.e. mother-reared or orphaned) and how this changes across age. Furthermore, we will longitudinally investigate additional underlying factors of empathic and socio-emotional competences and their implications for individual health and survivability. By integrating behavioural observations taken at multiple time points across these individuals' lives along with veterinary records and ethnographic reports, we will investigate which underlying factors may facilitate or inhibit successful life outcomes in sanctuary-housed bonobos. The present study has the potential to provide important insight into healthy social functioning of rehabilitated orphaned bonobos and to provide useful information for the sanctuary to maximise the likelihood of successful rehabilitation efforts.

Poster 27

Laura van Holstein[1], Hannah McKay[1], Kathelijne Koops[2] - **Technological Red Queen: Primate technology and interspecific competition**

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Interspecific competition for niche space was likely a major selective pressure for tool use in hominins [1]. In the 'Technological Red Queen' project, we explore whether this relationship is unique to our lineage, or common to all tool-using primates. Most primate tool use is subsistence-related, and its taxonomic distribution is not explained by cognition or ecology alone [2], patterns consistent with a relationship between tool use and interspecific competition. However, whether interspecific competition drove the evolution of primate tool use has received little empirical attention to date. The evolutionary link between interspecific competition and tool use is the competition for ecological niches. Previous work [e.g. 3] uses relatively simple proxies for primate niches – body size, dietary "types", or climate data – but these do not fully capture all dimensions of a niche. The first step in our project is to quantify a novel, multivariate measure of niche space (composite niche space, "CNS") for all primates. Here, we introduce the CNS measure and calculate it for all extant primates. We discuss

the implications of its phylogenetic distribution and outline its potential applications in primate evolutionary biology.

Poster 28

Judit J. Stolla[1,2], Carina Bruchmann[1,2], Julia Fischer[1,2,3], Stefanie Keupp[1,2,3] - **The "Model/Rival" training method with long-tailed macaques (*Macaca fascicularis*)**

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Animals learn about their environments by individual and social learning. The presence and behavior of conspecifics affects individuals' behavior and attention in wild and captive settings. The "Model/Rival" (M/R) training method makes use of this: trainees learn the desired responses in interactive settings, where an agent models the desired response and simultaneously acts as a rival for the experimenter's attention. Here, we adapted the M/R technique to teach long-tailed macaques two behaviors for a behavioral study: (i) pulling a lever and (ii) exchanging tokens with the experimenter. As two of our subjects failed to learn pulling the lever, we hoped that M/R training would help them understand the task. Indeed, in our preliminary data, probability to pull increased from 5.5% to 49.1%. We also assessed the efficacy of the M/R method compared to individual learning in a token-exchange task. Four naïve monkeys received both training types with order of Alone and M/R condition counterbalanced between subjects. We found that subjects profited from the M/R method and were more likely to exchange tokens after having received the M/R condition (Exchange probability for subjects with order M/R-Alone: Cond1=20.4%, Cond2=72.5%, for subjects with order Alone-M/R: Cond1=1.7%, Cond2=36.7%). Taken together, we found the M/R method to be an effective tool to improve learning and performance in two tasks and encourage to study the implementation of social learning in training settings.

Poster 29

A.M. Schel[1], S. Kordon[1,2], E.H.M. Sterck[1,3] - **Intentional gestural communication in two macaque species with different social organizations: a test of the social complexity hypothesis for communication.**

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Following the 'social complexity hypothesis' for communication, tolerant species living in complex social societies are expected to show more communicative complexity compared to more despotic species living in less complex social societies. Communicative complexity can be established by measuring repertoire size and by assessing to what extent complex cognitive capacities like intentionality underlie communicative interactions. We present comparative data on the intentionality of the intra-specific gestural communication of the highly despotic rhesus macaque (*Macaca mulatta,* N=19 individuals) and less despotic long-tailed macaque (*M. fascicularis,* N=17 individuals) that live in naturalistic captive groups at the BPRC, Rijswijk, the Netherlands. By applying methods originally developed in ape gesture work, we determined whether the monkeys used specific 'markers of intentionality' during gesture production. Both rhesus and long-tailed macaques used 11 different gesture types in intentional ways. In both species, gesture production was characterized by several markers of intentionality, i.e. sensitivity to the recipient's attentional state, adjustment to audience effects, and goal persistence in case of communicative failure. Since the two monkey species showed similar levels of communicative complexity, our study either does not support the social complexity hypothesis for communication, or suggests that these monkeys' social systems are more similar than generally assumed.

Poster 30

da Cruz, Débora L.[1,2], Araújo, Arrilton[1], Burkart, Judith M. [2] - **The presence of infants affects food associated calls in wild marmosets: implications for intentional communication**

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Food-associated calls are widespread among primate communication. In cooperative breeders, these calls may indicate high proactivity in sharing resources with other group members and be under some intentional control, especially when infants are in the group. We investigated whether the presence of infants affects food calling in wild *Callithrix jacchus* in an experimental series in which marmosets would encounter food in diverse quantity and quality, both in periods where infants were present or not. We evaluated the latency to call, time feeding, and the number of calls emitted by the first animal to find the food. We found that male helpers, in contrast to other group members, had the most conspicuous behavior during feeding experiments. They decreased both their latency to call and time consuming food while increasing call production when the group had infants. This effect was independent from both type and quantity of food presented, indicating that males' behaviors were not driven solely by arousal after facing food or by the increased risk of competition, but most affected by infant presence. Our results are consistent with *C. jacchus*' proactive prosociality and males' prominent role in infant care. Moreover, these audience effects which are independent of the feeding motivation and arousal satisfy a key criterion of intentional communication.

Poster 31

Charlotte Canteloup[1,2], Joonho Lee[3], Samuel Zimmermann[3], Marco Hutter[3] *, Erica van de Waal[1,2] * - **When monkeys meet an ANYmal robot in the wild**

1. Department of Ecology and Evolution, University of Lausanne, Switzerland; 2. Inkawu Vervet Project, KwaZulu-Natal, South Africa; 3. Robotic Systems Lab, ETH Zürich, Switzerland; * co-last authors

Robots have an increasingly important place in our society: we rely on computers and artificial intelligence algorithms to take decisions. No behavioral study to date has tested the social integration of a robot in a wild group of primates. To fill this gap, we investigated the interactions between an animal robot, the quadruped ANYmal, and wild vervet monkeys. We introduced this robot to a group of 37 wild vervet monkeys within the Inkawu Vervet Project in South Africa. The ANYmal robot is a remotely controlled sheep-sized quadruped robot with an open box on its back filled with corn and apple pieces. We brought it to the field 9 times over 6 days for about 10h. We introduced the robot following different steps: i) the robot was laying down on the ground surrounded by food on the ground ii) the robot was stably standing up quadruped surrounded by food on the ground; iii) the robot was slightly moving while standing up with no food on the ground iv) the robot was slightly moving its body and its head while standing up with no food on the ground. We filmed the sessions, and we are currently analyzing the videos to record the reaction of the monkeys to the robot, the identity of the monkeys and spatial proximity networks around the robot. The next step will be to test whether monkeys create bonds with the robot, trust knowledge and learn from the robot. This pilot study offers exciting perspectives on the phenomena of social acceptance of machines in mammal societies.

Poster 32

Sandra Roubos[1], Annet L Louwerse[1], Jan AM Langermans[1,2], Jaco Bakker[1] - **Longterm and reversible contraception in female common marmosets (*Callithrix jacchus*)**

1. Animal Science Department, Biomedical Primate Research Centre, Lange Kleiweg 161, 2288GJ Rijswijk, The Netherlands; 2. Department Population Health Sciences, Animals in Science and Society, Faculty of Veterinary Medicine, Utrecht University, 3584 CM Utrecht, The Netherlands

Common marmosets have a relatively high reproductive efficiency in captivity. They are sexually mature at about 14-18 months, usually give birth to twins or triplets, conceive within 10-20 days after giving birth (resulting in two births yearly) and breed until the end of their lifespan. Due to this breeding success, zoos and sanctuaries need to achieve a balance between maintaining a sustainable population

while preventing breeding of surplus animals. Population control can be achieved by long-acting reversible contraceptives, as they eliminate the logistical problems associated with daily or weekly administration of oral or injectable contraceptives, with the advantage that group composition can stay intact. Implanon® (etonogestrel), a human progestin-based contraceptive, has those benefits. However, no efficacy data are available in marmosets. We conducted a retrospective longitudinal cohort study, using electronic health records, on the use of subcutaneous inserted etonogestrel implants and the number of parturitions, interbirth interval, litter size, body weight, stillbirths, pathology (if available) and unintended pregnancies in 52 female marmosets. Our data show that etonogestrel is safe, reliable, efficient (99.3%), effective up to 3 years and reversible in marmosets. In pregnant animals, the implant did not interfere with parturition. Based on our results we recommend implant insertion to be at the last stage of pregnancy and up to three days postpartum.

Poster 33

Maria A. van Noordwijk[1], C. Ackermann[1], A.M. Marzec[1], J.A. Kunz[1], B. Spillmann[1], L.R. LaBarge[2], E.R. Vogel[3], S.S. Utami Atmoko[4] - **Siring success clustered in space but not time in male Bornean orangutans**

1. University of Zürich; 2. Max Planck Institute of Animal Behavior; 3. Rutgers University; 4. Universitas Nasional, Jakarta; 5. IPB University, Bogor

Whereas female orangutans settle and maintain home ranges close to where they were born, males disperse and subsequently range widely. In the Tuanan population of Bornean orangutans (*Pongo pygmaeus wurmbii*; Central Kalimantan) >75 individually recognized adult males were seen in the 1000 ha study area for intermittent and mostly brief periods. Based on 15 years (2003- 2018) of observations and noninvasive fecal sampling, we established the unique genetic identity of 129 individuals (including 66 adult males) to disentangle their relatedness. Based on 15-20 microsatellite loci, and allowing a maximum of two mismatches for the trio of mother-offspringsire, we assigned the following paternities: 10 from among 15 genotyped infants born since 2003, 7 offspring born earlier as well as 4 immatures without genotyped mother, all at >95% confidence. Only one sire was known to be still unflanged at the time of siring. Overall, 6 males sired a single offspring and 5 sired 2-4 infants spread over at least 12 years. Within the Tuanan site, known multiple sirings by the same male seemed clustered in a limited area, although sires all ranged over much larger areas. This suggests that, despite their seemingly unpredictable ranging pattern, successful males retain consistent limited core areas and/or maintain special relationships with only a few females with adjacent or overlapping ranges.

Poster 34

Elisabeth HM Sterck[1,2], Han de Vries[1], Tonko W Zijlstra[1,3,4] - **Gaining and maintaining friends: a computer model of primate bonding**

1. Animal Behaviour & Cognition, Utrecht University; Utrecht, the Netherlands; 2. Animal Science Department, Biomedical Primate Research Centre, Rijswijk, the Netherlands; 3. Cognitive Psychology Unit, Institute of Psychology, Leiden University, Leiden, the Netherlands; 4. Leiden Institute for Brain and Cognition (LIBC), Leiden, the Netherlands

Bonds (or good relationships or friendships) are long-term mutually friendly interactions among specific group members. Bonds are found in many primate species and have been shown to provide fitness benefits. At the proximate level, this begs the question how these bonds are gained and maintained. To this end, agent-based computer models are an excellent tool, since these allow the exploration of the link between internal emotional processes and behavioural outcomes. With the agent-based EMO-model, we explored the connection between two types of internal emotional processes directing grooming partner choice which in turn determine group level patterns in gaining and maintaining of bonds. The internal processes that at a low bond strength do not promote partner choice of recent grooming partners, but that enhance such partner choice at high bond strength, lead to stronger and more differentiated bonds than the internal process that is neutral to bond strength. Bond formation is especially strong and stable when these internal processes do not quickly update

partner choice preferences. Thus, bonds are strongest and most differentiated when friends are gained slowly, but are long remembered.
PLoS ONE 16(4): e0249519. https://doi.org/10.1371/journal.pone.0249519

Poster 35

Roman Akyüz[1,2] - **Contagious yawning towards in versus outgroup members in chimpanzees**
1. University of St. Andrews; 2. Leiden University

The present evolutionary study sought to test the purported link between contagious yawning (CY) and empathy in chimpanzees. A total of n = 12 chimpanzees watched video stimuli of chimpanzees (ingroup versus outgroup members) yawning. The researcher wanted to measure contagious yawning (CY) in order to determine whether chimpanzees, closest living evolutionary relatives of humans, elicit more yawn contagion towards ingroup members (kin) than outgroup members (non-kin). The study failed to elicit yawn contagion, and thus, self-directed behaviours (SDBs) such as scratching, were coded instead. The underlying rationale for this was the fact that; (1) the researcher had noticed early in the study that the subjects were scratching themselves differentially to the video stimuli, and that; (2) self-directed behaviours have been shown to correlate with anxiety-producing situations, such as being within close proximity to conspecifics. The results show that there was no significant effect of group membership and gender on observed self-directed behaviour (=scratching) in subjects. Similarly, there was no significant effect of gender alone in relation to scratching behaviour in subjects. However, there was an interaction effect of group membership alone on scratching behaviour. The results regarding higher rates in scratching behaviour upon viewing familiar conspecifics, especially when compared to the outgroup stimuli, are unexpected.

Poster 36

Nanine de Groot[1], Annemiek J.M. de Vos-Rouweler[1], Annet Louwerse[2], Jan A.M. Langermans[2,3], Jesse Bruijnesteijn[1], Natasja G. de Groot[1], Ronald E. Bontrop[1,4] - **Genetic assays as tool for conservation management of non-human primate species**
1. Department of Comparative Genetics and Refinement, Biomedical Primate Research Centre, Rijswijk, The Netherlands; 2. Department of Animal Science, Biomedical Primate Research Centre, Rijswijk, The Netherlands; 3. Department of Population Health Sciences, University of Utrecht, Utrecht, The Netherlands; 4. Department of Theoretical Biology and Bioinformatics, University of Utrecht, Utrecht, The Netherlands

Genetic diversity of immune response genes within a population is of great importance to minimize the possibility that a population is wiped out by one pathogen. In addition, knowledge on parentage and geographic origin of a species may benefit colony management, and opens ways to controlled exchanges between different populations, for instance to prevent inbreeding. In the past two decades we have developed several sophisticated assays that can be used to characterize the genetic diversity in great ape, OWM, NWM, and lemur species. One of the assays enables a quick and robust characterization of the major histocompatibility complex (MHC) DRB profile. The genomic MHC region is highly polymorphic and polygenic, and encodes molecules that play a crucial role in immune responses. Our characterization technique has proven to be widely applicable to multiple species, and can be used to maintain an outbred population by managing the colony composition. Next to invasive techniques, such as drawing blood, this protocol can also be applied using DNA obtained from non-invasive derived material, such as hair and feces. Furthermore, assays were established and validated for origin determination by mitochondrial DNA analysis as well as for parentage definition by selecting for up to 23 different microsatellites in OWM and great apes. In conclusion, the assays provide excellent tools to optimize the conservation management of captive and free-ranging non-human primates.

Poster 37

Lena S. Pflüger[1,2], Richard L. Hahn[1,3], Johanna M. Schulz[1], Jana Jäckels[1], Martin Hofer[4], Helmut Schaschl[3], Bernard Wallner[1,2] - **Non-invasive mRNA extraction for gene expression profiling in semi-free ranging Japanese macaques (*Macaca fuscata*)**

1. Department of Behavioral and Cognitive Biology, University of Vienna, Djerassiplatz 1, 1030 Vienna, Austria; 2. Austrian Research Center for Primatology, Ossiach 16, 9570 Ossiach, Austria; 3. Department of Evolutionary Anthropology, University of Vienna, Djerassiplatz 1, 1030 Vienna, Austria; 4. Genomics Core Facility, VetCore, University of Veterinary Medicine, Veterinaerplatz 1, 1210 Vienna, Austria

Animal behavior is shaped by several extrinsic and intrinsic factors and their interplay. Molecular genetics helps in unpuzzling this complex trait, for example by studying functional gene polymorphisms linked to endocrine functions. To investigate the influence of genotype on physiology, behavior and/or cognition there is need to enlarge the understanding on how genes are behaving at a certain point in time. Gene expression profiling holds this information but centers a highly fragile molecule, the mRNA. While non-invasive methods for genotyping wild primate populations are well established, mRNA quantification received only little attention in field studies so far. We developed a novel saliva-based protocol for (m)RNA collection, extraction and quantification established in a semi-free ranging group of Japanese macaques (Macaca fuscata, Affenberg Landskron, Austria). Saliva was collected using a cotton swab attached to a fishing line and drenched in cherry sirup as an attractant. We successfully habituated N=10 adult females and N=24 adult males to the process. After extraction of (m)RNA, cDNA synthesis was performed for subsequent reverse transcription (RT) qPCR and storage of samples. Reference gene analysis (GAPDH, ACTB, RPL13a) revealed sufficient RT-Cq values (21.28 - 28.13) underlying the effectiveness of our protocol. Our protocol will be used to study the expression profile of HPA-axis related genes, e.g., MAOA and COMT.

Poster 38

Emily Elwell[1], Joshua Cox[1], Elysse Lloyd[1], Stefano Kaburu[2], Christopher Young[1], Stefano Vaglio[1,3] - **A novel scent enrichment to trigger mating behaviour in ruffed lemurs**

1. Department of Biology, Chemistry and Forensic Science, University of Wolverhampton, Wolverhampton, UK; 2. Department of Biomedical Science and Physiology, University of Wolverhampton, Wolverhampton, UK; 3. Behaviour, Ecology and Evolution Research (BEER) Centre, Durham University, Durham, UK

Modern zoos play an important role in contributing to the conservation of endangered lemurs through ex situ breeding and in situ reintroduction programmes. However, the mismatch between the zoo and wild environment can cause problems, such as stress and boredom which can in turn impact upon breeding success. Lemurs communicate via scents, including for signalling reproductive status, but sensory enrichments have not been used extensively to enhance zoo-housed lemur welfare and reproduction. This project aims to examine the effects of a biologically-relevant scent enrichment on captive ruffed lemurs (*Varecia* spp.). We investigated fertile and non-fertile ano-genital odour profiles from a female red-ruffed lemur (*V. rubra*) via solid-phase microextraction and gaschromatography-mass-spectrometry. We identified a total of 12 volatile chemical compounds as playing a key role in signalling fertility and then used these to synthesize the female fertile odour mixture to act as a scent enrichment. We presented the enrichment to red-ruffed and black-and-white-ruffed lemurs (*V. variegata*) at Dudley and Twycross Zoos. We assessed the effects of this enrichment using behavioural observations paired with faecal hormone measurements. Our preliminary findings indicate that this novel scent enrichment may trigger sexual behaviours in male lemurs, thus showing potential to impact positively on captive lemur breeding programmes.

Poster 39

Marie Padberg[1], Eckert, J.[1], Thiele, M.[1], Wang, D.[4], Howart, L .H. [2], Grosse Wiesmann, C.[3], Haun, D.B.M.[1]
- **Don't You (Forget About Me) – The developmental trajectory of the social memory effect in great apes**

1. Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; 2. Franklin & Marshall College, Lancaster, United States; 3. Max-Planck-Institut für Kognitions- und Neurowissenschaften, Leipzig, Germany; 4. UniSA STEM, University of South Australia, Mawson Lakes, Australia

Social context enhances encoding of objects in primates, including humans. In a study with infants, 9-mo processed a block tower better when it was built by a social compared to a nonsocial agent (Howard & Woodward, 2019). The same effect was found in adult primates (Howard et al., 2017, 2018). In extending these findings, the current study aims to investigate the social memory effect in chimpanzees, gorillas, orangutans and bonobos ontogenetically (infancy to adulthood). Similar to the paradigm by Howard & colleagues, great apes are familiarized with videos of a social (hand) vs. a non-social (claw) model building a block tower. In a subsequent preferential-looking phase, the familiarized tower is presented next to a novel tower. As a measure of stimulus encoding, we use the proportional looking time at the novel tower. We assume that a greater novelty response indicates enhanced processing of the familiarized stimulus. Furthermore, we aim to investigate how longlasting this effect is by retesting the novelty preference after a delay of two days. Data collection is ongoing; we are planning to present data of 21 chimpanzees at the conference. Additionally, we will investigate the physiological basis of the effect by measuring the participants' heart rate before and during stimulus presentation with a contact-free measurement. With this project we hope to better understand how social context influences memory in great apes during development.

Poster 40

Leonie Pethig[1,2], Peter Kappeler[1,2], Claudia Fichtel[1] - **Sex-specific drivers of an unusual adult sex ratio in redfronted lemurs (*Eulemur rufifrons*)**

1. Behavioral Ecology & Sociobiology Unit, German Primate Center; 2. Department of Sociobiology/Anthropology, University of Göttingen

In most mammalian species, including humans, males and females exhibit age-specific survival, usually resulting in female-biased adult sex ratios (ASR). Data on age and sex-related variation in health and survival can reveal fundamental sex differences in biological adaptations, but such data are extremely scarce for wild populations and unavailable for species with unbiased ASRs. The main objectives of our study are (i) to determine age- and sex-specific survival patterns for a wild redfronted lemur population with, on average, even ASR, and to assess (ii) variation in intrinsic determinants of health and survival, as well as (iii) extrinsic mechanisms that contribute to survival to understand the dynamics of their sex ratios from birth to death. We will therefore combine long-term demographic data, hormonal, genetic and behavioral data from previous studies, and new physiological, and behavioral data. By examining sex- and age-related variation in survival, immunocompetence, parasitism, frailty, social buffering and risk-taking, our study will be among the first to investigate the adaptive significance and proximate mechanisms underlying sex differences in health and survival in a wild primate population. As such, it will also contribute comparative perspectives for a better understanding of the human male-female health-survival paradox as well as constitute one of the most comprehensive analyses of the drivers of sex ratio variation across the lifespan in wild mammals.

Poster 41

Georgia Sandars[1], Jake Brooker[1], Zanna Clay[1] - **The significance of positive behavioural contagion in chimpanzees**

1. Durham University, UK

Behavioural contagion is the onset of a species-typical behaviour soon after witnessing it in a conspecific. This facilitates emotional contagion, forming a core mechanistic basis for empathy, and

enables animals to synchronise their behaviour, allowing for cohesive group living. The sharing of positive emotions in particular is key for social affiliation and may be influenced by different factors to negative contagion, with distinct evolutionary advantages. However, most past research has focused on negative emotions or neutral contexts. Here, we explore whether chimpanzees demonstrate contagion of social behaviours associated with positive emotion (grooming and play), and how this relates to social integration and relationships. We collected naturalistic observations of 47 sanctuaryliving chimpanzees at Chimfunshi Wildlife Orphanage (logging 237 hours of observation). Upon the initiation of grooming and play bouts, we took 5-min focal follows of those who observed the behaviour, and paired these follows with matched controls. Presence of behavioural contagion was tested using a Wilcoxon matched pairs test. The social factors moderating the effect and its link to social integration were then explored using Generalised Linear Mixed Models in R. Studying what influences this foundational empathic process, and its significance for social integration, deepens our understanding of social bonding and group dynamics, and holds implications for hominin evolution theories.

Poster 42

Julia Lehmann [1], Baptiste Sadoughi[2], Laurent Lacroix[1], Hélène Meunier[3], Colette Berbesquea[1] - **How stressful is social tolerance? An investigation into rank, stress and health measures in two species of macaques**

1. School of Life Sciences, University of Roehampton, London, United Kingdom; 2. Department of Behavioural Ecology, University of Göttingen, Kellnerweg 6, 37077 Göttingen, Germany; 3. Laboratoire de Neurosciences Cognitives et Adaptatives, UMR 7364, Primate Centre of Strasbourg University, Niederhausbergen, France

Rank is often considered a universal driver of health inequalities and individuals of low social rank often suffer more from diseases or have a shorter lifespan. Here we ask how the relationship between rank and health measures varies depending on the social organisation of the species; in other words, is living in a hierarchical society more or less 'stressful' than living in a more tolerant social structure? We collected data on rank, hair cortisol concentration and low-grade inflammation markers in two macaque species with different dominance styles: the egalitarian Tonkean macaque (*Macaca tonkeana*) and the despotic long-tailed macaques (*Macaca fascicularis*) at the Centre of Primatology at Strasbourg University. We found that hair cortisol levels were significantly higher in the egalitarian Tonkean than in the despotic long-tailed macaques. There was no sex difference in cortisol levels but as predicted, hair cortisol increased with age in males. Furthermore, rank stability was a better predictor of health variables than rank, especially in Tonkean macaques. Our results suggest that species differences in dominance styles translate into differences in long-term health measures. We suggest that the higher cortisol concentrations in Tonkean macaques could be linked to instability and lack of predictability and control of social relationships.

Code of Conduct

EFP Code of Conduct Policy

In order to create a safe and healthy environment on our conference, we have created a Code of Conduct Policy, which can be found below.

We obviously hope there will be no issues pertaining to this code of conduct, but for the unfortunate event when there are issues nonetheless, we have appointed two confidants to whom you can address your issues, concerns, or complaints. Obviously, they will treat this with the utmost care and confidentiality.

Confidants:

Julia Ostner
Julia.Ostner@biologie.uni-goettingen.de

Yena Kim
wildlife1984@gmail.com

Code of Conduct

European Federation for Primatology's Commitment to a Safe and Non-threatening Conference Environment

The EFP is dedicated to providing a harassment-free environment. Harassment includes speech and/or actions that are considered to be personally offensive or not welcome. We prohibit any form of harassment, sexual or otherwise, toward any of the participants at our conferences regardless of age, ethnicity, race, gender identity or expression, sexual orientation, religion, ability, marital status, appearance, nationality, language, or any other reason [1]. This policy applies to all participants and guests, as well as any exhibitors, sponsors, and/or supporters that attend, participate in, or exhibit at the bi-annual meeting of the EFP.

The EFP is an all-inclusive federation focused on encouraging all areas of non-human primatological scientific research, facilitating cooperation among scientists of all nationalities engaged in primate research, and promoting the conservation of all primate species. We support and encourage research on primates from undergraduate and graduate students, research scientists and professionals, and university faculty from European institutions, as well as from other countries around the world. As such, we encourage respectful exchanges of ideas, acknowledging that English may not be the first language of participants and that there may be cultural differences in communication styles. We do not condone elitism in words or actions by faculty toward students, by senior to junior professionals, or peers, or among individuals with different levels of expertise.

Acceptable Behavior Policy at the Bi-Annual Meetings and on Social Media

The European Federation for Primatology is founded on open and respectful exchange of ideas, words and actions during the biannual meeting and on EFP social media sites. The Federation will not tolerate inappropriate behavior which includes, but is not limited to:

- inappropriate acts or offensive comments that demean another by means of reference to the individual's ethnicity, gender, character, research interests, race, body size and adornments, clothing style, gender identity, religion, age, English-language proficiency, or disability;
- wanton destruction or vandalism of personal, hotel, or convention center property. Individuals who are currently sanctioned for assault or harassment by an adjudicating institution (e.g., a university where they work or worked) will be excluded from attending the EFP conference and any other EFP - sponsored events.

What is Harassment?

Harassment is defined as systematic or continued, unwelcomed words or actions that include taunts, threats, advances, and demands and may occur in situations where a power differential exists. It applies to our bi-annual conferences and all online spaces in which EFP conference attendees conduct professional business, and also includes EFP-sponsored social events at conferences.

Harassment includes verbal threats, violation of personal space, unwelcomed touching, offensive language that is directed at some aspect of another's physical or emotional presence, stalking and sexual harassment.

Sexual harassment includes unwelcomed sexual advances, demands for sexual favors, or comments made based upon one's gender. Although European laws might not prohibit simple teasing, offhand comments, or isolated incidents that are not very serious, we do not tolerate this at our conferences. Moreover harassment is illegal when it is so frequent or severe that it creates a hostile or offensive environment [2].

Best Practices: Sexual conduct

Participants at an EFP conference are expected to conduct themselves in a manner consistent with applicable civil and criminal laws prohibiting harassment, rape, and sexual assault. Participants at an EFP conference should also be aware of conditions that may lead to vulnerable or threatening situations. Especially, but not exclusively, members holding positions of power should refrain from engaging in sexual relationships with those holding less powerful positions. If you have the ability to exact damage to a colleague's career or they perceive that you could, it is best not to engage sexually. Be aware of power differentials and have special consideration of colleagues at vulnerable career stages including, but not limited to, postdoctoral researchers, research assistants, graduate and undergraduate students, field project participants, and laboratory interns.

Reporting Harassment

Harassment and other code of conduct violations reduce the value of our professional meeting for everyone. Regardless of the source of harassment or whether it occurs in-person or online, if someone makes you or anyone else feel unsafe or unwelcome, or if you are a bystander to such actions, please report it quickly. The "bystander intervention approach" encourages individuals to assess the situation and the perceived level of urgency or danger to the victim, and intervene/say something. You should feel that it is your responsibility to do something and feel confident about intervening [3].

Quick mechanisms to report a harassment complaint:

- support the victim
- speak with one of our confidants
- alert the organizers of the conference (efp-gfp2022arnhem@uu.nl)

Attempts will be made to resolve the situation by speaking with the individuals involved. Confidants and/or EFP representatives will discuss the details first with the individual filing the complaint, then with the alleged offender, and seek counsel if the appropriate course of action is not clear [4]. During their fact-finding effort, EFP representatives will seek to maintain confidentiality as it pertains to both the identity of the individuals and characteristics of the incident. While we recognize that behavior that is acceptable to one person may not be acceptable to another, and that misunderstandings do occur, we will not hesitate to act if asked to address an unsafe, abusive or threatening situation.

Punishment for harassment

Failing to adhere to this policy will result in immediate exclusion from the conference, online event, social events and workshops. If deemed appropriate we will assist any victim of harassment in pressing charges.

Acknowledgments
We thank the APS, and their ad hoc Code of Conduct committee, for allowing us to draw inspiration form their code of conduct policy. We also thank the presidents of the national primate societies in Europa who submitted thoughtful comments on a draft of this policy.

References:
[1] "Forms of harassment" modified from the American Association of Physical Anthropologists (AAPA) Statement on Sexual and Other Harassment (http://physanth.org/about/position-statements/sexual-and-other-harassment/)
[2] https://eige.europa.eu/gender-based-violence/regulatory-and-legal-framework/legal-definitions-in-the- eu#:~:text=Whoever%20forces%20another%20person%20by,months%20up%20to%20five%20years.
[3] Tabachnick, J., 2009. Engaging bystanders in sexual violence prevention. Enola, PA: National Sexual Violence Research Center. (http://www.nsvrc.org/sites/default/files/Publications_NSVRC_Booklets_Engaging-Bystanders-in- Sexual-Violence-Prevention.pdf); also see Section VIII of the AAPA Statement on Sexual and Other Harassment.
[4] AAAS Annual Meeting Code of Conduct (http://meetings.aaas.org/program/code-of-conduct/).

Time tables Busses

3 Burgers Zoo Openl.Museum

breng

Alle bussen op deze lijn zijn toegankelijk voor reizigers met rolstoel, rollator of kinderwagen

Geldig vanaf: 06-03-2022

- halte toegankelijk voor rolstoelen
- Arnhem
- Willemsplein
- Bothaplein
- Jacob Cremerstraat
- Graaf Ottoplein
- Graaf Lodewijkstraat
- Sint Antonielaan
- Heselbergherweg
- Ziekenhuis Rijnstate
- Oremusplein
- Peter van Anrooylaan
- Ravelstraat
- Burgers' Zoo

Maandag t/m vrijdag		Zaterdag		Zon- en feestdagen
	Zomer**		Zomer**	
	58			
6	00 15 30 45 59		58	
7	12 27 42 57	7 09 34	28 58	
8	12 28 44 59	8 04 34	28 43 58	8 58
9	14 29 44 59	9 02 32	13 28 43 58	9 17 28 47 58
10	14 29 44 59	10 02 17 32 47 58	13 28 43 58	10 17 28 47 58
11	14 29 44 59	11 13 28 43 58	13 28 43 58	11 17 28 47 58
12	14 29 44 58	12 13 28 43 58	13 28 43 58	12 17 26 47 56
13	11 26 41 56	13 13 28 43 58	13 28 43 58	13 17 26 47 56
14	11 26 41 56	14 13 28 43 58	13 28 43 58	14 17 26 47 58
15	11 26 41 56	15 13 28 43 58	13 28 43 58	15 17 28 47 58
16	11 26 41 56	16 13 28 43 58	13 28 43 58	16 17 28 47 58
17	11 26 41 56	17 13 28 43	13 28 43 58	17 17 28 47 58
18	16 30 45 58	18 02 17 32 44 59	13 28 43 58	18 17 28 44 58
19	13 31 43	19 14 44	13 43	19 14 44
20	12 42	20 12 42	12 42	20 14 44
21	12 42	21 12 42	12 42	21 14 44
22	12 42	22 12 42	12 42	22 14 44
23	12 42	23 12 42	12 42	23 14 44

** Zomer: 17-07-22 t/m 03-09-22

40004018

3 Het Duifje

breng

Alle bussen op deze lijn zijn toegankelijk voor reizigers met rolstoel, rollator of kinderwagen

Geldig vanaf: 06-03-2022

- halte toegankelijk voor rolstoelen
- Arnhem
- Burgers' Zoo
- Openluchtmuseum West
- Beethovenlaan
- Oremusplein
- Ziekenhuis Rijnstate
- Graaf Ottoplein
- Willemsplein
- Centraal Station
- Willemsplein
- Velperplein
- Stadstheater Arnhem
- Airborneplein
- De Monchyplein
- Stadswaardenlaan
- Het Duifje

Maandag t/m vrijdag		Zaterdag		Zon- en feestdagen
	Zomer**		Zomer**	
6	15 30 45			
7	00 15 30 45	7 23 48	12 42	
8	00 15 30 45	8 18 48	12 42 57a	
9	00 15 30 45	9 16 46	12 27a 42 57a	9 13 32a 43
10	00 15 30 45	10 16 31 46	12 27a 42 57a	10 02a 13 32a 43
11	00 15 30 45	11 01 16 31 46	16 31a 46	11 02a 14 34a 45
12	00 15 30 45	12 01 16 31 46	01a 16 31a 46	12 04a 15 34a 43
13	00 15 30 45	13 01 16 31 46	01a 16 31a 46	13 04a 13 34a 43
14	00 15 30 45	14 01 16 31 46	01a 16 31a 46	14 04a 13 34a 43
15	00 15 30 45	15 01 16 31 46	01a 16 31a 46	15 04a 13 32a 43
16	00 15 30 45	16 01 16 31 46	01a 16 31a 46	16 02a 13 32a 43
17	00 15 30 45	17 01 16 31 46	01a 16 31a 46	17 02a 13 32a 43
18	00 15 32 45	18 01 17 32a 47 59a	01a 16 28a 43	18 02a 13 32a 43
19	02 14 29 46a 57b	19 14 29b 57b	58a	58b
20	27b 57b	20 27b 57b	13 27b 57b	19 13 28b 58b
21	27b 57b	21 27b 57b	27b 57b	20 28b 58b
22	27b 57b	22 27b 57b	27b 57b	21 28b 58b
23	27b 57b	23 27b 57b	27b 57b	22 28b 58b
	27b 57b		27b 57b	23 28b 58b

** Zomer: 17-07-22 t/m 03-09-22

a: Afwijkende bestemming Arnhem CS
b: Afwijkende bestemming Arnhem CS

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