having the capacity to neutralise the effects of envenomations of non-PNG taipans, this antivenom may have the capacity to neutralise coagulotoxins in venom from closely related brown snakes (Pseudonaja spp.) also found in PNG. Consequently, we investigated the cross-reactivity of taipan antivenom across the venoms of all Oxyuranus and Pseudonaja species. In addition, to ascertain differences in venom biochemistry that influence antivenom efficacy variation, we tested for relative cofactor dependence. We found that the new ICP taipan antivenom exhibited high selectivity for Oxyuranus venoms and only low to moderate cross-reactivity with any Pseudonaja venoms. Consistent with this genus level distinction in antivenom efficacy were fundamental differences in the venom biochemistry. Not only were the Pseudonaja venoms significantly more procoagulant, but they were also much less dependent upon the cofactors calcium and phospholipid. There was a strong correlation between antivenom efficacy, clotting time and cofactor dependence. This study sheds light on the structure-function relationships of the procoagulant toxins within these venoms and may have important clinical implications including implications for the design of next-generation antivenoms.

Thursday October 10: 09.20 – 09.45h
Maintaining venomous animal collections: protocols and occupational safety.
For herpetologists, toxinologists, venom producers, and zookeepers, maintenance of a healthy collection of animals for research, venom extraction purposes, and educational outreach is crucial. Proper husbandry practices are a must for ensuring the health of any institution’s collection. In addition to concerns associated with animal health, numerous daily activities associated with the routine care and maintenance of a venomous collection can pose significant risks to employee safety. Not only must proper safety precautions be taken to minimize the risks associated with collection maintenance, but also steps must be taken to minimize stress placed upon the specimens themselves, thus promoting a healthy collection that will sustainably yield the venom required for research.

Friday October 11: 11.35 – 12.10h
Coagulotoxic effects by brown snake (Pseudonaja) and taipan (Oxyuranus) venoms and the efficacy of a new antivenom.
Snakebite is a neglected tropical disease that disproportionately affects the poor. Antivenom is the only specific and effective treatment for snakebite, but its distribution is severely limited by several factors, including the prohibitive cost of some products. Papua New Guinea (PNG) is a snakebite hotspot but the high costs of Australian antivenoms (thousands of dollars per ampoule) makes it unaffordable in PNG. A more economical taipan antivenom has recently been developed at the Instituto Clodomiro Picado (ICP) in Costa Rica for PNG and is currently undergoing clinical trials for the treatment of envenomations by coastal taipans (Oxyuranus scutellatus). In addition to potentially
Joe Wasilewski is very well known in the herpetological community for his work at the IUCN, being both a member of the crocodile specialist group as the iguana specialist group. He currently works on various projects in the Everglades national park as well as Belize, his insights in animal behaviour and ecology has made him a key figure in many species protection programs. In the past Joe has been seen on many prestigious TV shows and is involved in many documentaries.

Thursday October 10: 11.00 – 11.20h
Invasive species of Florida

Friday October 11: 11.00 – 11.35h
Eastern diamond back rattle snakes

Saturday October 12: 09.15 – 09.50h
Joe Wasilewski Invasive species in Florida – a natural history KCC

Dedicated to supporting ecological research and conservation initiatives aimed at determining the status of King Cobras in the wild and identifying threats and solutions for their future survival. We strive to develop a better understanding of the King Cobra’s role within the tropical Asian landscape, as well as their importance in human culture and their impact on the lives of people.
As an undergraduate, Matt studied Prairie Rattlesnake defensive behavior for his honor’s degree in Biology. After graduating, he spent two years in Aruba studying the Aruba Island Rattlesnake. Matt taught high school biology in The Netherlands for several years before returning to the US, where he subsequently completed his MS and PhD at the University of Arizona. Matt has published over 40 peer-reviewed journal articles and book chapters dealing with ecology and conservation of herpetofauna, primarily snakes. Currently, he is a Research Scientist in the School of Natural Resources at the University of Arizona, where he maintains an active research program in the US and internationally. Matt is a member of the IUCN Viper Specialist Group, and he serves as an Associate Editor of the Journal of Wildlife Management. He is also a founding board member and Chief Scientific Advisor to the King Cobra Conservancy, an NGO dedicated to conservation of king cobras and the habitats on which they depend.

**Thursday October 10: 15.25 – 15.45h**

**Ecology and Conservation of King Cobras in India and Southeast Asia**

The king cobra is the world’s longest venomous snake, reaching lengths of up to 5-6 m. These charismatic snakes have long captured the imagination of people throughout the world, putting fear in the hearts of some, while inspiring awe in others. When he began studying King Cobras in India in 2008, there had never been an in-depth study of the species’ ecology in the wild. Using radio telemetry, we learned a great deal about these amazing snakes, publishing several shorter papers on our research. Obviously, with such a small sample size, we needed to do more. We began research on King Cobras in Thailand in 2013. To date, we have radio tracked over 20 individuals, publishing a series of papers based on more robust sample sizes. Our talk will focus on king cobra spatial ecology, habitat use, diet, and reproductive activity, including data from juvenile snakes.

And finally, I will discuss our newly begun research in Indonesian Borneo (Kalimantan), where we are studying king cobras associated with an oil palm plantation in an effort to learn more about how to conserve this flagship species in the face of dramatic environmental degradation. In addition to research findings, I will also discuss our extensive outreach efforts designed to engage local communities and the general public in the conservation of King Cobras and the habitats on which they depend.

**Saturday October 12: 09.50 – 10.25h**

**Long-Term Effects of Urbanization on Three Sympatric Rattlesnake Species in Arizona**

Among snake species, rattlesnakes are one of the most studied groups. However, there exist significant gaps in our knowledge of how urban development effects rattlesnakes. Understanding anthropogenic impacts associated with urbanization is critical for developing effective conservation strategies. We examined responses to urban development among three rattlesnake species, Western Diamondback Rattlesnakes (Crotalus atrox), Tiger Rattlesnakes (Crotalus tigris) and Black-tailed Rattlesnakes (Crotalus molossus). Since 2002, we conducted repeated surveys at Stone Canyon, an urbanizing residential development located at the base of the Tortolita Mountains near Tucson, Arizona, USA. Making use of our long-term dataset, we compare relative abundance, activity patterns, and other aspects of rattlesnake ecology and behavior. We discuss our results as they relate to rattlesnake ecology in general, and to the influence of anthropogenic factors on populations over time.
Michael Richardson
Institute of Biology, Leiden University

Thursday October 10: 09.45 – 10.05h
Reptile development and evolution

Saturday October 12: 16.20 – 16.55h
Snake Genomics, evolution and development

Michael Richardson is a British citizen who carries out research in developmental biology. He was appointed in 2000 to the van der Leeuw chair of evolutionary developmental biology at the University of Leiden, the Netherlands. His active research focus is: fundamental developmental biology (the evolutionary developmental biology of vertebrates, mainly reptiles and fish); and applied developmental biology (zebrafish embryos as models for compound screening). These two areas synergise in his future plans to use zebrafish embryos as screening models to study the evolutionary developmental biology of the snake venom delivery system.
Gowri Shankar is a PHD candidate at North Orissa University and his main study is in the field of phylogeography of king cobra’s across the Indian sub-continent. He has published many scientific papers on the king cobra and done pioneering work with radio telemetry in India. Gowri worked on many wildlife documentaries for the BBC, discovery, national geographic and animal planet. He’s also saved and relocated more than 300 wild king cobra’s during the years and released many juveniles back into the wild making him a crucial player for the king cobra’s survival in India.

Thursday October 10: 15.50 – 16.10h
Hannah and her sisters: The world’s longest venomous snake is not alone anymore

Friday October 11: 09.15 – 09.50h
Gowri Shankar Hannah and her sisters: The world’s longest venomous snake is not one anymore: Integrated taxonomic revision of the King Cobra Ophiophagus Hannah
Johan Marais is the C.E.O. of the African Snakebite Institute, established in 2010. He is the former curator of both FitzSimons’ Snake Park in Durban and Transvaal Snake Park in Halfway House, has served on the Crocodile Specialist Group of IUCN, was chairman of the Herpetological Association of Africa and of SARCA (Southern African Reptile Conservation Assessment) which was funded by SANBI (South African National Biodiversity Institute).

He does work for corporate companies as a consultant and has done extensive reptile research in northern Mozambique, Uganda, Malawi, Botswana, South Africa, Angola and Namibia in recent years. He is affiliated with the University of Witwatersrand and does most of his research with Villanova University in Pennsylvania, USA and Sam Davis University in Texas, USA. This research includes reptile and amphibian surveys and searches for specific species for phylogeny and taxonomical studies. As director of The African Snakebite Institute he lectures widely on snakes of Africa as well as first aid in snakebite and the medical treatment of snakebite. His customers include companies like ESKOM, Sasol, Wilderness Safaris, the Legacy Group and various mines like COAL of Africa, Anadarko, Master Drilling, Ghagho and Exxaro. He offers snake awareness, first aid for snakebite and snake handling courses and is responsible for the establishment emergency protocols for snakebites for large companies. Johan is a FGASA (Field Guides Association of Southern Africa) endorsed training provider and is accredited by the ISZS (International Society for Zoological Sciences). He has provides lectures on snakes and snakebite to the Department of Health, Northern Cape, The South African Society of Travel Medicine, Inhemaco and Travel Doctors. His courses are registered with the HPCSA for CPD points.

In honour of his contribution to popular herpetology and science, two newly discovered reptiles were named after him – a gecko from western Namibia (Pachydactylus maraisi) and a worm lizard from northern Mozambique (Zygaspis maraisi). He has published widely in scientific and popular magazines and is an accomplished photographer. His first book on snake was published in 1984.

Thursday October 10: 13.40 – 14.00h

Snakes and snakebite in South Africa

Snakebite envenomation is a massive problem world-wide and recently declared a neglected tropical disease by the World Health Organisation. South Africa has a total of 129 snake species. 14 are considered potentially deadly, a further 24 can give particularly bad bites while 36 are mildly venomous and 55 non-venomous.

Close on 4,000 people are bitten by snakes annually with less than 1,000 hospitalised. About 40% of patients show no signs of envenomation and less than 15% require and receive antivenom. Around 10–12 fatalities are reported annually.

More than 90% of snakebites are inflicted by the Mozambique Spitting Cobra (Naja mossambica), the Puff Adder (Bitis arietans), the Rhombic Night Adder (Causus rhombeatus) and the Stiletto Snake (Atactaspis bibronii), all snakes with predominantly cytotoxic venom. Most fatalities are as a result of bites from the Cape Cobra (Naja nivea) and the Black Mamba (Dendroaspis polylepis). Their venom is potently neurotoxic and in severe bites may lead to fatalities in less than 30 minutes.

Most serious snakebites in South Africa are treated with Polyclonal antivenom, a product manufactured by the South African Vaccine Producers. The venom of ten snake species is utilised in the manufacturing process and it is sold locally in 10 ml vials for around $100. Patients receive 8–12 vials per treatment and largely with good results, if it is administered sooner than later. Up to 40% of patients experience some form of allergic reaction to the antivenom with around 25% of them going into anaphylaxis.
The availability of antivenom is often problematic and its quality and consistency needs to be improved.

**Friday October 11: 16.05 – 16.40h**

**A monograph of the genus Bitis**

The genus Bitis is comprised of eighteen species distributed across Africa and into the Arabian Peninsula. It occupies a variety of habitats from thick tropical forest, high altitude mountains, coastal dunes, dry rocky desert and Karoo flats. There is huge morphological variation between the species with the West African Gaboon Adder (Bitis rhinoceros) reaching two meters in the length down to the smallest adder in the world, the Namaqua Dwarf Adder (Bitis schneideri) reaching less than 30 cm. Bitis differ in geographical range, with the Puff Adder (Bitis arietans) occupying most of sub-Saharan Africa, excluding the tropical forests, and the Albany Adder (Bitis albanica) occupying an area of less than fifty square kilometers.

Due to the cryptic nature of these adders, they are problematic to study and there are still a number of taxonomical questions and species complexes that need to be resolved. At least three of the eighteen species are listed as “Data deficient” by the IUCN. A further five are listed as vulnerable or endangered.

The main threats to the genera are habitat destruction. Mines, logging, agriculture, industrial developments and urbanization threaten many of the species. There is the additional threat of collection for the illegal pet trade as Bitis are a desirable group. Fourteen of the eighteen species have been recorded in the trade and many animals are smuggled out of Africa. The trade is easier to quantify as data is available and often receives negative press whereas habitat destruction remains one of the largest threats to all African wildlife and its impact is immeasurable.
Colin Strine is a young conservationist and ecologist working for Suranaree University of Technology in Northeastern Thailand. He established the Thailand King Cobra Telemetry Project with Dr. Matt Goode, and Dr. Pongthep Suwanwaree in 2013 and has since expanded the program to include conservation components. He also established Sakaerat Conservation and Snake Education Team (SCSET) to train hundreds of emergency technicians surrounding the biosphere reserve and throughout Thailand on mitigating human snake conflict through snake removal and educational resources distributed by the rescue crews. In addition, this team trains international volunteers from around the world in radio telemetry, conservation actions, data collection and spatial ecology techniques. Colin is currently a member of the Society for Conservation Biology (SCB) and the Association of Tropical Biology and Conservation (ATBC). He currently lectures at Suranaree University of Technology and has five graduate students working with him.

**Thursday October 10: 11.50 – 12.10h**

**Star Serpents of Southeast Asia: A look into the life of snakes in rural Thailand**

**Friday October 11: 09.50 – 10.25h**

**King cobra movement through a hostile landscape—incorporating time, space, and trajectory into movement analyses.**

Understanding how animals move is critical to providing useful conservation and management advice to policy makers. How animals react to land-use changes can yield insight into how animals are changing their behavior to survive in rapidly changing environments (specifically agricultural areas). Animals tend to reduce movement in agricultural areas, but reptiles (and snakes are sorely under-represented in the literature). We examined the king cobra, in Northeast Thailand. We used a scheduled radio-telemetry regime to examine movement between forest and agricultural areas and then used GPS-targeting analytic methods to examine movement variance, movement frequency and site re-use. We show that king cobra movements increase when in forested areas and tend to decrease when in agricultural areas. In agricultural areas king cobras restricted their movements to stay within vegetated semi-natural areas, often located along the banks of irrigation canals. Site re-use patterns were similar for both agricultural areas and protected forests. Presence of threatening landscape features (roads and settlements) did not affect movement variance consistently; suggesting that they will remain in close proximity to threats provided habitat patches are available. There were individual differences in their response to agricultural landscape, but the main trend suggests a movements reduce in fragmented habitat patches embedded in agriculture. Our findings match with movement theory on forest specialist species and the findings for mammals. Future works should look to the implications of reduced movements on individual fitness and ecosystem functioning.

**Friday October 11: 13.00 – 14.40h**

**Workshop Dynamic brownian bridge movement models workshop – Colin Strine & Ben Marshall**

Home range estimations are frequently used to help understand snakes’ activities and habitat use. However, the methods used to estimate snake home ranges have remained largely unchanged for decades despite improvements in tracking technology. Older methods have been found to have potentially critical flaws that can lead to over- and under-estimation of home range size. Errors associated with home range estimation can lead to incorrect assessments of a snakes’ habitat or space requirements.

The dynamic Brownian Bridge Movement Models workshop is designed to introduce participants to a more modern method for home range estimation –dBBMMs. Unlike older methods, dBBMMs use more information gathered during data collection, namely time and location error. By combining locations, location error, times, and estimations of a snake’s speed we are able to produce home range...
estimations that are more realistic, improving how confidently we can answer questions connected to space use. As dBBMMs explicitly incorporate time, they also enable us to investigate movement patterns over time.

Current work is suggesting that dBBMMs, although designed for use with GPS tracking devices, are suitable for radio-telemetry studies. Dynamic Brownian Bridges Movement Model’s versatility makes them immediately applicable to snake tracking studies, without any dramatic changes to data collection procedure.
My research interests focus on conservation biology, particularly using molecular approaches. These methods are very useful to determine population structure at large and small scales, detect migration between demes and evaluate inbreeding. Previous works were focused on the phylogeography, population structure and reproductive success of the European vipers. I am currently developing projects on other reptile and amphibian species, such as the Orisni viper (Vipera ursinii), the slow worm (Anguis fragilis), the smooth snake (Coronella austriaca) or the green toad (Bufo viridis).

In fact, most of my research is focused on the reptiles, and particularly vipers due to the lack of conservation biology on the taxa compared to bird or mammal. Moreover, they are interesting models for studies on fitness, population structure and inbreeding avoidance.
Rogier has worked with animals from a very young age, starting with volunteering at the local animal shelter(s) from the age of twelve. At fifteen he got his first paying job at exotic pet shop ‘Kameleon’ while studying to become an animal husbandry professional as well as a veterinary assistant. He also studied dog behaviour and worked as an educational animal guide at “Safaripark Beekse Bergen”.

At the age of seventeen he also started working as a veterinary assistant at animal hospital “Den Herd” and after a few years he made the decision to start working fulltime with reptiles and amphibians because of his passion in the field as well as taking over the exotic pet shop from his former boss. He then started to give lectures and teaching courses on exotic animal behaviour and maintenance from his vast experience and knowledge while pursuing various conservation goals.

In 2007/2008, Rogier founded the Herpetofauna foundation to further his ambitions in the field of conservation and education and has since been involved in various advisory groups working on animal legislation apart.

Saturday October 12: 16.55 – 17.20h
Safety management and proper husbandry of venomous snakes in captivity: In a changing political environment
Mahmood Sasa has a Biology degree from Universidad de Costa Rica, and Master and Ph.D. in Quantitative Biology from the University of Texas at Arlington. Mahmood has studied the ecology and biogeography of amphibians and reptiles that inhabit tropical dry forests in Middle America, and until recently, served as the scientific director of Palo Verde Biological Station, Organization for Tropical Studies, in the dry forest of Costa Rica. He is currently a professor at the School of Biology and a researcher at the Instituto Clodomiro Picado, both from Universidad de Costa Rica. Mahmood is interested in herpetology, and his area of expertise includes population and conservation biology, management of wildlife reserves, the evolution of venom systems in snakes, and biostatistics. He has authored or coauthored more than 70 publications, including scientific articles and book chapters.

Saturday October 12: 11.30 – 12.05h
Protecting the snakes of Costa Rica: Can snakes become flagship species for conservation?

In biodiversity conservation, the protection of species considered to be harmful, such as snakes, is one of the most challenging obstacles, even for societies with keen environmental awareness. Costa Rica is a country with a tremendous reputation for the ecological protection of its exceptional biodiversity. Nonetheless, a conflict between human and snake communities persists, which impacts human health, social, and economic status and threatens populations of snake species.

Costa Rica’s commitment to wildlife protection is founded in its network of protected areas. However, a heuristic analysis based on potential distribution maps of snake taxa shows that this network is not enough to ensure the protection of all 143 species of Costa Rican snakes. We explore the use of surrogate species as a complementary conservation strategy for snakes in Costa Rica. To do so, we conducted an opinion study to identify emotive species of snakes that could become flagship species for conservation. Our preliminary results indicate that, despite widespread ignorance about the identity of snakes, colorful species arouse higher affinity and interest in the general public than dark-toned species. Furthermore, we are finding evidence of some awareness about the importance of protecting snake species, which contrasts with the fear and hate that many species generate. That awareness persists even among sectors that are more vulnerable to snakebites.

We highlight the need to address snake conservation from an integrative perspective: promoting knowledge about the importance of snake species and their value to society, enhancing partnerships with different stakeholders, and empowering communities to act in their protection.
Mark O’Shea is an internationally renowned TV presenter and one of the top reptile experts in the world, his understanding and respect for wildlife in general and of reptiles in particular is undisputable. He is also an explorer/adventurer, professional photographer, author, public speaker and a respected scientist. He is also a powerful advocate for herpetological conservation issues and a fervent supporter of snakebite research, as up to 120,000 people needlessly die of snakebite each year.

Having a natural curiosity, respect, and an inexhaustible passion for his subjects, Mark, presenter of the successful O’Shea’s Big Adventures, for US Animal Planet, (O’Shea’s Dangerous Reptiles for UK’s Channel 4), has received enormous critical acclaim from across the media and made him popular with audiences at home and on an international platform. “Keep your Terry Nutkins, your Steve Irwin and your David Attenborough. While I admire each of them for their individual skills… there is a new king in the TV wildlife jungle. His name is Mark O’Shea.”). The Guardian

Mark has filmed 38 widely acclaimed adventurous natural history documentaries in 25 countries and also has a wealth of experience in behind the scenes filming for BBC (NHU) and Discovery. His recent work includes presenting on BBC’s “Inside Out East Midlands – Nottingham Photo Safari” and as expert on Channel 4’s “Easter Egg Live”. Mark’s other television appearances include: Blue Peter, Really Wild Show, Get Fresh, Serious Desert, Gloria Hunniford, Graham Norton, Danny Baker, Ready Steady Cook, Taste Today, and he has appeared on several US chat shows and countless radio shows.

**Thursday October 10: 14.25 – 15.00h**
Blood, sweat and snakebites: the making of an herpetologists

**Saturday October 12: 10.55 – 11.30h**
The secret life of the Papuan Taipan
Sefanne Hakken is an ambitious young researcher driven by curiosity and a passion for nature. She graduated with a bachelor’s degree in biochemistry in 2014. Currently, she combines a job as a researcher at the HAN BioCentre with a part time master’s education in Molecular Life Sciences. In her research, she focuses on the development of screenings assays for the detection and measurement of antifungal activity.

**Saturday October 12: 13.00 – 13.25h**

**Herpetofauna foundation: An overview (past into the future)**

The goal of the Herpetofauna foundation is to support conservation initiatives and scientific research into reptiles, amphibians and arthropods. Moreover we acknowledge the importance of education. But how are we able to carry out our mission? During this talk we will give you an overview of past and running conservation projects, educational projects and scientific research, as well as talking about the events we organize in order to raise funds. We would like to engage in a discussion about the future and vision for our foundation, and hope you can share some of your insights with us!
Saturday October 12: 13.00 – 13.25h
Coagulotoxic Cobras: Clinical implications of strong anticoagulant actions of African spitting Naja venoms that are not neutralised by Antivenom but are by LY315920 (Varespladib)

Snakebite is a global tropical disease that has long had huge implications for human health and well-being. Despite its long-standing medical importance, it has been the most neglected of tropical diseases. Reflective of this is that many aspects of the pathology have been underinvestigated. Snakebite by species in the Elapidae family is typically characterised by neurotoxic effects that result in flaccid paralysis. Thus, while clinically significant disturbances to the coagulation cascade have been reported, the bulk of the research to date has focused upon neurotoxins. In order to fill the knowledge gap regarding the coagulotoxic effects of elapid snake venoms, we screened 30 African and Asian venoms across eight genera using in vitro anticoagulant assays to determine the relative inhibition of the coagulation function of thrombin and the inhibition of the formation of the prothrombinase complex through competitive binding to a nonenzymatic site on Factor Xa (FXa), thereby preventing FXa from binding to Factor Va (FVa). It was revealed that African spitting cobras were the only species that were potent inhibitors of either clotting factor, but with Factor Xa inhibited at 12 times the levels of thrombin inhibition. This is consistent with at least one death on record due to hemorrhage following African spitting cobra envenomation. To determine the efficacy of antivenom in neutralising the anticoagulant venom effects, for the African spitting cobras we repeated the same 8-point dilution series with the addition of antivenom and observed the shift in the area under the curve, which revealed that the antivenom performed extremely poorly against the coagulotoxic venom effects of all species. However, additional tests with the phospholipase A2 inhibitor LY315920 (trade name: varespladib) demonstrated a powerful neutralisation action against the coagulotoxic actions of the African spitting cobra venoms. Our research has important implications for the clinical treatment of cobra snakebites and also sheds light on the molecular mechanisms involved in coagulotoxicity within Naja. As the most coagulotoxic species are also those that produce characteristic extreme local tissue damage, future research should investigate potential synergistic actions between anticoagulant toxins and cytotoxins.
Sophie switched careers after several years of working as an occupational therapist, where she engaged in enhancing quality of life and independence for children and adolescents with disabilities. She recently finished her Master of Health Sciences, with the specialisation International Public Health. Sophie originally came into contact with Health Action International (HAI) during her Master’s thesis, during which she investigated the skills Civil Society Organisations need in order to engage in policy for better access to sexual and reproductive health commodities in Uganda.

Sophie is passionate about creating health equality and opportunities for everyone, which is what drove her to HAI. She works on the Snakebite programme empowering Civil Society and engaging to improve access to antivenoms in Kenya, and will be responsible for the launch of the project in Uganda and Zambia.

Sophie is fluent in English, Dutch and German and is proficient in Swedish and French.

Saturday October 12: 13.50 – 14.15h
Health Action International
Sterrin Smalbrugge

Sterrin is a Dutch ecologist and herpetologist. She graduated Cum Laude from Wageningen University and conducts research on reptiles worldwide. Some of her study topics include reptile-environment relationships and potential effects of climate change on the distribution of crocodilians. Besides her research, Sterrin is passionate about education. She owns her own education business that allows her to educate a wide variety of audiences. From small children to university students, Sterrin’s goal is to spread the message that reptiles are worthy of conservation, just like any other species. She specialises in venomous snakes, and enjoys giving handling courses. Furthermore, she is involved in documentary making and she’s currently writing a children’s book on reptiles, which will be published in September by Luitingh-Sijthoff.

Thursday October 10: 11.25 – 11.45h
Engaging the youth: How to make our future generation care about reptiles and their conservation
I am a 30 year old hobbist that has been keeping reptiles of varying guises for a few years, I have a keen interest in education and the sharing of information. I am also part of a social group that uses science to show how we can better the animals lives and I also have an interest in how we can better peoples lives with the use of venoms. With the want to share information I started the podcast and I have been shocked everyday since, at how quickly it has taken off and gained a truly global audience!
Roel Wouters is a young scientist from Leiden University with degree in biology and a passion for herpetology. He has experience in both the field and the lab, all around the world and he has been involved in multiple projects related to (venomous) snakes, ranging from ecology to biomolecular research. His current research is focused on the evolution and development of the infrared sensing pits in pitvipers, which will be main the topic of his talk.

Friday October 11: 14.10 – 14.35h
Evolution and Development of Infrared Sensing Pits in Pitvipers: From Fundamental Science to Conservation

Pit vipers (Crotalinae) are a subfamily of snakes characterized by an infrared-sensing, the loreal pit or pit organ, located bilaterally between the eye and nostril. It functions in prey acquisition, predator avoidance and behavioural thermoregulation. The pit organ consists of an outer and an inner chamber, septated by a heavily innervated membrane. The evolution and development of the loreal pit remain poorly understood. Here, we study the development of the loreal pit in a rare embryo collection of Bothrops jararaca and Calloselasma rhodostoma, using macro-photographing, microCT, 3D-reconstruction and histology. In early development, we find the outer chamber develops as a shallow pit, rostral to the eye and lined with cuboidal epithelium, similar to its flanking epidermis.

In intermediate stages of development, we see the inner chamber develops as a pocket rostral to the orbit and dorsal to the initial pit. It is lined with squamous epithelium, similar to the neighbouring corneal epithelium. The two chambers are partly separated by loose connective tissue: the early pit membrane, which is similar to that of the orbital ridge. In advanced stages of development, the loreal pit is similar to the adult morphology and is relatively displaced rostrad as the snout elongates. The pit membrane is heavily innervated by the trigeminal nerve and completely separates the two chambers. We have also found that the loreal pit sheds during ecdysis. Our findings suggest the ancestral loreal pit contained only one chamber, morphologically similar to the labial pits of extant pythons and boas. Our findings also suggest the outer chamber invaginates from the skin, while the inner chamber is derived
Stephen Spear

Dr. Stephen Spear is the Director of Wildlife Ecology at The Wilds. He received his B.S. at the University of Richmond, M.S. from Idaho State University, PhD from Washington State University, and now works on a variety of wildlife conservation projects incorporating field ecology, genetic laboratory work, and GIS modeling. His background is primarily focused on reptile and amphibian conservation, but enjoys the challenge of working on multiple species and systems at The Wilds. He also serves in positions in a number of conservation groups, including as secretary for the Ohio Fish and Wildlife Management Association and as Deputy Chair for the IUCN global Viper Specialist Group.

Saturday October 12: 14.15 – 14.40h
The IUCN Viper Specialist Group: Successes, Challenges, and Opportunities for Achieving Conservation of Viper Species

Vipers are estimated to represent 20% of all threatened snake species, despite only making up 9% of total snake diversity. Despite the conservation need, historically there has been relatively little focused conservation priorities on viper species as a group, with most conservation action occurring toward a few focal species. The International Union for the Conservation of Nature (IUCN) Viper Specialist Group (VSG) was formed in 2010 to serve as a voice and facilitator for viper conservation worldwide. As with many IUCN specialist groups, the VSG is organized by geographic region, with each region coordinated by a regional chair. In addition to the regional coordinators, the VSG leadership committee includes the Chair, Deputy Chair, a Red List Authority Coordinator, and Program Manager. The initial goals and motivations of the VSG have been to set the stage for effective viper conservation, especially given the numerous gaps in data and conservation assessments for many viper species. For instance, many viper species have not been formally assessed through the IUCN red list. The VSG has focused on facilitating and completing more Red List assessments, and since 2012, nearly 100 new species assessments have been added. More work is needed as currently only 202 of ~329 viper species have had assessments published on the Red List, and we continue to work toward the goal of all vipers assessed under the Red List. Complementary to the Red List efforts, the members of the VSG published a paper on global viper conservation prioritization that used a different set of criteria than the Red List (addressing both threat and evolutionary/ecological distinctiveness) and identified additional species of conservation concern, including many not yet formally assessed on the Red List. This effort highlighted geographic regions in greatest need for viper conservation and underscored the paucity of natural history and survey data available for many viper species. The VSG has been a supporter of researchers and conservation efforts for individual viper species. While the VSG is not a funding group for viper conservation, we have helped to provide guidance and direction to viper conservationists for funding support and provide endorsement of projects. This included working with the Rainforest Trust to create a protected area for the endangered viper Bitis albanica. The VSG is currently focused on its next phase to build on past accomplishments and identify continuing gaps and conservation needs. We are in the process of developing a global viper conservation action plan that will serve as a template for our efforts for years to come. The plan will be organized by region and include an ex-situ conservation component. Developing effective tools for education and outreach, with attention to human health, is an important goal. We also are working to identify high priority areas that should be targets for species protection and to fill natural history gaps in viper knowledge. Collectively, the VSG shares the vision of this symposium for incorporating venomous snakes into flagship conservation efforts and are excited to discuss our priorities and goals within this symposium.
Choti Singh developed a passion for wildlife and nature as a child. She spent her school years in India, Kenya, and rural Zambia. Among all the animal species she spent time with, Choti was especially drawn to snakes, as well as her early love of frogs! After pursuing a degree in Zoology with a focus in animal behavior, she conducted graduate research involving taste-choices in rodents, as well as maternal bonding in primates. She subsequently specialized in forensic psychology and working within the mental health field professionally, but has maintained her love for conserving wildlife and preserving the environment. She has traveled to Central and South America to photograph wildlife, and plans to return to Zambia soon.

**Saturday October 12: 13.25 – 13.50h**

Save The Snakes - Bridging the gap between snake conservation and human-snake conflict mitigation
Dr. Nicklaus Brandehoff is an emergency medicine physician, medical toxicologist, and wilderness medicine enthusiast. He is an assistant clinical professor of the department of emergency medicine and division of toxicology at the University of California San Francisco-Fresno program. He completed medical school at UCSF and an Emergency Medicine residency at UCSF-Fresno. He then completed a Toxicology Fellowship at the Rocky Mountain Poison and Drug Center where he was fortunate enough to learn from some of the world’s experts in snakebite management and venom research. He has authored several chapters and academic papers on envenomations. In his spare time, he loves traveling, training his Dutch Shepherd, and dressing his newborn son in ASF onesies.
Kamal Devkota currently works at the Nepal Toxinology Association. Kamal does research in Snake, Snakebite and Snake Conservation. Their current project is “Save Snakes Save Nature” in Rupandehi district, Nepal.

Friday October 11: 14.10 – 14.35h
Snake Conservation in Rupandehi District, Nepal

The study and research of snakes has always received less priority in Nepal. Traditional beliefs, misconceptions and superstitions followed by the local people have increased human-snake conflict in communities. The aim of the study was to provide most recent and more comprehensive information on diversity, distribution and habitats of snakes and to investigate peoples’ perceptions towards snakes, snakebite and snake conservation in Rupandehi district, Nepal. The study was carried out during June to September, 2015-2017. We categorized 16 different sites from the districts and conducted direct observation and opportunistic visual encounter survey methods into human residence in indoors and at outdoors; near to the bank of water bodies; piles of logs, rocks, concretes and culverts; agricultural lands, crop fields and farms; community forest, roadside and any other possible habitats in the selected sites during the day and night time to detect both diurnal and nocturnal species especially in summer and rainy seasons. We carried out face-to-face interview and extracted the attitude, knowledge and awareness of people on snakes with the help of pretested and semi-structured questionnaire using random sampling methods. We produced educational materials like brochures, posters, pamphlets, hoarding boards, photographs, books, videos and distributed to local people. Few collected snakes were preserved in 10% formalin for their appropriate identification. We recorded a total of 22 species belonging to 18 genera and six families (Typhlopidae, Pythonidae, Boidae, Colubridae, Elapidae and Viperidae). Among all recorded snakes, five species were deadly venomous (Naja naja, Naja kaouthia, Bungarus caeruleus, Bungarus fasciatus and Daboia russelli). We recorded snakes ranged from the smallest-bodied blind snake to the largest-bodied python. We found 41% snakes in the human residence outdoors, 19% in agricultural lands, crop fields and farms, 11% in indoor, 9% in roadside, 8% in community forest, 6% near to the bank of water bodies and 6% around concrete and rock crevices. Among the total snakes recorded, 57% were found dead and 43% were found alive. We found that majority of the respondents disliked snakes (80%) because of fear of being bitten whether it is venomous or non-venomous. About 76% people replied that they can distinguish venomous and non-venomous snakes and most of them were unable to identify and answered incorrectly. Spectacled cobra was the most common venomous snake that was identified by most of the respondents. Most of the snakebite victims applied tourniquetes and sought hospital providing anti-venom therapy but some of the people still depend on traditional healers and unaware of recommend first-aid methods and available treatments. More than 70% respondents replied that they were unknown about the traditional beliefs, misconceptions, superstitions and actual facts. Most of the respondents were aware of protective measures that prevent or minimize snakebite but didn’t practice it. There is a lack of knowledge on importance of conservation of snakes among local people. Therefore, more community based snake conservation educational and awareness programs should be conducted to minimize the human-snake conflict in communities which can make a long-lasting contribution in nature conservation.
Anthony Daly-Crews

Tony Daly-Crews is the director of the Rattlesnake Conservancy, a passionate field biologist, and veteran. As a native Floridian growing up in Ocala, he spent a lot of time outdoors. Tony studied Ecology and Evolutionary Biology at the University of North Florida. Research he was involved in was primarily focused on management and restoration of Florida scrub, focused on reptile and amphibian management.

Tony has been part of various aspects of venomous herpetology, from instructing new keepers to participating in the rule making process for venomous in Florida. In 2016, he served as a member of the Venomous Reptile Technical Assistance Group (VRTAG) for Florida Fish and Wildlife Conservation Commission (FWC) and worked with a group of professionals to improve and update current rules regarding captive venomous reptiles.

As the Executive Director of TRC, he is involved with large scale planning of conservation projects, coordination with other organizations and zoos, fundraising, and field research when he is able to make time!

Outside of his work with TRC, he has worked for the federal government for 5 years. His career began as a regulatory biologist for U.S. Fish and Wildlife Service. He now works and resides in Phoenix, AZ, as the Regional Biologist for Western Area Power Administration under the Department of Energy.

Friday October 11: 13.10 – 13.35h
Human Dimensions in Snake Conservation.

Translocation, commonly known as relocation, is the act of removing an animal from their home range to another potentially suitable habitat. Snakes are often translocated due to conflict with land use associated with children, pets, and livestock, as well as in situations where the animal appears to be in danger (crossing roads, etc.).

Human conflict with wildlife, especially snakes, is increasing in areas where urban development encroaches on natural areas. In response, commercial industry (such as animal control), concerned citizens, conservationists, and others are tasked with relocating “nuisance” snakes to areas well beyond where they may interact with the aggrieved party again. Scientists and conservationists also translocate imperiled snakes in areas at risk for development, during reintroduction efforts, and to bolster genetic viability of isolated populations. However, little is known about the characteristics of people who regularly translocate snakes and how they make decisions about translocation.

To explore this, our team designed a brief questionnaire and distributed it through social media groups associated with conservationists, reptile enthusiasts, commercial industry, and wildlife professionals between the months of February and April 2019. The questionnaire examined who is translocating snakes, frequency, and motivations. We also explored the relocation of venomous snakes in particular.

74.8 percent of participants (n=140) translocated snakes sometimes or all of the time, and three quarters (74.2%) moved fewer than 20 snakes annually. 40 percent moved less than 5 snakes annually. Only about 5 percent of participants who translocate snakes say they have no experience with snakes. The remaining participants identified as snake enthusiasts (private herpetoculturalists, fielder herpers (amateur reptile observers or photographers, similar to “birding”), (53%), biologists or scientists (26%), or both (6.7%).

The majority (88.5%) of participants translocated snakes found on someone’s property who did not want it there and/or the landowner was threatening to kill the animal. Around half (46.2%) of participants translocated snakes that were on roads. Almost a third of participants (29.8%) report moving snakes less than half a mile from the original capture site,
and less than 3% said they moved snakes more than 2 miles from capture site. However, nearly 40% of participants separately indicated that they moved snakes to the nearest protected area, regardless of distance, so these findings need to be interpreted cautiously.

Participants also reported translocating venomous snakes. Of participants who translocate snakes, 83.7% said they relocate venomous snakes. Despite this, over a quarter (26.1%) reported having no training—formal or informal—in handling venomous snakes. Around a third of participants (34.1%) had informal training on handling venomous snakes, while another third (31.8%) had formal training, such as a venomous course or through their profession. Eight percent of participants reported both formal and informal training.

To our knowledge, our results are the first to describe characteristics of individuals engaged in snake translocation and their motivations for doing so. When done improperly, translocation may increase mortality in individual animals and inadvertently spread pathogens. As such, understanding who is translocating snakes and why is critical for researchers and conservationists developing best management practices for translocation and developing conservation strategies for imperiled species. The Rattlesnake Conservancy plans to evaluate the long-term impacts to multiple species of Crotalid to compliment development of relocation guidelines for the average public, nuisance wildlife trappers, researchers, and conservationists.
Wolfgang Wüster is a Senior Lecturer in Herpetology at Bangor University, UK. He has broad interests in the systematics, ecology, evolution and biogeography of venomous snakes, and in the evolution of snake venoms. He has described a number of new species of snakes, with a special focus on cobras, and contributed to unravelling the question of the origin of snake venoms, and the factors affecting the evolution of venom composition. He has a particular interest in relating the findings of this world to the problems of snakebite and its prevention and treatment.

Thursday October 10: 14.05 – 14.25h
Venom at the interface between snake and environment
Venomous snakes provoke fear and fascination in equal measure: the ability of an often small and seemingly undefended animal to cause death or serious injury, and to prey on other animals as large as itself, cannot fail to impress. Venom is a key evolutionary innovation that contributed considerably to the diversification of snakes. It allows these limbless predators to overcome large, well defended prey, and also to defend themselves against their predators. Snake venoms are complex cocktails, containing dozens of active ingredients. The composition of these toxins varies hugely between, and even within, different snake species. This can hinder the treatment of snakebite victims, as an antivenom against one venom may be ineffective against another. My lab’s research has largely focused on the question why venom composition is so variable. In a number of examples, we have shown that differences in venom composition seem to be adaptations to different diets, for instance through prey-specific venom activity. However, in other cases, this does not appear to be the case – so we need to be cautious not to assume that all venom differences reflect different diets. Other factors that could influence venom composition include selection for defence and possibly digestion. On both counts, the jury is still out, with contradictory evidence. Finally, we are also interested in the role of venom in the evolution of snakes more generally. For instance, since venomous snakes are avoided by some predators, mimicry of venomous snakes has allowed diversification of non-venomous snakes that are able to live with greater exposure to predators thanks to the protective umbrella provided by venomous snakes. These many remaining questions emphasise the need for a better understanding of the natural history of snakes, and how they actually use their venom in nature. We remain remarkably ignorant of many aspects of the ecology of venoms in wild snakes, including their effects on natural prey, or the frequency with which they are used in defensive encounters. The use of venom by “colubrid” snakes remains particularly poorly explored.

Friday October 11: 16.40 – 17.15h
Venomous snakes as flagship species: identifying likely candidates
Flagship species in conservation are intended to act as ambassadors for their habitats and other species occupying them, to attract funding for conservation, or act as magnets for ecotourist dollars. Flagship species are normally iconic species that are popular with a significant proportion of the public, who are prepared to dedicate resources to their protection. As significant causes of mortality and morbidity, especially in the rural tropics, venomous snakes do not naturally fall into this category. However, over the last two decades, an increasing positive interest in herpetology in general and venomous snakes has opened up the potential for a role of flagship species. Due to their much smaller habitat ranges, reptiles can potentially act as umbrella species for much smaller, yet nevertheless conservation-relevant habitat fragments than the mammalian megafauna usually serving as flagship species.

In this presentation, I discuss the kinds of scenarios in which venomous snakes might act as flagship species. Ideal scenarios include situations where internationally known, iconic species cause few
accidents, occur in intact environments, yet can be found with suitable local help, or where entire faunas are attractive to ecotourists. For venomous snakes to fulfill their role as umbrella species protecting the wider environment, local people must derive perceptible benefits from the presence of the snakes. In turn, herpeto-tourists should ensure that local people are aware of the reason for the visits, and the additional income they derive as a result. While venomous snake tourism is clearly a real phenomenon in some parts of the world, there has been no rigorous quantification of its economic benefits and impact on social attitudes. There is a clear need for research into the economic potential of venomous snake-based tourism, the identification of species and locations where this is practical against the background of local customs and legislation, and its potential for changing negative attitudes towards venomous snakes.
The Atlantic Bushmaster (Lachesis muta rhombeata): from field work to results on movement and habitat of a flagship snake

The Atlantic Bushmaster (Lachesis muta rhombeata) is a “primary” forest species that needs to cope with small and scattered forest patches within a mosaic of plantations, pastures, and suburban areas throughout northeastern Brazil. In 2017, we initiated a small study on the activity pattern and habitat parameters of this flagship species, tracking up to six native and translocated animals, to compare movements and habitat selection of indigenous and translocated bushmasters within a forest fragment at the Michelin Ecological Reserve and adjacent modified rubber plantation that might serve as a potential surrogate habitat. We present insights on the methods, from capture to radio-tracking, some results of movements and present imagery files from transmitter implantation to field behavior. Bushmasters were mostly found “resting” on the forest floor with variable plant cover during the day and ambushing at night. They moved within a diameter of ca. 500-2000 m, rarely staying at the same location between two consecutive tracking events of 2-3 days. Macrohabitat selection was very variable, from humid depressions and riparian habitat to drier slope and ridges in the forest. One bushmaster preferred rubber plantation and even returned to it after reaching the adjacent forest edge.
Mangshan Viper as a Flagship Species: outlook of a viper in conservation need and anticipated field study

The Mangshan Pitviper (Protobothrops mangshanensis Zhao, 1990) is endemic to a small region in southern China. It is the largest viper in Southeast Asia and possibly the most astoundingly colored one with its extreme resemblance to moss. Their impressive size, spectacular color pattern, and comparative elusiveness has rendered them a mysterious attribution. The Mangshan Pitviper is listed as Critically Endangered in the China Red Data Book of Endangered Animals and is classified as Endangered in the IUCN Red List on the basis that this species has a range unlikely to exceed 300 km². A large survey during 2007–2010 recovered only eight specimens and the illegal harvesting of >30 individuals. The total population size of the Mangshan Pitviper was estimated to be <500. We present the practicality of this viper as a Flagship Species and intend to initiate a field study to better understand its habitat requirement, including microhabitat selection and activity pattern throughout the season. Such information will be important to better manage conservation actions in the future for its survival in an unique global hot spot. Some herp diversity will be presented to illustrate the outstanding diversity and landscape of the Mangshan and Nanling national parks.
Jory van Thiel is a young, passionate and futurist scientist born in the Netherlands in 1995. Jory is a bachelor’s student in Life Sciences with a specialisation in molecular biology. Before he started his bachelor degree in Life Sciences, he studied ecology for four years. After conducting research on the common European viper (Vipera berus) and king cobra (Ophiophagus hannah) during his teenage years, Jory did the first part of his bachelor project in the Richardson Group (Leiden University). Whereby, he tested a variety of snake venoms using several functional assays, in order to better understand their biological roles. Jory is incredibly passionate about nature, with his main interest in venomous and poisonous animals.

Thursday October 10: 10.10 – 10.30h
From student to research assistant

Saturday October 12: 14.15 – 14.40h
Secret of the Spitting Cobra: Eye-Irritation Potential of Spitting Cobra Venoms Using an in vivo Embryonic Chicken Model

Spitting cobras of the genera Naja and Hemachatus evolved the ability to spit venom as a defence-specific adaption. This allows them to cause instant pain and irritation in the eyes of potential predators. Venom ophthalmia caused by spitting cobra venom is characterized by i) pain, ii) hyperaemia, iii) blepharitis, iv) blepharospasm and v) corneal erosions. Using the Hen’s Egg Test – Chorioallantoic Membrane (HET-CAM) assay, we screened the eye-irritation potential of venoms from 19 species of spitting and non-spitting cobra. This was to determine whether defensive venom-spitting behaviour causes an more intense eye-irritation to evolve in the venoms. Our results show no correlation between eye-irritation potential and venom-spitting behaviour. Our data suggests that an increase in eye-irritation evolved independently three times within the [Naja+Hemachatus] clade, namely: once in Hemachatus haemachatus, once in the [African spitting cobras+Naja subfulva] clade and once in Asian cobras. The most frequently observed in vivo vascular effects caused by spitting cobra venoms are both hyperaemia and coagulation. In conclusion, the present study shows evidence of enhanced eye irritation in selected lineages. This contributes to our understanding of the evolution of this trait, and may hopefully help in the development of future therapeutics against snake venom-induced eye-irritation.
Drs. Marc Maas was born in Tilburg, the Netherlands and has been interested in exotic animals from an early age. This interest was started with collecting, catching, keeping and studying reptiles and amphibians with his brother Johan as a hobby. Later on, Johan started a Petshop only for reptiles and amphibians where Marc learned a great deal about the different species and how to keep them. Marc started his study veterinary medicine, focusing on reptiles and amphibians, at Utrecht University and graduated in 1989.

Currently, Marc is working as a veterinarian for exotic animals at Dierenkliniek de Langstraat and holds the position of managing director of Vets & Pets, which comprises of veterinary clinics for companion animals.

**Saturday October 12: 15.45 – 16.20h**
Repile veterinary medicine
Tim van Wagensveld is coordinating herpetological research in the Dutch Caribbean (St. Eustatius, Saba & Bonaire) for Reptile, Amphibian and Fish Conservation Netherlands (RAVON). Fundraiser for evidence-based conservation of threatened species e.g. the Lesser Antillean Iguana, and species monitoring. He is also the supervisor for students/internships and webmaster for the RAVON website.

**Thursday October 10: 16.15 – 16.35h**
Lesser Antillean iguanas (Iguana delicatissima) on the move or not?: Home range utilisation, movement and nesting behaviour

**Friday October 11: 13.10 – 13.35h**
Lesser Antillean iguanas (Iguana delicatissima) on the move or not?: Home range utilisation, movement and nesting behaviour
Specific research on teachers’ conceptions of snakes is lacking. Determining what type of professional development may or may not be needed or desirable will be dependent on obtaining some sort of foundational knowledge of what teachers know about snakes and how they interact with snakes. Basic research that explores teachers’ perceptions of subjects or content information that was previously shunned by teachers or presented to students in a negative fashion would be helpful in justifying the type of professional development that is developed and implemented. Also, current attitudes toward animals have been studied, but attitude changes toward animals have not been studied in-depth. However, to truly understand how people interact with snakes in-depth, or any object for that matter, is dependent on circumstances and the context of the act itself, not on one's attitude (Blumer, 1969). According to Blumer there are exceptions; for example, those persons who experience ophidiophobia may tend to act more from a predisposition, which may “dominate the act to the exclusion of the demands of the situation and the expectations of others” (p. 97). In this session, based on two studies I have done in Kenya, I will explore three different theoretical perspectives for determining how people with negative worldviews about snakes can acquire a more positive orientation, e.g., an alternative scientific perspective, towards snakes.