Summer 2011

evolve

Biological Sciences Newsletter

New Fossil Sheds Light on Pterosaur Sex Life

Dr. Charles Deeming has been involved with an exciting research project which allowed scientists for the first time to sex pterodactyls – flying reptiles that lived alongside dinosaurs between 220-65 million years ago.

The discovery of a flying reptile fossilised together with an egg from the Jurassic period (about 210 million years ago) in China provides insight into reproduction. This was the first specimen of this group of extinct flying reptiles that was associated with an egg, and so could be assigned to a specific gender, which is extremely rare in the fossil record.

The crested male and crestless female based on the 'Mrs T' fossil

The fossil, nicknamed 'Mrs T', was first reported in the prestigious journal *Science* in January 2011 (*Science,* **331:** 321-324, 2010) and caused a bit of a media stir. The fossil seemed to represent a tragic accident, as the well developed shell shows that Mrs T was just about ready to lay her egg when she was killed in an accident that broke her left forearm, possibly the result of a storm, or perhaps even a volcanic eruption.

Charles's involvement was with the analysis of the egg that was preserved adjacent to the pelvis of the animal. The presence of the egg meant that this individual has to be a female. Charles said: *"This was a great find – we could compare this soft-shelled pterosaur egg with other pterosaur eggs in the fossil record and use its dimensions to predict its likely size and even how big the hatchling was going to be."*

This fossil tells us much more about the sex life of pterosaurs. Other members of the research team based in China and at the University of Leicester were able to show that this apparent female had a wide pelvic canal and no crest on its skull. Other specimens of *Darwinopterus* have narrow pelvic canals and crests on their skulls and so were interpreted as males. Head crests are commonly seen on fossil pterosaurs and in the most spectacular cases these can reach five times the height of the skull. Scientists have long suspected that these crests were used for some kind of display or signalling and may have been confined to males, while females were crestless. In the absence of any direct evidence for gender until now, this idea remained speculative and crested and crestless forms were often separated into completely different species.

This was not Charles's first foray into Palaeontology. In the early 1990s he was part of a team that conclusively showed that ichthyosaurs (marine reptiles also from the Jurassic) were truly viviparous. In 2006 he published a paper in the journal *Palaeontology* on the porosity of dinosaur eggshell, which indicated that these eggs had to be buried during incubation and so more like modern reptiles than modern birds

The presence of the egg meant that Mrs T was a female

This issue...

The fossil nicknamed 'Mrs T'

UNIVERSITY OF LINCOLN

Researchers Successfully Treat Debilitating Horse Disease

Researchers at the University of Lincoln have created an effective therapy for a debilitating winter condition in horses known as 'mud fever'. The disease affects hundreds of horses each winter in the UK and many more around the world.

Tests have shown that the new product, called Muddy Buddy, can ease the pain and discomfort experienced by horses with the infection, which is caused by a microbe found in mud during the winter months when prolonged wet conditions occur.

Up until now many horse owners have been powerless to treat the lesions and sores from mud fever effectively and have witnessed this often painful infection of the lower limb develop so much that it can cause lameness in their animals. Extreme, prolonged cases can potentially lead to the animal having to be put down.

Programme leader and senior lecturer in Bio-veterinary Science at the University's Riseholme campus, Frank Ruedisueli, said: *"We are very excited that our research has led to this product being made available which could ease the suffering of many horses. Winter in the UK can be a nightmare for horses and their owners due to the microbe Dermatophilus congolensis, which infects the animal through the skin of its lower limbs, predominantly the fetlock area.*

"Over the past five years, staff and students at the University of Lincoln have been investigating potential topical anti-microbial treatments for this disease. In-vitro testing of a specific active ingredient under laboratory conditions resulted in a new formulation. This was then tested on horses with severe or stubborn cases of the condition in a nationwide field study."

Results were so encouraging that this product was developed further with a manufacturer of animal health products and is now commercially available.

Sharon Macadam's fourteen-year-old Dutch Warm blood, Punica, developed mud fever in the autumn of 2009. The disease led to scabs on her back legs which got progressively worse over the following weeks. Sharon said: *"Every time Punica moved her legs the skin would split and it was obvious that this was very painful for her. I tried treatments from the vet and almost everything on the market but to no avail. It was heart breaking to see her in such pain and I was seriously at the point of having her put to sleep."*

Within the first week of taking part in the field trials, Sharon noticed a big improvement in Punica's condition and, after the first month, the legs were no longer splitting as much and she was able to ride her lightly again. *"From then on it got better every week and Punica's mud fever has since been kept at bay,"* she said.

Frank added: *"After all the effort put in by staff and students, it is great to see research resulting in a practical application. This shows students that undergraduate research does contribute to animal health in the long term."*

Effect of healing barrier cream on severe mud fever

Effect of healing barrier cream on severe mud fever, progress over 14 days

"We are delighted to be able to work with the University of Lincoln and Dogs for the Disabled on this study to start to understand and evaluate the effects of such a programme and take the idea further. "

PAWS

Animal behaviour experts at the University of Lincoln are taking part in a major research project which could offer hope to many families with autistic children.

Working with the UK charity Dogs for the Disabled, Daniel Mills, Professor of Veterinary Behavioural Medicine, is overseeing the research project Parents Autism Workshops and Support (PAWS) at the University. The National Autistic Society is collaborating on the project which is funded by the Big Lottery.

Dogs for the Disabled currently train assistance dogs for children with autism. This project recognises the large amount of anecdotal reporting of the 'special connection' that can happen between pet dogs and some children with autism. The new PAWS service is offering families the chance to develop the potential of that relationship through a series of workshops and on-line support.

Professor Mills said: *"There is an enormous amount of anecdotal information out there to suggest that dogs can not only help children with Autism Spectrum Disorder but also that they may help alleviate stress within the family more generally. There is, however, a lack of good science to show exactly what the effect is or how reliable it is.*

"We hope through this study to be able to pinpoint and quantify specific benefits for carers so they can have realistic expectations and get the most from their relationship with a dog. We have a great team and I am very optimistic that this work will lead to direct benefits for many families and individuals."

Early results suggest any breed could improve communication and relationships. One family who took part in a pilot for the project said that there had been some startling changes to their three-year-old son, Jude, since they started working with their pet dog, Claude. Jude's mother, Kristina, said: *"There is no doubt in my mind that Jude's development has taken massive leaps as a result of his relationship with Claude. The day we brought Claude home was the day that Jude actually spoke directly to someone for the first time. Up until then, Jude would talk, but always to himself, even if he was talking to you, he didn't direct the conversation to you. But with Claude, Jude actually started talking to the puppy, albeit a one way conversation!*

"Thanks to Claude, Jude will wear his school uniform, provided Claude wears a school tie too. If Jude is upset, Claude comes dashing in with a wagging tail and thereby helps to diffuse a potentially stressful situation. Jude has learnt to sample new foods provided Claude tests them out first and has even finally understood the importance of toilet training having watched Claude learning to do the same."

Mark Lever, chief executive of the National Autistic Society, said: "*Through the National Autistic Society helpline and contact with our members we regularly hear from families who report that their children respond well to the company of dogs or develop some sort of special connection with them. Therefore we are delighted to be able to work with the University of Lincoln and Dogs for the Disabled on this study to start to understand and evaluate the effects of such a programme and take the idea further.*

"There are more than half a million people in the UK with autism and we are delighted to be able to support projects of such great potential and practical value."

Course leader for PAWS at Dogs for the Disabled, Katie Bristow-Wade, said: *"PAWS is different from many of the other animal assisted therapy projects that have gone before because it aims to make the most of the relationship a family has with a pet dog. We take families through every step of the process, from choosing the right dog for their family, through to the early days of introducing the family to a dog and of course the all important training. But we don't stop there; we also offer advice on identifying tasks to work on with the dog and we can put families in touch with local trainers. Every family will also be able to access on-line support and share experiences with other families through the dedicated PAWS website."*

For more information on the project visit: **www.dogsforthedisabled.org**

Undergraduate Student Wins America Trip

A second year equine student has won an exclusive internship in America.

Shannon Willmott, a second year BSc Equine Science student from the University of Lincoln won a place against UK second and third year undergraduates who were invited to apply for a three month internship to Virginia Polytechnic Institute and State University (Virginia Tech).

Shannon was selected on the basis of her 3,000 word paper on Nitrate and Nitrite Poisoning in Horses and its Possible Growing Welfare Risk to the UK, and her online interview which was conducted between the BEF headquarters in Warwickshire and Virginia Tech in the USA.

> "I feel sure that the experience will be really valuable in helping me to decide where to focus my attention when I get back"

Shannon will spend several months at Virginia Tech's Middleburg Agricultural Research and Extension Center (MAREC), where she will work with over 50 horses; participate in research related to reproduction, nutrition, genetics, behaviour or the management of horses; learn about reproductive management and foaling; show young stock at regional sport horse shows (in-hand); visit regional breeding farms and events; and network with leading owners, riders and trainers.

Associate Professor of Equine Science, Dr. Rebecca K. Splan, who was on the interview panel, is an expert in equine biomechanics and the genetic improvement of performance horses. She said: *"It was a pleasure to 'meet' Shannon during the online interview and I look forward to welcoming her to our institute where I am sure she will benefit from the experience".*

With a keen interest in research, Shannon says: *"I feel sure that the experience will be really valuable in helping me to decide where to focus my attention when I get back"*

Student Success

We like to keep in contact with our students once they have completed their course at Lincoln. Here is what one of our former students is up to now.

Jennifer Britt

Course: Conservation Biology

Graduated: 2010

During her time at Lincoln Jennifer secured a UROS (Undergraduate Research Opportunity Scheme) bursary funded by the University of Lincoln. Her project was supervised by Charles Deeming who had convinced Jennifer of the value of dissecting the nests of blue tits and great tits, hair by hair!

The aim of the project was to determine what environmental factors affected the mass and composition of the nests that had been collected from nest boxes at Riseholme in 2008 and 2009.

Jennifer collecting a nest for examination

A female blue tit incubating her eggs

The results showed that the earlier a blue tit nest was built during a breeding season, the heavier it was and that there was an effect of the prevailing environmental temperature. Nests built during cold periods were heavier than those built during warmer periods. Interestingly this effect was not observed for great tits, which may reflect their larger body size.

All of Jennifer's hard work paid off because her research was published in one the UK's leading ornithological journals *Bird Study* (First-egg date and air temperature affect nest construction in Blue Tits *Cyanistes caeruleus*, but not in Great Tits *Parus major* J. Britt & D. C. Deeming; *Bird Study* **58:** 78-89, 2011).

Following graduation, Jennifer secured a 3-month internship with Delta Simons, a firm of ecological consultants based in Lincoln and in April 2011 she was employed as a field ecologist by ESL (Lincoln) to work on surveys for Great Crested Newts and other important species

You can see more alumni success stories on our website at: www.lincoln.ac.uk/dbs/studentsuccess.htm

Data collected by students during research for third-year dissertations is regularly used in scientific papers.

In 2006, Richard Crafer (Animal Behaviour Science) worked with Drs Paul Eady and Charles Deeming on the allometry of egg mass and incubation in birds and reptiles, which was published in the *Journal of Zoology.*

In 2007 Leticia Hamilton (Animal Behaviour Science) published with Paul Eady in ***Proceedings of the Royal Society of London (B)*** on the effects of sexual conflict in a bruchid beetle.

In 2009, Becky Skyrme and Jenny Tomkinson (both Animal Behaviour Science) gave oral presentations of their undergraduate work at the leading International Conference on Veterinary Behaviour (IVBM) held in Edinburgh. Becky reported on how body posture overshadows verbal commands and Jenny spoke on the ability of dogs to learn from the interactions of others. Another two students, Chloe Stacey and Charlotte Beesley (also studying Animal Behaviour Science), had posters of their work at the meeting. Chloe had investigated the use of an intermediate bridge in clicker training, while Charlotte had examined the effect of kennel door design on noise levels in our own kennel unit.

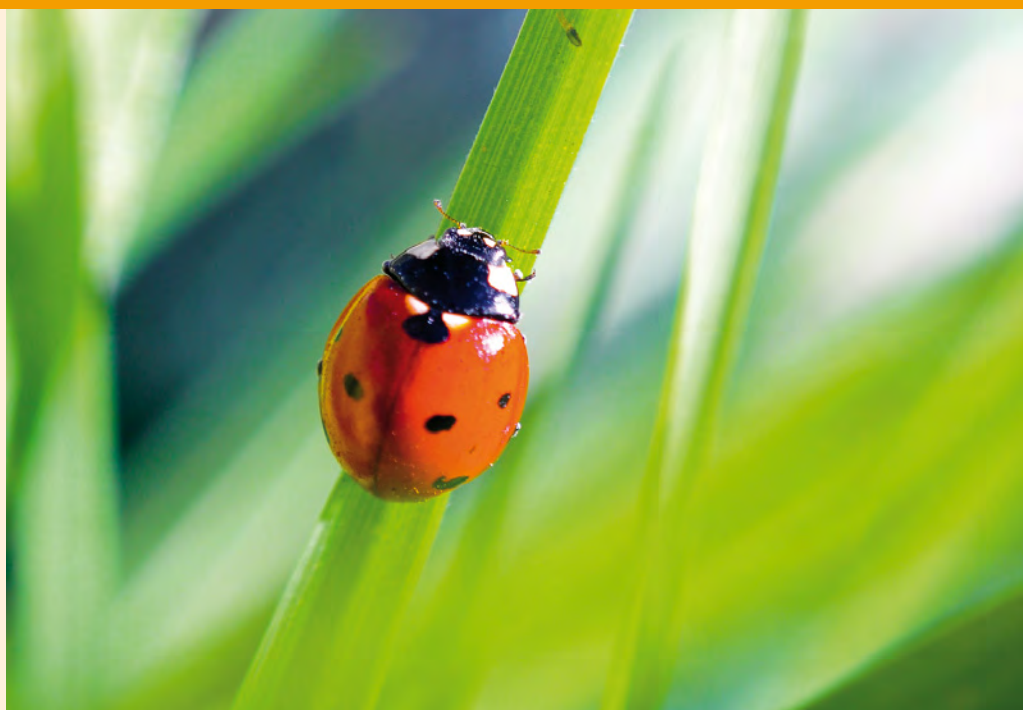
In the past couple of years, Sophie Bennett and Chris Morrant (both studying Conservation Biology) contributed data and were authors of a paper on invertebrate assemblages on new and mature hedges published with Charles Deeming in *Aspects of Applied Biology* (2010). Tracy Whitfield (Conservation Biology) was an author with Charles on a paper on egg composition in turtles published in *The Herpetological Journal* (2010). Holly Hodges (Conservation Biology) and Alison Vaughan (Animal Behaviour Science) contributed data that was described in a talk presented by Jonathan Cooper at the European Poultry Conference held in Tours, France in 2010

Collecting data from a hedgerow

New Biology Degree

The University has launched a new BSc (Hons) Biology for September 2011, building on our excellence in research and teaching in the biological sciences to deliver a programme that spans the breadth of modern biology.

We aim to recruit ambitious and well qualified students who want to contribute to some of the key issues of the 21st century, such as ensuring a sustainable food supply, both locally and globally. The students will have the benefit of teaching expertise from across the University and facilities at both Riseholme and Brayford



Recent Staff Publications

For a full list of our publications, visit: **www.lincoln.ac.uk/dbs**

Bass, K., **John, E.**, Ewald, N.C. & Hartley, S. (2010) Insect herbivore mortality is increased by competition with a hemiparasitic plant. Functional Ecology. 24(6): 1228-1233.

Campbell, E.H. (2010) Lactate-driven equine conditioning programmes. The Veterinary Journal. Epub ahead of print

Deeming, D.C. (2011) Importance of nest type on the regulation of nest humidity in birds. Avian Biology Research. 4: 23-31.

Eady, P.E. (2010) Postcopulatory sexual selection in the Coleoptera: mechanisms and consequences. In: The Evolution of Primary Sexual Characters in Animals (Eds. Janet Leonard & Alex Cordoba-Aguilar). Oxford University Press.

Hall, S.J.G. (2008) A comparative analysis of the habitat of the extinct aurochs and other prehistoric mammals in Britain. Ecography – Pattern & Diversity in Ecology. 31: 187-190.

Hudaib, T., Hayes, W., **Brown, S.** & Eady, P.E. (2010) Effects of seed moisture content and D-limonene on oviposition decisions of the seed beetle *Callosobruchus maculatus.* Entomologia Experimentalis et Applicata. 137(2): 120-125.

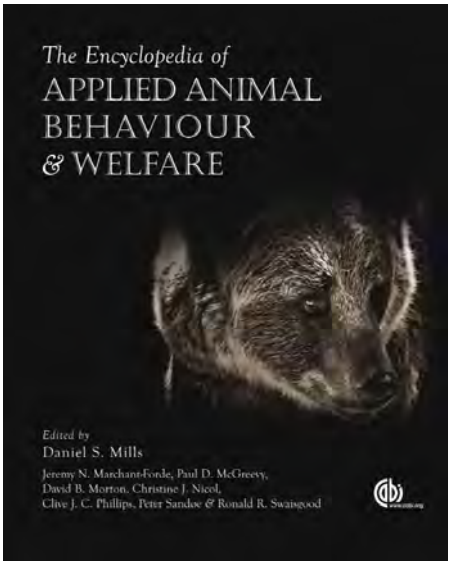
Mendl, M., Brooks, J., Basse, C., **Burman, O.,** Paul, E., Blackwell, E. & Casey, R. (2010). Dogs showing separation behaviour exhibit a 'pessimistic' cognitive bias. Current Biology. 20(19), R839-R840.

Mills, D. (2010) The Encyclopedia of Applied Animal Behaviour & Welfare. (Ed in Chief) CABI. Wallingford. (See right)

Mills, D. & **Zulch, H.** (2010) Appreciating the role of fear and anxiety in aggressive behavior by dogs. Veterinary Focus. 20: 44-49

Pike, T.W., Blount, J.D., Lindström, J. & Metcalfe, N.B. (2010) Dietary carotenoid availability, sexual signalling and functional fertility in sticklebacks Biology Letters 6(2): 191–193.

Wilkinson, A. & Huber, L. (2011) Cold-blooded cognition: Reptilian cognitive abilities. In The Oxford Handbook of Comparative Evolutionary Psychology (Eds. J. Vonk & T. K. Shackelford). Oxford University Press



Department of Biological Sciences
Riseholme Park
Lincoln
LN2 2LG

www.lincoln.ac.uk/dbs

Telephone **+44 (0)1522 886644**
Fax **+44 (0)1522 886880**
Email **enquiries@lincoln.ac.uk**

UNIVERSITY OF LINCOLN