The Systematist

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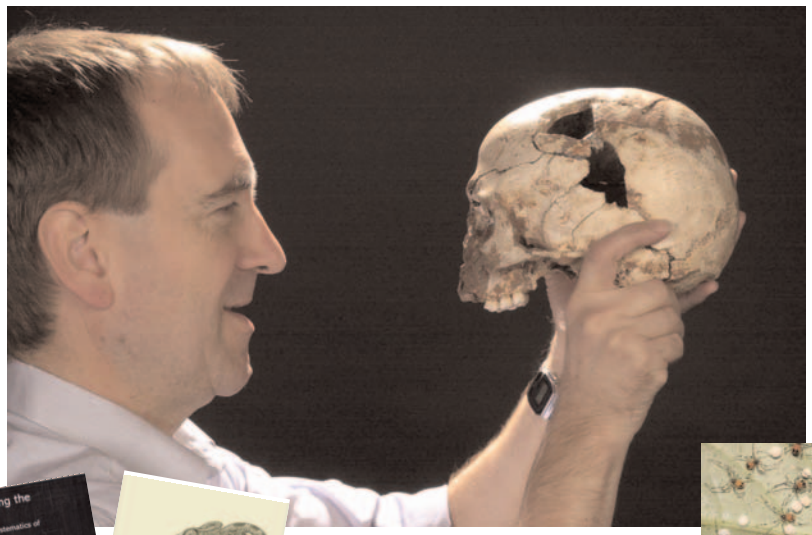
2007 Annual Lecture
Homo sapiens **and the Neanderthals by prof. Chris Stringer**



Biennial Report
Almost perfect, almost...

Book reviews
Systematics of species-rich taxa, and evolutionary pathways in nature

Inspirations
Ingi Agnarsson and his social spiders

Whither Natural History Museums?

Editorial

Dear Readers,

The end of the year brings new beginnings, new opportunities for planning research and acquiring funding. The Systematics Research Fund (SRF) and the Collaborative Scheme for Systematics Research (CoSyst) are both inviting applications for the new round with the following respective deadlines: 31 December 2007 and 31 January 2008. For more information and application forms please visit our website at www.systass.org.

This issue features the following interesting contributions. Dr. John Bates, Chair of the Department of Zoology at the Field Museum of Natural History in Chigaco writes about the continuing value and challenges faced by Natural History museums. Ciara Ní Dhubhghaill reports on the Edinburgh biennial, we annouce the biennial winners of the best poster and talk, and the 'winner' of an honour of a different nature, and we have two book reviews for you, including one of a new volume in our own Special Volume Series. Last but not least this issue's *Inspirations* features an arachnologist with a special fondness for social spiders. Enjoy!

2007 Annual Lecture

Prof. Chris Stringer FRS

Research Leader in Human Origins, Department of Palaeontology, The Natural History Museum, London

Homo sapiens and the Neanderthals

Wednesday 12 December 2007, 6pm (After the AGM at 5pm) The Linnean Society, Burlington House, Piccadilly, London

(Open to visitors)

The nature of the relationship between Neanderthals and modern humans has been a focus of debate for 150 years. While many workers accept that Neanderthals represented a distinct species *H. neanderthalensis*, there is still much disagreement over the reasons for their disappearance and the part played by our species in this event. Explanations have ranged widely from suggestions of disease or warfare through to economic competition from early modern humans, and even climate change has now been proposed as a significant factor. However, despite the continuing focus on events in western Europe 35,000 years ago, this was only the endpoint of much longer and more widespread potential overlap between the evolving Neanderthal and sapiens lineages. With increasing data and the imminent arrival of a complete Neanderthal genome, we may finally be close to an understanding of our relationship to these enigmatic relatives.

Cover illustrations: Our upcoming speaker at the 2007 annual meeting Chris Stringer (With permission of the NHM, London). The social spider *Theridion nigroannulatum* (Copyright 2007 Ingi Agnarsson)

The Systematics Association is committed to furthering all aspects of Systematic biology. It organises a vigorous programme of international conferences on key themes in Systematics, including a series of major biennial conferences launched in 1997. The association also supports a variety of training courses in systematics and awards grants in support of systematics research.

Membership is open to amateurs and professionals with interests in any branch of biology, including microbiology and palaeontology. Members are generally entitled to attend the conferences at a reduced registration rate, to apply for grants from the Association and to receive the Associations newsletter, *The Systematist* and mailings of information.

For information on membership, contact the Membership Secretary, Dr G. Reid (membership@systass.org), Department of Botany, Natural History Museum, Cromwell Road, London, SW7 5BD, U.K.

The Systematist Newsletter of the Systematics Association.

Natural History Museums

World Centers of Biodiversity Knowledge Now and in the Future

John Bates

Department of Zoology, Field Museum of Natural History, Chicago, U.S.A.

Whither Natural History Museums? These institutions exist around the globe and receive millions of visitors who come to learn about the natural world which is becoming increasingly difficult to reach or unfamiliar to those growing up in our largest cities. Many natural history museums are the centerpieces of regional, national and international knowledge about biodiversity and evolution, yet garnering support for these institutions continues to be a struggle and there is concern among many associated with them that they may not survive in the long run. I will consider modern natural history museums and look to the their future, which should be bright, but only if science continues to be at the forefront of supported initiatives at such institutions and in society in general.

A recent article in *Nature* bore the title "Endangered Collections" (Dalton 2007). This article and others have highlighted issues at the Smithsonian Institution and the Academy of Natural Sciences, Philadelphia, two of the oldest Natural History Museums in the United States, but the problems these venerable institutions have faced are shared with other Natural History institutions large and small. The causes cited for the difficulties usually come down to finances and changing funding priorities, with some arguing that museums are antiquated, or that their missions are somehow out of step with a changing world. Another recent article about the plight of museums began: "Corporate managers like mission statements: scientists generally don't. Academic freedom often sits uneasily alongside the goal-driven culture of the private sector" (Anon 2007). No one should be surprised that there is friction between some corporate-minded people and some academics, but the issue is not that one side is goal oriented and the other not. Rather, the two frequently have similar goals with different perceptions about how they should be achieved, with some corporate managers wanting to plow any new funds into new initiatives, while academics desire the financial security that will ensure that they can continue to do top-flight science. The best solution would seem to be striking a balance between the two approaches.

The first thing is to establish the mission of Natural History Museums. They can be and are many things, but at their heart are always the collections, the research done on those collections, and the education possible using them. These collections are the repositories for information about earth's biodiversity and how it has evolved through time (Here I take the view that biodiversity includes all aspects of anthropology, botany, geology, and zoology, recognizing that most museums do not cover all these fields). The mission then is to document and understand biodiversity and the processes that shape it and communicate that knowledge to the world at large. Museum researchers undertake this mission for both practical and idealistic reasons. On the practical side, humans cannot divorce themselves from the web of life that covers the surface of Earth, if we do not understand biodiversity, we may doom our civilizations as we continue to alter the balance of Nature on ever-increasing scales. On the idealistic side, for many of us, the sheer wonder of the myriad of solutions to surviving on earth (or not) through time is enough to make biodiversity the most interesting aspect of the planet. Through our institutions, their collections, exhibits, public programs and training, museums drive to communicate and teach future generations to value and understand ever-evolving biodiversity.

There is no doubt that many institutions have suffered and continue to suffer from neglect within the larger communities they inhabit. None of us employed by a Natural History Museum today can feel satisfied that society sees the appropriate level of value in what our collections and their associated programs offer, but such is the challenge for almost any non-profit institution. While we need to find appropriate and new ways to be considered relevant (Pettitt 1997; Suarez and Tsutsui 2004), this must be done without losing sight of the heart of what we are - stewards of what humans know about the planet's biodiversity.

The brand of the institution/the importance of academics

Branding is corporate jargon, but it has its place in the current climate in which natural history institutions find themselves. How do natural history museums compete for visitors who have more choices than ever before and still be true to their

mission? An idealistic answer might be that they simply need to continue to display the natural world the way they always have, but that will probably not pay the new (larger) bills. Exhibit departments have done wonders creating new and modernizing older exhibits making use of technologies, such as computers and high definition television screens. They have also worked to bring the increasingly high tech science done by museum researchers to an increasingly techno-savvy younger generation, but they cannot forget the importance of basic evolution and natural history, which is still not well taught in our public schools. So, the most responsible exhibit brand is one that stays true to the mission of natural history institutions continuing to bring out traditional information about evolution and natural history, while also highlighting the new and exciting research methods and results. The same can be said for the "brand" of research. A successful staff of any leading natural history museum should conduct both the traditional taxonomic work necessary to describe life of the planet and as much cutting edge, collections-based research as is feasible. There must also be an emphasis on training, because the systematics and evolutionary research done in museums is uniquely supported through these institutions and their collections.

Academic training may be the aspect of Natural History Museums that is most overlooked in terms of broader contributions to all levels of society and has become too undervalued at many universities with museum collections. In terms of both collections-based biodiversity studies and state of the art evolutionary research, many in museums are training the next generation of researchers and collection managers, not to mention providing opportunities for people interested in museums to get to know the types of science that can be done using collections. Training happens at all levels from high school interns, to undergraduates, graduates and professionals working in related biological fields. It can be local, regional or international in scope, which is why Natural History Museums are centers for those interested in biodiversity.

The morale of personnel

Any manual on how to be a successful corporate executive must have a section that emphasizes that maintaining morale of the employees is an important part of any institution's success. Continuing budget wows at many museums decrease morale and potentially lead scientists and others who would make wonderful curators, collection staff and other museum employees to avoid such positions. The causes of these financial problems likely varies from institution to institution, but one that is clear is that these institutions strike a fine line between the need for new initiatives and supporting the core of the institution (Dalton 2007). Successful museum leaders need to consider issues of staff morale and input when setting strategic goals.

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Museums are dynamic institutions

We, museum scientists, can be our own worst enemy. Dictionary definitions for "museum" include: "a place for learned occupation, an institution devoted to the procurement, care, and display of objects of lasting interest or value, or a place where objects are exhibited." While the first two definitions describe a museum well, to some, "museum" simply implies a storage and display site for old things. The word "museum" even has been used by some scientists to describe parts of the world where it is felt that the majority of evolution happened a long time ago (Fjeldså 1994, McKenna and Ferrell 2006). Fjeldså (1994) argued that avian speciation rates are higher in the Andes than in the Amazonian lowlands; and therefore Amazonia was a museum compared to the Andes and less of a conservation priority. I argue that Amazonia is a museum, but not because it harbors only older lineages, in fact, there is plenty of evidence that evolution continues today in the Amazon Basin just like it does in the Andes (Bates and Demos 2006). To me then, Amazonia is a museum, but only because I reject the notion that museums are dusty old places. Anyone visiting the research facilities or modern exhibits of a functioning modern Natural History Museum is going to find the historic collections, but they also will find recently collected, more data-rich specimens, state of the art electron microscopes, liquid nitrogen storage facilities for genetic resource collections, high tech labs for sequencing DNA, and high powered computing clusters. Why? Because the scientists that curate and study scientific collections are at the cutting edge of the new technological advances in their fields studying biological and cultural diversity.

These new research tools present a problem as well. Researchers at modern Natural History Museums need to be able to use and maintain research tools that are far more expensive than ever before. They also need well-educated staff to operate these machines. The cost of doing this research has greatly increased. Grant writing can get

such research tools in the door and installed, but long-term maintenance is not generally feasible solely through the granting game.

Almost every active Natural History Museum is involved in some sort of effort to computerize all or parts of their collections offering rapid access to data and new and powerful analytical possibilities (Krishtalka 2002). This also is a daunting and expensive task especially for the largest collections, but the benefits to the community in terms of increased data access are substantial. There are still those who view making collection data freely available via the web as not compensating for the efforts necessary to create and care for collections. The counter argument is that increased access to the data will yield increased recognition of the value of these data and increase the support base. Whatever one's point of view on this, computerization of collections is something that is moving forward and support needs to be given to help sister institutions in less developed countries connect their collections to the growing global networks.

It is easy to try to do too much. The mission of Natural History Museums is plenty large when it is limited to documenting and understanding biodiversity and the processes that shape it. Paying for the facilities and staff necessary to carry out this mission is not trivial, but our donor communities and society at large can be convinced of the need to better support our institutions. The need will always exist to present our arguments about the value of these collections and the research but we need to remember that they are dynamic entities.

Reaching the broadest audience.

I am struck by a tendency for museums and their personnel to be continually worried that they are not reaching enough people. That there is more they should do (e.g., McCarter et al. 2001). On the one hand this will always be true; there are always new technologies to be employed and there are always new ways that museum collections might be explored and data from them used in novel ways. But sometimes, I feel that museums fail to stop and recognize how much we accomplish now. In talking about my institution in other countries, I like to emphasize that most of the approximately 1.4 million visitors who visit The Field Museum annually will unfortunately never get the opportunity to learn firsthand about the biodiversity of other parts of the world. Too many grow up in cities where they do not even have an adequate appreciation of what goes on in the lands beyond the suburbs (or even in the parks within the city), but in our museum they have the opportunity to learn about biodiversity and science on a global scale in ways that will lead some into supporting efforts to conduct the much needed biodiversity research that we do. Having curatorial research programs intimately associated with Natural History collections and exhibits is vital to make this connection successfully.

Natural History Museums need to get the massage out that they are what they are: incredible archives of biodiversity that are being added to in increasingly new an innovative ways (Krishtalka and Humphrey 2000). They are academic institutions that are training critically important new generations of scientists with the taxonomic expertise to understand how to conserve biodiversity into the future.

In summary, one could go back to the earliest human civilizations and find a struggle to convince the majority of any society to accept the intrinsic value of biodiversity. Thus, we should not be surprised that museums have and will continue to have the need to justify their existence to new generations, at the same time as long as there is life on earth these collections and exhibits will continue to provide a valuable tool for understanding and conserving that life. Natural history museums do face challenges both from within and from the outside. Many have weathered more than one such period in the past and survived. They should be able to do it again. Those of us committed to these institutions and the collections they house need to creatively beat the drum and continue to educate the public about on the value of these unique encyclopedic resources.

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Biennial Report

Perfect, well almost...

This year the biennial meeting of the Systematics Association was hosted in Scotland by the Royal Botanic Garden in Edinburgh from 28 to 31 August. Those at these beautiful gardens pride themselves on its 16,000 species-strong living collections of plants and fungi but the gardens are also internationally renowned as centres for excellence in plant taxonomy, biodiversity science and systematics, making it an appropriate choice for this years meeting.

Stephen Blackmore and his colleagues at the Royal Botanic Garden in Edinburgh were wonderful hosts and did a great job in organising and administering the conference. The quiet effectiveness at which everything was carried out created an ideal environment for the scholarly sessions. Meetings were held simultaneously in a large lecture theatre and smaller conference room while teas, coffees and the much pounced-upon, obligatory conference biscuits were in a separate building a short walk away along with the posters and a room with internet access.

Upon registration, each delegate received a cloth carrier bag embellished with the logo for this year's conference, “Arachne's Disc”, a diatom etched by David Mann. The same diatom graced our complimentary notepads, posters and the cover of the programmes. Clutching their “freebies”, (some more gleefully than others-a reflection perhaps of the number of summer conferences attended?) the delegates made their way to the lecture theatre for the opening session.

The symposium was opened by Professor Stephen Blackmore, Regius keeper of the Royal Botanic gardens who welcomed us and spoke briefly about the future of systematics. This sixth biennial systematics conference continued the format of previous meetings in providing a mixture of both open and focussed thematic sessions.

The three major themed symposia were; Floras and Faunas serving Biodiversity research, Speciation, and the UK Research Councils Systematics Symposium. Emerging technologies and techniques were outlined in “how-to” talks and covered dating molecular phylogenies, geophylogenetics and evo-devo methods in non-model organisms. These subjects and titles along with the wide variety of student presentations and the discussion of systematics projects being funded by British Research Councils promised to keep everyone dashing from room to room, embroiled in lively discussions and furiously taking notes. Did it deliver?

Tuesday's lecture theatre sessions focused on taxonomy and biodiversity whilst the conference room hosted those presentations concerned with dating phylogenies and biogeography and also the first of the “how-to” lectures. Of the day's presentations, the one that seemed to get everyone talking was Tony Gutierrez's presentation of the military's research into field identification of vectors and pathogens. The prevailing impression was that we are not so far off the triquarters of Star Trek lore, an exciting prospect to be sure with the potential to impact greatly on the way we study biodiversity.

To my mind Wednesday delivered the most variety. The day started off for me with a series of presentations on the theoretical and practical challenges in phylogenetics and provided plenty of food for thought. I was lucky enough to catch Ben Rowson's prize winning talk on diversity in tropical snails relative to sexual conflict and adaptive radiation. Ben caused much grimacing and leg crossing among members of the audience with his detailing of spiny penises and sexual conflict. Rod Page presented a series of simple tools for gathering the necessary details of an organism needed for any serious systematics or biodiversity appraisal, see http://ispecies.org. The post-lunch UK Research Councils Systematics Symposium was for me, one of the highlights of the talks. They encompassed a range of topics, covering phylogenetic methods, taxonomic databases (once more) and life histories. Sandie Baldauf's talk on choanoflaggelates along with nifty video images stood out as being both informative and entertaining as did Tim Littlewood's discussion of parasitic life-histories. Representatives from the BBSRC and NERC spoke about funding opportunities for systematics based research but sadly there weren't too many people there to hear them, most people spilling out of the conference room listening to the student presentations on general systematics.

The speciation symposium on Thursday was well attended and covered all the bases; delimitation, divergence, reproductive isolation, hybridisation and radiations whilst the plant systematics presentations showcased a variety of approaches

to resolving evolutionary histories.

Thursday evening too proved very interesting when we all strolled down to Edinburgh's Dynamic Earth for the conference dinner and ceilidh. Overlooking Salisbury crags, famously linked with the father of modern geology James Hutton we mingled quietly sipping champagne, none the wiser of the hilarity to come. Dinner too, saw copious amounts of alcohol being consumed-all the better to blame uncoordinated dancing on. There was no fear of people being too shy to dance and risk ridicule, as most embraced the spirit(s) of the evening and took to the floor. Bowing and leaping about aside, sweaty, red faces were a great equaliser and the evening was a testament to networking. The last of us left around two thirty for the moon-lit walk back to Pollock halls.

The late night was all too evident the next day when both the lecture and conference rooms failed to fill up before lunch. Friday's' programme didn't include a symposium but was instead comprised of two open sessions, phylogeography, differentiation and population genetics in the lecture theatre and evolution and development in the conference room. David Kidd's “how-to” presentation on geophylogenies drew quite a crowd at nine in the morning despite the excesses of the previous night as did Catherine Kidner's on evo-devo methods in non-model organisms.

Professor Richard Bateman closed the conference with nostalgic reminiscences about how far the association has come, an acknowledgment of the hard work gone into the organisation of the conference and praise for the speakers. He ruminated on the direction systematics was going in and the funding difficulties to be overcome. Student prizes were awarded to Ben Rowson for best talk and Alice M. Blumlein & Davide Pisani for best poster.

My only criticisms of the meeting (and I am all too aware that I didn't present anything so can't throw too many stones) are levied at the lack of detail of methods in the general systematics presentations, the overwhelming number of plant topics and the general absence of debate/discussion. While one could argue that the group of choice is inconsequential given that we are united in our interest in processes and techniques used to study said group, there was little in the way of methodology covered in the open systematics presentations that I saw. I am sure we are all aware of the importance of transparency in phylogenetic methods. The large amounts of molecular data being generated necessitate ever more sophisticated methodologies and the prevailing sentiments that morphological datasets are rife with homoplasy and subjective data mean we all need to rigorously display our data handling techniques. To keep up to date with international standards of analysis it is crucial that we know how others are generating their trees. This brings me to my third criticism-lack of debate. The only instance where anything near a discussion got going was in the conference room after a presentation where a student touched upon using Bayesian techniques in the analysis of her data. A parsimony versus Bayesian discussion got going, with hands shooting up in the air rapidly in the hope of making a counterpoint but this deviation from schedule was swiftly nipped in the bud by the chairperson who recommended continuing over coffee. Such minor criticisms however, fade in the light of my overall positive impressions of the conference.

I imagine most of those who attended the conference would deem it a success. There was surely something of interest for everyone among the myriad of topics included. The how-to talks stood out from the crowd, presenting new techniques and pressing one to consider the application to one's own data. Issues pertinent to systematics today were widely discussed, including how to climb aboard the bandwagon that is the climate-change debate. New faces in systematics were introduced and I know that I will be keeping a close eye on the journals for the publication of many of the topics discussed. Well organised, stimulating and varied, the conference was certainly worth tearing myself away from my studies (I did mention the conference biscuits right?). I look forward to the seventh biennial conference, held for the first time outside of the UK in Leiden and hope to present my own work to a similar audience of esteemed systematists. Many thanks to those involved in the organisation of the event and to those who presented talks for making this 6th biennial conference an enjoyable one.

Ciara Ní Dhubhghaill, PhD student in Crustacean Systematics, University of Bath, Bath, UK

Prize Winners at the 6th Biennial

Best Poster Prize

Alice Blumlein (& Davide Pisani) for ‘Timing the Origin of Vision’

Alice Blumlein (right) and Davide Pisani

I graduated with an honours BSc in Biology from National University of Ireland, Maynooth in 2007. Despite, or rather because I had not studied phylogenetics I chose a final year project in phyloinformatics, under

the supervision of Dr. Davide Pisani & James McInerney. The project sought to analyze the origin of vision through a phylogenetic analysis of the opsin superfamily. These light-sensitive proteins mediate the visual response throughout the animal kingdom. The initial findings were encouraging and I spent some of this summer continuing the analysis with Dr. Pisani in his newly founded Laboratory of Evolutionary Biology. The results of these analyses seemed very interesting and were presented in the poster “Timing the Evolution of Vision”.

This year I have been awarded an individual PhD studentship from the Irish Research Council for Science, Engineering and Technology (IRCSET) and have recently started work in Yeast Genetics laboratory under the supervision of Dr. Gary Jones. My project focuses on the role of HSP70s in amyloid disorders, the evolution of this protein family, and prion propagation. I will combine both wet-lab and computational methods to identify residues or domains that may be possible therapeutic targets.

My children, William 17 and Naomi 11, should always get a mention, because they keep me grounded to the real world of dance lessons and French grinds. Finally, I'm also partial to a bit of socializing, so thanks to everyone at the Systematics Association for a great week in Edinburgh.

Best Talk Prize

Ben Rowson for ‘What drives Diversity in Tropical Carnivorous Snails (Pulmonata: Streptaxidae)?’

Ben was born and grew up in Cardiff, Wales, UK. A childhood passion for shell collecting was revived while studying for a BSc in Environmental Biology at the University of St. Andrews, Scotland, UK (1996-2000). Courses in evolutionary biology and an Honours project on sexual selection in bush crickets led to a deepening interest in systematics, as did a NERC-funded MSc in Ecology at the University of Wales, Bangor (2000-2001). His thesis on planthoppers of the Galàpagos, in collaboration with the National Museum of Wales, Cardiff (NMW) provided more specialist entomological experience. Since 2002 Ben has been a Research Assistant at NMW, focussing mainly on land-snails, and in 2005 began a PhD with NMW and Cardiff University on the systematics of the Streptaxidae. These carnivorous tropical snails have unique morphologies whose roles in diversification have not been examined. Ben's PhD combines morphological and molecular approaches to resolving the evolutionary history of this speciose and under-studied group, which will have biogeographic and taxonomic implications. Spending time in Africa, illustration and descriptive taxonomy are particularly enjoyable aspects, as is the occasional opportunity to hunt insects with his wife Rhian, an entomologist.


Ben Rowson

Netting a Fishy Worm
A systematist’s ‘honour’

I was recently honoured by my colleagues with the patronym *Overstreetia olsoni* Bray & Cribb, 2005: a species of fluke (Platyhelminthes: Digenea) from the Capricorn silverside, *Atherinomorus capricornensis*, from the Great Barrier Reef in Australia. In general, patronyms are named in recognition of contributions made to the field by the named person, and in this way reflect a degree of esteem by one's colleagues. In the case of *O. olsoni*, however, my contribution was less 'to' the field, but rather 'in' the field, and was a dubious one at that.

One morning during a collecting trip at the Heron Island Research Station (Univ. Queensland) in the Great Barrier Reef, I left my colleagues in the lab dissecting reef fishes whilst I went together with a student and a seine net to collect a guitarfish (Rhinobatos typus) from a reported 'hot spot' near the station. Surveying the waters from the beach I soon saw the tell-tale shadow of a ray swimming close to shore and thus immediately began to pursue it with the seine. Dragging the heavy net toward shore it became increasingly clear that I had netted not a single, large elasmobranch, but instead an enormous school of silversides of just the right size to be caught in the net by their gills, and thus to dismiss the possibility of taking the seine out for another try. Indeed, the net with its entire school of little fish had to be carried back to the station and the collecting crew summoned to stop their work in the laboratory and to help remove the fish from the seine: a task I recall taking 8-10 people the better part of an hour (and far longer for the repair of my reputation). All was not for waste, however, as at least some of these fish harboured a new species (also representing a new genus) that was later named in my 'honour' and whose succinct etymology kindly belies my real 'contribution': "This species is named for our colleague, Dr Peter Olson, whose enthusiasm with a seine net led to the discovery of this species".

Details of the SA research grants, conference bursaries and funding for the organisation of meetings can be found at: www.systass.org

Inspirations

Funding for systematics research. Now there is a contentious subject! In the last issue of *The Systematist* prof. R. Wills Flowers identified a funding bias in the United States towards large museums and universities as an unexamined impediment to taxonomy. Flowers argued that the "most productive segment of the taxasphere," including taxonomists in smaller institutions, state agencies, retirees, and other unsalaried taxonomists, was largely excluded from receiving government funding. The future of taxonomy, he argued, would therefore benefit from a more equitable distribution of money.

A recent paper by Agnarsson and Kuntner published in *Systematic Biology* (56:531-539) addresses a different important impediment to the full potential of systematics. They focus on the success of the PEET initiative (Partnerships for Enhancing Expertise in Taxonomy) of the NSF (National Science Foundation of the U.S.A.). Disconcertingly, even though the training provided under the program is an undeniable success, the taxonomic expertise of over half of the PEETsters is lost due to the lack of available jobs in systematics. Obviously, a better coordination of systematics funding for training and jobs is essential to change this deplorable situation.

For this *Inspirations* we interviewed the first author of the above paper, Dr. Ingi Agnarsson. Although he is a specialist of spider systematics, Ingi's publication list bears witness to the fact that good systematists have to be good all-rounders. Among other things Ingi has worked on the phylogeny and evolution of social spiders, showing that social habits have evolved multiple times, on the evolution of web forms in spiders, the evolutionary consequences of long term inbreeding, and the co-evolution of cetacean tonal sound production and social structure.

How would you summarize yourself in the form of a title of a scientific paper?

"An ape (*Homo sapiens*; Hominidae: Mammalia) seeking biodiversity"

Summarize the when and where of your academic career beginning with your undergraduate days

I did my undergraduate at the University of Iceland during 1992-1995. I then spent a few years working and traveling before undertaking a Ph.D. study at the George Washington University and the Smithsonian, in Washington DC (1998-2004). After that I moved across country and up north to do a postdoc at the University of British Columbia in Vancouver, Canada (2004-2006). Now I am doing another postdoc, this time at the University of Akron, in Akron, OH and I also hold research associate positions at the Smithsonian Institution in Washington, DC, and the Scientific Research Centre of the Slovenian Academy of Sciences and Arts in Ljubljana.

When did you decide to follow the career path you are on now?

As far back as I can remember there has never been any question in my mind what I wanted to 'become', no other career ever made sense to me. That my dad and granddad were biologists had something to do with it, but not because I was pushed towards a family 'trade'. Rather I think I simply inherited their interest in nature (I eagerly wait for Decode to discover the elusive biology gene). According to my parents, I was five when I first declared that I was going to become a biologist. Around that age I started collecting things like rocks, insects, shells etc. I especially liked collecting moths, but relatively soon I started to get frustrated because I was always catching the same ones! Iceland, being cold, quite isolated, and having had nearly all its fauna and flora wiped out during the last ice ages, is home to relatively few species (e.g. one native mammal, no amphibians or reptiles, and only 80-90 species of Lepidoptera). We don't even have rats or mosquitoes, and I got really excited when, after years of collecting insects, I found my first cockroach! So within me grew a compassion for diversity and a dream to work in the hotspots of biodiversity on earth, especially tropical rainforests. I didn't know that then, but I think I was already headed for a career in systematics-the study of biodiversity. Now, an important part of my work as a taxonomist consists of fieldwork in the tropics around the world where we are finding that the vast majority of the spiders we collect (80-90% in the groups I study) are not only new to me (my childhood dream) but also new to science. As E. O Wilson put it, taxonomy is indeed a "pioneering exploration of life on a little known planet."

What are the main goals of your research, and what is your future ambition?

My research spans a range of topics such as morphology, taxonomy, biodiversity estimation, ecology, evolution, sociality, communication, silk biomechanics, inbreeding, and phylogenetic theory. Closest to my heart, however, are very basic

questions, such as how many species inhabit earth, and what are they!? It is truly amazing how little we know about the diversity of species on our own planet and alarming how relatively little effort and funding is put into studying it.

Fundamentally, therefore, I am driven by the desire to discover, describe, and classify species on earth, and the group I have chosen to work on are spiders. I hope to be able to contribute to speeding up the process of species discovery and description and in increasing the accessibility and utility of taxonomic information for general researchers and the public. This will include developing tools to disseminate taxonomic information rapidly and in a user-friendly manner to a broad audience, for example via online databases, species web pages, interactive identification keys, DNA barcode libraries etc,

Ingi Agnarsson sampling from a large web of the social spider *Anelosimus eximius*

What organisms have you worked on, and which are your favourite organisms and why?

I have worked on a range of organisms, e.g. seashore invertebrates, butterflies, spiders and relatives, and whales. Spiders are absolute favorites though; they are outrageously cool. All spiders are predators and almost all are venomous. Spiders are typically aggressive and commonly cannibalistic, yet, some are cooperatively social. Some steal prey and silk from the webs of others, others enter heterospecific webs and use aggressive mimicry to lure the webs owner into their deadly 'arms', yet others mimic sex-pheromones of moths attracting juicy moth males to their trap-truly a 'fatal attraction'. Their use of silk is extraordinarily broad, using up to seven different kinds for various tasks such as prey catching (webs), prey attack and wrapping, to make lifelines, glue, egg cases and attachment discs, and even to get airborne. Spiders crawl, run, jump, burrow, climb, swim, scuba-dive and fly. If it can be done, a spider's doing it.

How many hours per week do you work?

I'd guess the norm in the last years has been minimally 80hrs and often more. However, I have been reducing that a lot lately to have more time for my family. We now have a small child and my wife is working at home finishing her PhD, so I spend much more time at home, and work less at home, than I used to.

What percentage of time do you spend on each of your different responsibilities?

As a Ph.D. student and postdoc I have, so far, had little administration or teaching I'd guess I typically spend a couple of months a year in the field, do a similar amount of focused lab work, and then spend the rest of my time writing and reading.

How many undergraduate, PhD students, postdocs, and technicians are in your lab?

I am a postdoc in the lab of Todd Blackledge. He currently has one Ph.D. student and several undergrad students working in the lab.

What gives you the most satisfaction and frustration in your job?

Discovery is a reliable source of satisfaction, and taxonomy is full of discoveries. Getting papers published and grants funded is, of course, also very satisfying. My major frustrations regard the general lack of availability of jobs and funding in taxonomy and the mistaken, but widespread, view that taxonomy is a low-key and rather unimportant science that is not publishable in major journals.

Do you have any international collaborations?

I have lots of international collaborators. Most of my work is based on collaboration - it is a great way to get a lot done, to broaden your research, and to tackle questions that you may not have the skills or ability to answer on your own. All in all I have published papers with more than 20 co-authors from over 10 countries, including collaborators from N. America, C. America, S. America, Europe, Asia and Australia.

What kind of fieldwork do you do

and where has it taken you so far?

Currently I mostly do fieldwork collecting and observing spiders, but also assist my wife in her fieldwork observing, recording, and photo-documenting dolphins. My fieldwork has taken me across the globe to four of the continents to places like Chile, Costa Rica, Ecuador, the Guianas, Hawaii, Madagascar, Malaysia, Panama, Singapore, S. Africa, and Tobago.

Did any memorable incidents happen during field collecting?

Among the most memorable is our trip into the remote interior of Guyana. Flying two tiny Cessna's, we were able to bring only bare essentials for our trip, even having to leave half our already meager luggage behind on the airfield (including heartwarming items we sorely missed later, such as blankets and bottles of rum!). Our 'airfield' was a strip of inundated savannah in the middle of the rainforest; landing there seemed to us only a slightly better option than accepting our fate and simply crashing into a tree. However, somehow we landed, and our pilot bids us farewell with the words “maybe nobody will see you ever again” and took off. We were, fortunately, well taken care of by the WaiWai Indians from a village near the 'airstrip' and soon had our camp set up a few hours down river. After intense two weeks of fieldwork, our return to 'civilization' was nerve-racking. For some reason, only a single plane came to pick us up, whose maximum carrying capacity was far exceeded by us and our luggage. Nevertheless, we'd give it a try, insisted our pilot. He first ferried us in two lots to a slightly bigger savannah 'airstrip' nearby, next to the tiny town Ishelton. That airstrip is favored by grazing cows so that we needed to fly over it at a few meters elevation a couple of times to scare them off before risking a landing. Then we loaded all of us and our luggage on the single plane, being, of course, hopelessly overweight. The pilot took the plane to outside the edge of the airstrip for extra distance, and then fired up the engines full power with all brakes active. Once there was no cow in sight, he then released the breaks. At that point we were committed, the only way out was to accelerate as much as possible before running out of airstrip and into the trees hoping to get enough lift to clear the canopy (meanwhile crossing our fingers for a bovid-free runway). At what seemed several seconds after the very last minute the pilot pulled the lever and somehow the overloaded airplane took off and just cleared the canopy. After takeoff, things didn't improve as we flew straight into a heavy rainstorm. Our two-hour flight back to Georgetown was in total darkness and silence as we pondered if this would be our last. Finally, we surfaced from beneath the rainstorm just a few minutes away from the airport. After landing our finally rising spirits were again crushed as we were greeted by the local authorities that confiscated all our specimens! That was a memorable day…

Is there any paper or book that has been very influential for your thinking?

It has to be Darwin's classic “The origin of species ...” I had a course devoted to that book during my undergraduate and it really opened my mind to the brilliance of Darwin-even now, 150 years after its publication, it is remarkably fresh and insightful-and the beauty of the theory of evolution. I had up until then been more interested in ecology but after reading the book I knew evolutionary biology was going to be my main path.

How was the most important mentor in your career?

I have had the fortune to enjoy the advice of many excellent mentors in recent years, however, Jonathan Coddington stands out among them. He has many qualities that make him an outstanding mentor, combining a brilliant mind with originality, clarity of thought, and a facility to explain any idea in a clear manner whether conversationally or in writing. He is generous with sharing his original ideas and offering advice, while never imposing. I am deeply grateful for his mentoring and continue to benefit enormously from it.

What is the best advice you have ever received?

It is a straightforward advice to make practical research choices. Your research can go in endless directions and there is never a shortage of questions to tackle, how should one prioritize? Jonathan suggests “look for the low hanging apples” which I have found excellent advice. Seek first the obvious questions that are begging to be answered-questions that do not require enormous effort to address, but are likely to have clear answers and to have an obvious impact/payoff. It sounds obvious, but I think many researchers, especially early on, make the mistake to first tackle obscure and difficult questions, that require a huge effort to address, but offer only unclear payoff at the end.

However, the 'advice' I am most grateful for having finally heeded was my wife's call to have a child. That is an experience topping any you can find in science.

How many scientific publications do you have at the moment?

36.

Could you nominate any of your discoveries or papers as the most important? Why should people not working on your organisms

care about your work?

I find most interesting a recent paper in *Evolution* written with three outstanding coauthors (Leticia Avilés, Wayne Maddison, Jonathan Coddington). There we show that spider sociality, rare as it is (ca. 20 out of 40.000 known species), evolved independently in almost every single species it occurs - even in multiple social species within a single genus. We argue that this remarkable pattern of evolutionary replicates, whereby sociality evolves repeatedly but subsequently social lineages apparently fail to diversify, is an unusually clear example of an evolutionary dead-end.

I am very proud of the papers that my wife (Laura J. May-Collado) and I have coauthored on whale phylogenetics and evolution of tonal sounds. They are very special for both of us and bring a whole new (and fun) meaning to the concept of taking work home.

I am also fond of my taxonomic revisions as they are the kind of work I think is generally underappreciated yet, I think, incredibly important. In that vein, I think a paper with my good friend (and best man!) Matja_ Kuntner in *Systematic Biology* is important in calling attention to the 'taxonomic impediment' (just as many taxa, taxonomists are facing extinction) and pointing to possible solutions to it.

I think these papers address issues that are not organism-specific, but should be of some concern to a broader audience.

You have a lot of papers with co-authors. Is there a particular contribution you generally bring to these papers?

Intellectually I don't think there is, my contribution really varies depending on the coauthors. However, I think I often bring the drive and goal orientation to get things going and finished. In short, I keep bugging and bugging my coauthors until the paper is done.

What qualities and skills do you think a successful researcher in your discipline must possess?

Stubbornness, goal orientation, and a true passion for what you are doing I think are necessary qualities. The list may also include a desire to travel and an ability/will to withstand tough conditions in the field, willingness to work long hours for low pay, and to move your home to where work is, sometimes annually... As for skills, as we state in our recent SysBio paper it seems clear that high-impact taxonomy in the near future will be an interdisciplinary, interactive confluence of genetic and classical morphological taxonomy and theory of biodiversity estimation and conservation. With this growth of skill-sets necessary for a career in systematics/taxonomy (e.g. morphology, molecular techniques, advanced microscopy techniques, data-basing, web page making, ability to photograph and draw and so on) students should aim to familiarize themselves with them all and master as many as they can.

Do you have any tips for students aspiring to a career like yours?

You have to be sure you really, really, want this type of career. Many, many years of hard work and dedication during your training will guarantee very little career wise. The job market is tight and pay is low. However, the harder you work and the more you get done the better are your chances and the payoff, is potentially enormous. It includes travel to exotic places, the privilege to turn up to work every day to do what you otherwise would do (or would like to do) with your spare time, but first and foremost (for me) making novel discoveries on a daily basis frequently documenting for the first time species / morphologies / behaviors etc. that no one else in the world has ever observed.

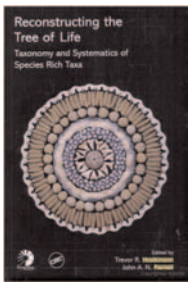
What do you think are currently the greatest impediments to achieving a successful career in systematics and taxonomy, and how could you try to overcome these?

There are few jobs, obtaining funding is difficult, especially in careers focusing mainly on taxonomy. Taxonomy has very limited access to the major journals and there seems to be limited interest in it from the scientific community in general. It is necessary to keep in mind that species are the basic currency of many fields: taxonomy enriches phylogeny, and provides one of the fundamental units for ecology and conservation biology. For the last decades phylogenetics, ecology and conservation have been capitalizing on the rich taxonomic heritage of 20th and 19th century taxonomists. However, due to dwindling taxonomic expertise the tank may soon run on empty. Realizing the importance of taxonomy, and increasing the funding and career opportunities in the field is necessary to avoid impoverishing these fields through taxonomic bankruptcy.

Taxonomists could do their share by calling attention to the 'taxonomic impediment' and by approaching taxonomy with a broad vision such as using taxonomic revisions to synthesize knowledge not merely describing species, and by embracing and acquiring skills in the use of new tools and technologies to combine with traditional ones. Increasing the scientific impact and utility of taxonomic work will help the field.

Book Reviews

Reconstructing the Tree of Life: taxonomy and systematics of species rich taxa



Hodkinson, TR, Parnell JAN (eds.). (2007). CRC Press, Taylor & Francis Group. ISBN 9780849395796; ISBN 10: 0849395798 (hardback), £68.99.

The most recent addition to the Systematics Association Special Volume Series is, simply put, a true gem. It brings together the remarkable efforts of an international community of taxonomists and systematists with expertise spanning a wide range of organisms, and versed in a multitude of theoretical and practical aspects of phylogeny reconstruction. In an era dominated by issues of global change and biodiversity conservation, the book edited by Hodkinson and Parnell is a much needed exposition of basic as well as more advanced approaches to gaining a proper understanding of the rich and multiform variety of life on Earth. The book chapters are elaborations of talks offered at the Fourth Biennial Conference of the Systematics Association (Dublin, August 2003). The leading theme is the treatment of highly speciose taxonomic groups, and this is explored in three main sections using different perspectives.

The first section includes three chapters and serves as a general framework for the rest of the book. However, it delivers much more than a thorough guide through the themes of quantifying the magnitude of diversity, the advantages and limitations of working with large taxonomic groups, and the provisions of adequate protocols for undertaking studies of such groups. It also provides enlightened suggestions for policy-making agendas worldwide, including ways in which systematic research can benefit the community at large outside the circle of practising biologists.

Chapter 1 by Hodkinson and Parnell delves into general concepts and definitions of taxonomic richness, and ways in which the latter can be assessed objectively and with reference to taxonomic rank. The chapter also includes a succinct overview of the scope and contents of the following contributions and ends with a thought-provoking, half tongue-in-cheek J'accuse addressed both to evolution (with its 'impious' delivery of mammoth tasks for taxonomists and systematists to sort through) and, perhaps more vehemently, to worldwide countries' 'leading lights', too often unaware of the pivotal role and contributions that taxonomic and systematic research offer.

Chapter 2 by Schram elaborates on the latter issue at length. It is a neat synthesis of what our role in the modern world is, and how we can shift paradigms and reset agendas worldwide. The vast potential of human and technological resources, the strengthening of global networks of contributory data, the solid training of younger generations of biologists and, last but not least, the radical restructuring of policies and political undertakings are the key factors that will allow systematic research to continue to flourish.

Chapter 3 by Seberg and Petersen is of a more technical nature in the context of the first section of the book. It is a refreshing perspective on the way taxonomy has advanced, and also highlights future prospects and current limitations and potentialities of this discipline. Emphasis is on renewed efforts in primary data collection, the very basic undertaking upon which everything else is contingent. Even stronger emphasis is on the molecular side of organisms. The leitmotif is DNA barcoding, which the authors praise as a powerful and complementary method to aid in identification of species. The rest of the chapter highlights problems and advantages of DNA taxonomy and barcoding, but offers useful protocols on all aspects of taxonomy in the new millennium, from specimen collection/preservation methods to implementation of criteria for database creation, use and developments.

The second section of the book includes nine chapters. It is about assembling trees for highly speciose groups and putting them to good use. The opening Chapter 4 by McInerney et al. addresses prokaryotes, specifically a review of the historical developments leading to the current understanding of this assemblage, molecular data input and their importance to our understanding of their intrinsic relationships, problems deriving from gene transfers, and a battery of methodological approaches devised to arrive at a desirable framework of large-scale phylogeny.

The most recent addition to the Systematics Association Special Volume Series is, simply put, a true gem. It brings together the remarkable efforts of an international community of taxonomists and systematists

Chapter 5 by Wilkinson and Cotton reviews and elaborates upon the Divide-and-Conquer approach to supertree construction. The chapter is a useful review of highly

advanced supertree assembly methods and offers a succinct summary of alternative techniques. In a similar fashion, Chapter 6 by Bininda-Emonds and Stamatakis addresses the performance of different optimality criteria for large taxon sets. The vexing question of achieving accuracy in resulting trees is exposed at length together with the implementation of methods that satisfy the demands of speed and practicality.

Despite the mathematically intensive treatment, Steel's Chapter 7 is very readable and thought provoking in its distillation of philosophical issues concerning whether, in fact, there is scope at all for undertaking overarching phylogenetic analyses covering larger and larger data sets.

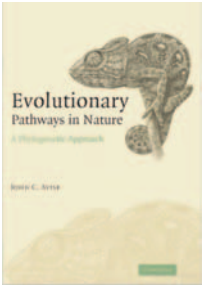
Chapter 8 by Wheeler could easily be read as a punchy and crunchy primer for molecular phylogenetics. Even a hardcore morphologist like myself found it compelling and elegant reading. Chapter 9 by Ronsted et al. delves into the issue of species-level phylogenetic resolution for highly speciose genera and co-evolution. Chapter 10 by Davies and Barraclough summarizes hypothesized causal explanations/predictors for the abundance of angiosperms, including productivity, evolutionary rates and ecology. In chapter 11, Hilu tackles the patterns of species-level richness in different groups of grasses and continues the theme of biological and extrinsic factors that may be held responsible for the explosive diversification of some genera. In chapter 12, Minelli et al. offer an evo-devo approach to animal phylogeny reconstruction and detail important issues of evolutionary and comparative biology, from homology to character delimitation, and from heterochrony to the establishment and development of genetic networks.

The third section of the book is a collection of articles addressing large-scale phylogenies in specific taxonomic groups. Case studies encompass insects, fish, fungi, flowering plants, grasses, diatoms and red algae. Cassis et al. (chapter 13) focus on plant bugs and discuss measures and estimates of diversity, field collection strategies, availability and implementation of data integration and dissemination. Stauffer et al. (chapter 14) explore the classical, textbook example of cichlid fish's taxonomic richness to address speciation patterns, biogeography, and biological factors (including feeding and breeding strategies) accounting for their multiform diversification. Tang et al. (chapter 15) address multiple ways in which fungal diversity can be uncovered. They review species concepts in the group, survey of hosts as sources of undetected diversity, and the use of molecular data to uncover yet additional richness in this group. Parnell et al. (chapter 16) discuss one particular and highly speciose genus within the plant family Myrtaceae. The key issue here is the way to unravel the truly amazing variety of morphologies and how to resolve intrinsic relationships at low levels of taxonomic hierarchy. Hodkinson et al. (chapter 17) survey the evolutionary history of grasses. An interesting part of the chapter is devoted to novel and recently implemented techniques for uncovering significant changes in the pattern of lineage splitting. Distribution of diversification shifts suggests a predominant, within-group pattern of significant increase in net speciation rates. A brief discussion of ways in which shifts could be correlated to key evolutionary innovations is presented. Utteridge and de Kok (chapter 18) discuss collector curves as a way to make predictions about future concentration of taxonomic efforts. Williams and Reid (chapter 19) survey diatom diversity from a historical perspective. I cannot recommend strongly enough the reading of this particular chapter as it is a source of inspiration for all those, professionals and beginners, that are passionate about systematics at all levels. I'll leave it at that. The more informed reader will uncover much more in the reading of this chapter, whether they are interested in diatoms or not. A chapter on red algae by Brodie and Zuccarello completes the book. Algae in general and red algae in particular were a true nightmare during my undergraduate courses in systematic botany. It was very refreshing to find, more than twenty years later, a neat and succinct treatment of this group.

In conclusion, I strongly recommend this book to all professional systematists with an interest in large-scale phylogenies and related issues. However, the book is likely to enjoy enormous success in much wider circles, including intermediate and advanced students in systematics.

Marcello Ruta
University of Bristol
UK

Evolutionary pathways in nature: a phylogenetic approach



Avise JC. (2006). Cambridge University Press, Cambridge. ISBN 0521674174 (paperback), £37.50 (US$ 65.00); ISBN 0521857538 (hardback), £70.00 (US$ 120.00).

A recent CNN internet poll asked “Which came first, the chicken or the egg?” Two-thirds of punters rightly voted for the egg (the DNA of fertilized eggs is identical to that of the chickens that hatch from them). Nevertheless, nearly 6,000 people were on the side of the

chicken. Clearly the potential market for John Avise's new offering is enormous, and the need has never been greater! And now you know how I waste my time.

This is a lovely book. A hugely enjoyable and accessible read, cleverly pitched such that newcomers and seasoned systematists alike will feel equally at home. Avise sets out his stall in a punchy introduction to molecular systematics and character mapping, conveying all of the key ideas without belabouring the math (a temptation he avoids throughout). He has a lightness of touch, coupled with a humorous and direct style. This is a book about what can be learned by optimizing morphological, physiological and behavioural characters, as well as geographical distributions, onto molecular trees. It garners a rich selection of phylogenies from the recent literature: around forty annotated cladograms throughout the 220 pages of the main text, addressing issues in the evolution of groups as diverse as viruses, plants, pandas and humans. Each question is introduced assuming no background knowledge, and competing hypotheses are outlined before discussing the mapping of characters. The book is loosely structured according to the type of traits being considered, and there is no perceivable increase in the complexity of case studies as you progress through. Hence, it is very easy to browse, and very easy to get sucked into, wherever it falls open. The additions of a more technical appendix and a comprehensive glossary were thoughtful and welcome. As a mine of deftly summarised examples, many beautifully illustrated with line drawings by Trudy Nicholson, this book is without equal. It will be well-thumbed, and undoubtedly find its way onto many reading lists.

Thirty years ago, if you wanted to know how kangaroos started jumping, you either constructed a plausible scenario of intermediates (bolstered, perhaps, by a judicious selection of fossils), or reached for Kipling (arguably superior). Morphology-based treatises on evolutionary pathways were often hampered by preconceptions about the nature of hypothetical ancestors ("ur" animals), the supposed trajectories of "important" characters, and famously counter-cladistic logic. What modern phylogenetics offers is the means to test hypotheses and assess probabilities, which is what makes it unambiguously scientific. And where molecular systematics scores over its morphological counterpart is in obviating the need for subjective decisions about the inclusion/exclusion of characters, and the demarcation of states. The "danger" of morphology, then, is that we become trapped in a self-reinforcing loop: "seeing" the characters we expect and propagating received wisdom (or, in some cases, nonsense). It is reasonably to be hoped there is no such temptation with As, Cs Ts and Gs. Hence the current fashion, and the practical (if not philosophical, given Avise's disclaimer!) position of this text: by all means hang morphology onto your tree, but perhaps best to be sure that your tree has a sound molecular basis. And here, I think, we risk throwing the bath out with the waterbaby (or something). What is needed are better morphological phylogenies, and better ways to combine different types of data. By limiting ourselves to molecular trees we can only "extrapolate back" from the living biota, thereby ignoring the invaluable insights offered by fossils (which, in some cases, preserve direct evidence of the very transitions and pathways we seek to reconstruct). Molecular systematics could never have inferred the existence of feathered dinosaurs (or dinosaurs of any kind), pelycosaurs or trilobites, and the Cambrian explosion would have sounded a great deal more muffled and distant. Most radiations were vastly more elaborate and baroque affairs than their extant remnants alone would lead us to suspect, and evolutionary pathways look far simpler when you prune out all of the extinct branches from the tree.

With this is mind, it is perhaps unsurprising that almost all of the examples discussed here concern relatively shallow and recent cladogeneses (mostly within families, orders and occasionally classes, and predominantly over the last 200 million years or so). Deeper and (dare I say) bigger questions receive comparatively little coverage. For example, the evolution of limbs from fins is an iconographic pathway if ever there was one (as bumper sticker merchandisers will attest). A fuller understanding of this particular transition is requiring the synthesis of molecular and morphological data with that from development and palaeontology. This has brought a number of surprises. The pentadactyl limb is decidedly not

This [Avise's] is a lovely book. A hugely enjoyable and accessible read, cleverly pitched such that newcomers and seasoned systematists alike will feel equally at home

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the ancestral condition for tetrapods, early forms often having seven or eight digits. Legs appear not to have evolved initially for walking on land, but primarily for wrestling through weed-choked shallows. And perhaps, most amazingly, while we might guess that fins and limbs share the same underlying homeobox patterning system, part of this template is ripped off and run backwards in the development of hands and feet. Many other major transitions - terrestrialization in other groups, the evolution of insect wings, the origins of birds, the evolution of cetaceans and modern humans - have only been illuminated by combining multiple sources of data.

Ultimately, I really rather wish I'd written this book! Partly because Avise will make a few bob if there's any justice, but mostly because it's a very nice idea and excellently carried off. As a reference source, every library should have a copy, and anyone teaching or studying evolutionary biology will find it an invaluable mine of examples.

Matthew Wills
University of Bath
Bath

Calendar

5 December 2007
9th Young Systematists' Forum
Flett Lecture Theatre, The Natural History Museum, London
Registration is free. Please send applications by email to Dr. Juliet Brodie (j.brodie@nhm.ac.uk), stating your name, contact address, and whether or not you wish to present a talk or a poster. For further information see: http://www.systass.org/ysf/

12 December 2007
Annual General Meeting and Lecture by Chris Stringer
Linnean Society, London, 5pm (AGM), 6pm (lecture, open to visitors)
See page 2 for more information about the lecture of Prof. Springer.

2 July 2008
The Sir Julian Huxley Lecture by Joseph Felsenstein
Linnean Society, London
Title to be announced

First half of September 2008
Meeting on Systematics and Climate change
Trinity College, Dublin
Contact: Dr. John Parnell, Trinity College, Dublin

3 December 2008
Annual General Meeting
Linnean Society, London

11-14 August 2009
7th Biennial Meeting
National Herbarium of the Netherlands, Leiden, and National Museum of Natural History, Leiden
For more information see www.systass.org