

Web-chat

Non-reviewed nano-related discussions from informal discourses held on *coccoliths.list* and *PaleoNet*

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1. Peter Ward (argo@u.washington.edu - 27.9.07) offered: While this is broadcast to everyone, it is aimed primarily at the Americans on the list, although I think it affects everyone. To those of you who have submitted to NSF for research funds over the past few years, working through Rich Lane's panel, there is no need to elaborate - we are in a crisis of funding. Too many good proposals, too little money - Rich Lane surely presides over the most frustrating job in the world - the bi-yearly declination of proposals that should be funded. The acceptance rate seems to be below 10%, and few fields can long sustain vigor when fewer than one in ten of us gets federal funding. There are many reasons for this, surely, some obvious, some not. Among the obvious, however, is the inescapable conclusion that we have not adequately made the case at a national (or even international) level that we deserve more funding, that our science should get a larger cut of the NSF science pie than it does now. Why does our science matter? Why should it be funded? Who makes our case in the meetings where the pie is sliced in the first place? How many papers do we put out in the 'Cadillac' publications (a NASA term - *Science, Nature, PNAS*) - what is our citation record - and who keeps track for use in the proverbial closed-door meetings where the pie of funding is sliced? How does one make the successful case against physics, chemistry, biology, and the rest?

With this e-mail, I suggest that we begin a dialog on how to improve this situation. If we can blivate at length on *Paleonet* about The View and latex, surely we can put our collective intelligence and wisdom together on how to tap into better funding. We should be in the catbird's seat: we hold the tablets of time, we deal with climate and its origins, we sit at the head table of evolutionists and so

much more. Our relevance in debates over teaching science instead of creationism, of how global warming can really wreck a world, of how a planet with life changes over time with relevance to life beyond Earth, even of finding life (or its fossils) on Mars, let alone our ownership of dinosaurs and hence the interest of kids large and small - and yet the funds we receive to conduct our science are so meager as to strangle our science.

I believe that we should pressure our 'senators' - those paleontologists in the National Academy have a greater voice than we rank and file - to stand up for us with more vigor than they have in the past. Secondly, there should be more of those senators - why is it that a paleontologist is elected into the Academy only once a decade or so - when in fact our field can stand against any in the intellectual records of so many of our colleagues - why are there not more of us in the corridors of national science power? We are doing something very, very wrong, and we play the power game that exists between various science disciplines very poorly, quite obviously.

What can a solution be? Rich Lane has tried in the past to convene groups looking for solutions to the funding problem. But he needs more of us to chime in. More of us should explain, through the vast opportunities of the internet as well as mainstream media, why we matter - what we do, and tell more of the fabulous discoveries about the past and present that can so fascinate taxpayers. We need to better make the case for our relevance, and explore ways to do so. We need officers in the Paleo Society (PS) who work not just for us in the field, by keeping the journals and short-courses rolling, but work as well for the good of the field through active participation in finding more national funding - who bang on DC doors, who know their way through the NSF halls.

Should we have a policy to fund our young scientists at a greater rate? Should we make all grants 2 years instead of 3 to spread the money farther? Should we create new 'initiatives' from our vast breadth - and if so, which ones? Global warming is not going away anytime soon, and we hold the key to important science relevant to this field, with its increasingly large pots of funding.

Why have we not started lobbying with our own elected state representatives - for example, when NASA recently cut funding to astrobiology, many of us, prodded by leadership in the NASA Astrobiology Institute (which, by the way, had more paleontologists as heads of teams than from any other discipline, as we paleontologists are pre-adapted to be astrobiologists, having already learned to balance our intellectual lives between different disciplines, which is what AB strives to do), many of us trooped our grad students up to Capitol Hill in DC, and banged on doors. This

works. Some funding was restored.

How about asking our officers to spend 10 minutes at the upcoming PS Lunch to tell us what the leadership in the PS is doing to improve NSF or other funding? How about having Rich Lane give us a report of funding trends, in addition to the reports from our other officers, for he is in leadership, *de facto*? How about cutting 5 minutes off some of those droning medal acceptance speeches to describe realistic ways of translating the excitement of paleontology to the excitement of that now all too rare phone call from NSF announcing that a proposal was funded. How about figuring out some way to increase our acceptance rates to 20% from its current doldrums? How about workshops on how to conduct an 'ask' from private donors, or how to write a successful proposal in this new world? How about more action, or at least more explanation, from those we elect, those that are elected for us, those that are hired to fund us? This is a crisis.

I believe, at a minimum, that the PS should begin true elections, people with platforms that might differ from candidate to candidate, instead of our current method of installing people who have had a good research record, when we need people who have a good lobbying record. Let's elect activists, people with vision, people with experience in tapping public and private funding, people with an agenda and plans for dealing with this crisis. Let's face this crisis, and confront it with solutions.

Roy Plotnick (plotnick@uic.edu - 28.9.07) responded: I am in full agreement with Peter Ward's statement, in particular that a situation that has been serious for years has now reached crisis proportions. How many new positions for young paleontologists will there be, and how many already with jobs will receive tenure, given the current funding situation?

Martin Farley (mbfarley@hal-pc.org - 2.10.07) added: I think Peter Ward is correct that we need to do a better job of selling our field to the broader society that could fund our work. We need to consider what levers (and this is advisedly plural) to pull to increase funding for paleontology and what examples of our work will work best with each lever. One element is for paleontology to speak with a more unified voice. One thing that splinters our effectiveness is that paleontologists have many societies. While I appreciate the efforts of the PS, it is relevant to point out that PS doesn't include all paleontologists. Many (most?) micropaleontologists, in which I include palynologists, are not members of PS. This is probably true of most paleobotanists too. The absence of these groups from PS has complicated origins, but the lack of unification hurts the field. At a minimum, PS could take a more active role in trying to pull together the various elements of the field. In my opinion, PS has had some success by organizing the paleo sessions at GSA in most years by the kind of problem the paleontology is attacking rather than the fossil group being used. Even if PS can't get more of the non-member paleontologists to join, it can act as an umbrella to organize the societies that those paleontologists do belong to.

We can gain from observing the successes in paleontology funding. For example, paleontologists associated with ODP have been successful in getting funding from the oceanography program of NSF. One aspect of this success is integration of paleontologic results with the broader geologic and oceanographic investigations undertaken as part of ODP.

There are broader levers for us to keep in mind too. *Science*, in its 24 Nov 2006 issue, had an interview with Sherwood Boehlert, the then retiring chair of the House of Representatives Science Committee. In it, he recommended that scientists need to do more advocacy with the political sector to show the value of science. He recommended meeting with political candidates to explain why they should be interested in the science agenda. Ultimately, the government funds science because it believes that the result will be beneficial to society, including the economy. We need to do a better job of articulating what benefits there have been (and will be) to even basic paleontologic research. In fact, we might want to start compiling examples of these benefits: One that comes to mind is how basic work on palynology led to techniques that are now contributing to understanding the life cycle of key agricultural crop pests (*i.e.*, insects). Environmental micropaleontology is another category of examples.

Some of this has been attempted with other arenas of paleontologic support. Several years ago, John Armentrout and I wrote articles for *Geotimes*, and particularly *Offshore*, explaining how to use paleontology effectively in the oil industry. John Armentrout also prepared a talk for exploration managers on the value of paleo (his very nice PowerPoint slides were on the NAMS website for anyone to use the last time I looked). This is by no means an exhaustive list of levers and examples, so I invite discussion of other ways to sell the benefits of paleo.

Roger Thomas (roger.thomas@fandm.edu - 2.10.07) commented: In his posting last week, Peter Ward draws attention to the critical shortage of NSF and other government funding in support of research in paleontology. This problem is not unique to paleontology nor is it unique to the US. Nonetheless, the situation is serious, and Peter has made some good suggestions in regard to the kinds of action we should take to improve the standing of our profession. One thing is reassuring. Despite limited funding, it is quite extraordinary how much exciting, ground-breaking research is being done and reported in *Science*, *Nature* and more specialized journals, every month.

It is not the case, as Peter Ward implies, that the PS has its head in the sand, taking no account of the funding problems we face. Over the past three or four years, under the leadership of Bill Ausich, Dave Bottjer and now Derek Briggs, the Society has pursued the following initiatives: (1) PS/NSF 'Town Meetings', designed to publicize funding that is available from a variety of sources within NSF, and to facilitate discussion of other funding options that paleontologists should pursue, have been held at annual meetings of the Geological Society of America in 2004, 2005

and 2006. A similar meeting was held at the North American Paleontological Convention in Halifax, Nova Scotia, in 2005, and another will be held at the GSA meeting later this month. Rich Lane of NSF has been an active and most helpful participant in all these discussions. (2) In consequence of these discussions, the PS received a grant from NSF to fund a workshop on Future Research Directions in Paleontology, held in April, 2006. Representatives of the Society of Vertebrate Paleontology and the Paleobotanical Section of the Botanical Society of America participated with active members of PS in this effort. This group, ably led by Dave Bottjer, has developed a research plan incorporating several key initiatives. These are outlined in a brochure that will be released and highlighted at the GSA meeting, this month. (3) In 2005, the PS applied for and received a grant of \$25,000 from NSF to support participation by US students in the North American Paleontological Convention, in Halifax, Nova Scotia. These grants were awarded on a competitive basis to student applicants, taking no account of PS membership in making these awards. (4) In 2006, the PS applied for and received a grant of \$25,000 from NSF to support participation by US students in the International Palaeontological Convention, in Beijing. These grants were awarded on a competitive basis to student applicants, taking no account of PS membership in making these awards. (5) In 2006, the PS provided \$7500 of its own funds to help make up a shortfall in funding for the highly successful summer course that has been offered for several years by the Paleobiology Database. The PS Council will be considering a renewed request for funds to support the 2008 summer course, at its meeting in Denver. (6) Drawing on a modest income from endowed funds, a generous annual gift from the Mid-America Paleontological Society (MAPS), and the largest part from general income, the PS provides 25-30 small grants of \$500 to \$1000 for student research, every summer. Currently, the Society is in the process of raising \$250,000 to endow and further enhance this program of student grants. We are now halfway toward achieving this ambitious goal. (7) Every year, prompted by the foresight of Jack Sepkoski, the PS provides 26 small research grants of \$500 to scholars in countries of the former Soviet Union. This program is unendowed. It is supported by the Society's general income.

No one would pretend that these worthwhile ventures go all that far in addressing the need for more financial support of paleontological research that Peter Ward has articulated. Undoubtedly, there is more we can do. Leadership positions in the PS are up for election every year. Next year, Mark Patzkowsky will have completed six years of excellent service as our Treasurer. We will also be electing a new President-elect, and a new Councilor. I will be delighted to forward the names of members of the Society who wish to serve in any of these capacities to the Committee on Nominations. In the following year, 2009, I will have completed my term as Secretary and we will also be electing another new Councilor. There are regularly recurring opportunities

to serve in coordinating our programs at professional meetings, in educational outreach, and as editors of one or other of our two excellent journals, our newsletter and our special publications. This is not a closed shop. Membership on the Council of the PS turns over quite rapidly. We welcome the participation of all those who are willing to volunteer their time to take on leadership roles in the Society. **Mickey Rowe** (mrowe@lifesci.ucsb.edu - 2.10.07) contributed: I'm glad someone else pointed that out... I was planning to, but hadn't gotten to it. I'm an outsider to paleontology, and I was a little surprised at people citing 10% as a low funding rate, as though paleontology has been particularly hard hit. In the past four years, the panels I've submitted to (variations on animal sensation and movement) have never had funding rates above 10%. Last year, NSF put out a survey that included a question about what people thought the success rates were for grants in the panels to which they submitted. Information about the survey can be found here: http://www.nsf.gov/od/ipamm/ipamm_2007survey.jsp or you can directly download the results (http://www.nsf.gov/od/ipamm/ipamm_2007proposersurveyresults/nsf_2007proposersurvey_results_070629.pdf). Question 40 is about success rates, and as you'll see if you get the file, almost 50% of respondents believe funding rates for their programs are 10% or less. As one of the survey respondents, I checked out these results as soon as they became available last spring. Since the subject is topical here, I decided today to find out how accurate peoples' perceptions are about those funding rates. NSF has a PowerPoint presentation file here: www.nsf.gov/attachments/103193/public/AkayIPAMMupdate.ppt. The bottom line of the presentation is that the number of submissions is going up, while NSF is funding a smaller number of grants because the average award size is increasing and the budget is not keeping pace. This is from slide 4 of the presentation:

Research proposal success rates dropped from 30% in FY 2000 to 20% in FY 2005, leveled off in FY 2006 (21%)

Coincided with:

47% increase in proposal submissions (began in FY 2000, peaked in FY 2004, leveled off in FY 2005 and 2006)

41% increase in average award size

39% increase in median award size

Research proposal success rates varied across the R&RA directorates, however all experienced declines.

I was surprised to find that the funding rate, NSF-wide, is so much higher than it is for the panel I submit to, though I also know that the numbers can be jiggered a bit because, for instance, collaborative proposals can be double counted (or not) depending upon the point you want to make. And I'm not sure how that issue was dealt with in the PowerPoint presentation. Anyways, it seems to me that if you want to do something about the problem it would be good to understand it. I'm sure a lot of you are familiar with all this, but I thought it would be good to put out some data — about both funding success rates and what others think of

them — for public consumption. I hope you find it useful.

Sara Lubkin (shl24@cornell.edu - 2.10.07) made the point: After eight years (mostly due to lack of funding and lack of lab space), I just earned my PhD in paleontology and have seen perhaps three job openings that I was qualified to apply for in the past year. As far as I know, none of the other students who I was in grad school with are employed in paleobiology jobs, although one has a post-doc. I'm struggling with the decision of continuing to look for a job that would involve relocation and probably time away from my family, or doing something else in order to pay off my student loans. I worry that if I take another job to pay the bills, I won't be able to get back into paleontology and won't have the time to get my dissertation in publishable format. I am not sure that I would advise a young person to study paleontology. I love what I do, but I certainly am glad my older children (soon to be college students) are considering more practical majors. I'm a paleontologist, and there is nothing better to get kids interested in science than a nice mixture of fossils and creepy crawlies. My nephew is fascinated with my work and it has inspired him to become some kind of 'ologist', but what do I say when he asks about paleontology? "Wonderful field Nate, if you like being unemployed". Some days I wish I had stayed in engineering.

Bruno Granier (granierbruno@orange.fr - 2.10.07) contributed: A mere coincidence but I received today a message from a French colleague with the following excerpt, answer from the hero in Leo Szilard's (1948) story '*The Mark Gable Foundation*', when asked by a wealthy entrepreneur who believes that science has progressed too quickly, what he should do to retard this progress: "You could set up a foundation with an annual endowment of thirty million dollars. Research workers in need of funds could apply for grants, if they could make a convincing case. Have ten committees, each composed of twelve scientists, appointed to pass on these applications. Take the most active scientists out of the laboratory and make them members of these committees... First of all, the best scientists would be removed from their laboratories and kept busy on committees passing on applications for funds. Secondly the scientific workers in need of funds would concentrate on problems which were considered promising and were pretty certain to lead to publishable results... By going after the obvious, pretty soon science would dry out. Science would become something like a parlor game... There would be fashions. Those who followed the fashions would get grants. Those who wouldn't would not." Sad but predictable.

Roy Plotnick (plotnick@uic.edu - 4.10.07) replied: First, I want to thank Peter Ward for opening up this discussion. How we as a community, either as individuals or through our professional societies, respond to this situation will determine the long-term viability of paleontology in the US. I also want to thank Roger Thomas for summarizing the efforts carried out to date by the PS and its leadership. We should all recognize that the PS is fundamentally

a voluntary organization; members of the council carry out their tasks without remuneration and at a significant cost to their own research and teaching, and they deserve our thanks. What is at issue is that NSF funding for paleontology is insufficient to maintain the field. In the most recent round in NSF Sedimentary Geology and Paleontology, the total budget for new projects was only \$1.6 million, for 18 proposals. Not all of this funding is for paleontology. Based on the forthcoming FRDP report, funding for paleontology comprises 2.5% of the EAR budget and only 0.5% of NSF's overall Geosciences budget. In an academic environment, especially at the research universities, where worth is often judged not only by receiving a grant, but by its size, current funding levels threaten both future hiring and tenure decisions.

The question is, what is to be done. To me, the issue is not whether we can identify important and interesting areas of research; this has been done repeatedly in the last decade and can be found in such documents as *Geobiology of Critical Intervals (GOCI)*, *The Geological Record of Ecological Dynamics*, and the forthcoming FRDP report. Instead, what is needed are structural changes in our institutions that will make them more effective advocates for our science. Some of these changes are contained in the FRDP document under the heading 'Development of the Role of Professional Paleontological Societies to Promote Paleontology and Paleontological Research'. This section was drafted by a group that included past and present leadership of the PS and SVP and includes specific actions that should be taken. These include activities within and among the societies to enhance research and funding prospects; promoting paleontology to other scientists; and promoting paleontology to the public at large, including elected representatives. As suggested by Martin Farley, this section also calls for much closer cooperation among our disparate societies. I strongly urge all of you to read this section, and the entire document, carefully when they are made available. No doubt other actions, including those suggested by Peter, should be considered and taken.

Michael Kishel (mike@virtuosoevolution.com - 4.10.07) came back with: Now maybe I am way off base, especially considering that I am not a professional but an amateur paleontologist (went to choose college majors and [fore]saw what you guys are talking about now). I did still do my bachelors and masters in a field of biology, though. I'm curious as to what all of your thoughts are on private funding. To my knowledge there are only two regular magazines devoted to paleontology that have limited distribution. But my experience has been that large portions of the population are interested in the field in a non-career-pursuing sort of way and as is true in my local amateur paleontology society (Western Interior Paleontological Society) there are quite a batch of volunteers and even some like myself who have enough science background to make a tangible contribution that might otherwise be done by graduate students. They are not the only ones though. There are a great many people who are interested who do

not even know that amateur organizations exist and have no idea that their local university department needs money. They've never seen a magazine either but they would probably buy it if they did. There's money out there. I know because I used my fancy science degrees to open a business. Lots of dough out there I think. Just need some creative methods to go after it. Look at our competition for example. Are we really going to allow Evangelical Christians to generate millions of dollars to open more fraudulent museums while our funding and therefore programs go down the tube? The truth can be hijacked with enough money and they know how to generate it. I think that we could steal their model and make sure that the truth remains paramount. Now I fully realize that I have just blasphemed the holy spirit in professional paleontology circles but really it should not be eliminated as a possibility even if it is the last resort. Those of you who are in the museum side know how fascinated we amateurs are with what you do. And as a final point we have a lot more money than you do that we just might be willing to spend. In addition to this, let me be very careful to point out that I am not talking about putting our museums and university programs up for sale like you might see at the Tucson gem and mineral expo. Just using creative methods of getting more donors, sponsors, private grants, private scholarship money, and whatever else is needed. OK who would like to go first and tell me why I am wrong? Be gentle. I just wanna help.

David Campbell (pleuronaia@gmail.com - 4.10.07) volunteered: I saw a recent study that found that biology tenured positions have remained fairly constant while the number of students has gone up. Does anyone know if this is the case in geology as well? Such a situation creates even greater problems than it might seem, because the constant number of tenure-track positions includes an increasing number of novel subfields. Paleontology and systematics tend to be regarded as topics that can be cut in order to add someone who works in the latest hot field. Are there ways to (a) better convey that paleo is a hot topic worth hiring in? (b) encourage adding positions to address new fields, rather than cutting important existing topics? (c) create jobs in paleo and systematics?

Peter Ward (argo@u.washington.edu - 4.10.07) responded: I was in the Geology Department at the University of Washington for 20 years with no additional paleo hires. I moved two thirds of myself (ouch!) to our Biology Department three years ago and we have made three new hires in two years in that department since then - two vert paleontologists and one paleobotanist, while our Geology Department turned my old position into another geobiologist, to add to the new position of geobiology/astrobiology (Roger Buick) that came with our addition to the NASA Astrobiology Institute in 2000. We have thus added what essentially are 5 new paleontologists through some creative labeling. Our Biology Department has over 2,000 majors, and all need to learn Evolution. Thus our Deans are happy to hire paleontologists because we can teach that, and anatomy. Add to that number Liz Nesbitt in our Mu-

seum/Geology Department and we now have seven active paleontologists, mainly by working with new positions needed for the huge number crunch in biology departments.

Jere H. Lipps <(jlipps@berkeley.edu - 18.10.07) added: Some of these issues are international in scope and others may impact others around the world, although I stay focused, as you did, on the US conditions. Nevertheless, I hope our colleagues in other countries may benefit from these discussions.

1. Paleo is funded also from a lot of other sources in NSF, including Polar Programs, Biology, Oceanography, Climate Change, *etc.*, and these need to be figured into the mix before action is formulated. We might be doing very well compared to some other fields, but I do not know of a compilation of such data. It could be had by an energetic undergrad just going through the NSF awards website and tallying the paleo projects (however they are disguised by other names). Maybe Rich Lane has it already? That would be useful information.

2. If you are curious about what is being funded, you can look at the NSF web display of awards in total, or by program or manager (nsf.gov then to 'awards'). Lane gave big awards (\$400K) for databases (do we really need them?), probably with the idea that they serve a wide part of the community (really?). Many projects were funded through Global Climate Change with him as the lead manager and these do not come out of the Paleo budget. A few of the usual investigative projects ran around \$100K each. The truth is: Very little money is available to the paleo community at large and only a few of us will benefit at any one time. Most communities probably feel this way too.

3. Considering that overhead takes a big piece of these little pies means we are getting much less (>50%) than those sums would indicate for actual research (my institution adds 52%, which is low I understand, based on a formula that is too complicated for this comment. Some overheads approach and exceed 100%). Program managers, even NSF, I believe, have no control over these, as they are negotiated by the Feds outside of NSF.

4. Award rates run less than 10% in the paleo program, and over 100 proposals (we need to know this number and to get these unsuccessful PIs together to find out what's going wrong) are received for any deadline date. This is very discouraging, not only for submitters but for reviewers as well ("Why should I review an excellent proposal, when it won't be funded — it's a waste of everyone's time" I heard paleontologists say). We are not alone, however. I hear from biologists in my department that success rates in their programs are less than 10% too. We need better data on all of these programs and on total number of submissions. We need to know that 8/123 proposals, for an unreal example, were funded, not percentages, simply because actual numbers make it more real. If my made up numbers were correct, this would indicate an awful lot of wasted time and effort for paleontologists and scientists in general. My only suggestion here is to write every proposal as a paper with a title page and budget, then strip the latter two off when it

is declined and submit it. At least it's not all wasted. Oh, you may need to add a little data and some conclusions but the only way people seem to get grants now days is to submit projects that are already nearly complete.

5. We probably should get paleobiology into the Biology Directorate in some formal sense, leaving Lane with stratigraphic, paleoenvironmental and other geologic paleo in the GEO Directorate. Some are being funded through BIO programs anyway. Maybe it's best to leave it this way, but more visibility might help.

6. A number of traditions/historical factors affect the amount of funding paleo gets. Deep Earth people, including geochemistry, have been doing well relatively because of past performance/impressions/leadership and those are hard to reverse without heavy leadership from above. But no one has anywhere near what is required to significantly impact the various fields. All programs seem to be too modestly funded for their constituencies. This requires action at the Congressional level; for paleontology we must make sure such appeals are relevant to national goals in science and society, and that some sensitive issues like evolution be handled well, perhaps as part of scientific literacy rather than a head-on confrontation.

7. Multi-million dollar projects, like EarthScope for the deep Earth folks, have not been emulated by paleo, although Steve Stanley's GOSCI was a recent attempt. Perhaps we need some careful thinking on other 'big bucks' approaches. But be forewarned that even these projects will not fund a large number of people. If we had such a program that focused on what the fossil record implies about the human condition or its future (and Earth's) in some very coherent and very well presented way, it might fly. It should certainly be process oriented. Maybe a 'Back to the Future' kind of project where the 'past is the key to the present and the future' holds some potential. We need discussion and vision. But these big ticket items are approved and managed at levels above the program managers usually.

8. NSF is like a broken sediment splitter. A lot of money gets poured in at the top by congress, a huge chunk falls outside the splitter just for management, and the rest gets sorted into the various directorates, divisions, then into smaller units, and finally into programs. The sorter is bent too, for some areas get much more than equally-deserving other areas. For increases in any program, a convincing argument must be made at higher levels in the structure. Program managers can help with insight and knowledge of the organization and its mandates, but the paleo community must make itself heard with strong justifications at the higher levels, starting with GEO and making a way perhaps even to higher levels. Right now, Sedimentary Geology and Paleontology is a Program (Rich Lane, manager) in the Surface Processes Section of Earth Sciences Division (which includes Oceans (OCE) and Atmosphere (ATM)) in the Geosciences (GEO) Directorate, which I think reports to the Director of NSF. In each of these, a number of special projects operate. Budgets for each of these (from NSF to programs and projects) are surely avail-

able on-line but I haven't found them on the NSF web site. Whatever we do will cut across a lot of others and force a new bend in the funds-splitter because new funds are unlikely to come or help. It seems an onerous task, indeed, but the squeaky wheel gets the grease, as they say. One thing we bet on is that nothing will change if we do nothing...

9. Paleo is well regarded by NSF, at least as a media item. If you walk into the GEO director's office, a display of fossils from recent work confronts you. The NSF website recently featured dinosaur hunting and whale fossils on the home page. Last year's significant accomplishments sponsored by NSF include a couple of vert paleo projects. So fossils are well recognized but the science needs to be strengthened among NSF *and* our colleagues. We need to make a strong case with all of them that life is one of very few factors that has changed the Earth and will continue to change the Earth through time. I think we are still regarded, as many on the other side have said and many on our side have pointed out that they said, as 'stamp collectors'. This needs to be changed even more. Look at the esteem bio in general is now held in. Paleo, as the history underpinning all this bio, should hold some of that same esteem and garner a few more dollars for more careful work relating that history to modern biology. We need to focus on processes rather than anything that smacks of stamp collecting, no matter where we make our pitch, while not ignoring the basic data of our field. A tough row to hoe, but not impossible. Another problem is that most paleontology is restricted in time or systematic category to very small units that have little application beyond their immediate constituency. That is largely the nature of paleo, but we can change that to some extent by careful thought and more collaborative research projects.

10. Paleontology is fragmented itself, as we all know. Roger Thomas is willing to take on this problem through the PS, as his last e-mail noted. Micropaleo, vert, invert, botany, paleo don't represent the entire field well and are poorly understood by other Earth scientists and even by some paleontologists themselves. This fragmentation enhances the stamp collecting view and trivializes some important things paleontologists are doing in Earth history. Perhaps a project on processes that considers and includes all paleo would work.

11. Soft-money positions (post-docs) are very costly to any program, and are a form of scientific welfare, as currently set up. A better recognition of these as additional desired education rather than stop-gap employment might make them more viable. On the other hand, that money will come out of the overall research budget and, with benefits, they cost a lot.

12. Don't blame the program managers. They are dedicated and committed to their communities. They clearly care a lot and are willing to work for good things, if those can be identified. Rich Lane works hard too for us, but has too few resources to accommodate all our needs. These people also carry proposals around to other units in NSF to see if they

can fund them in part or whole. I believe these people are working for us, and we should utilize them insofar as their employment conditions will allow.

13. Some responders to your message noted that paleo positions were rare. Flessa, in the late 90s, tracked academic paleo positions in the US for several decades. If I remember right, he documented about 480+ positions decades before, and the number was still about the same. These positions suffer again from the 'stamp collectors' labels by our colleagues and hence seem unnecessary in rapidly developing science departments in need of people in new sub-disciplines. We must make the history of life much more than a picture book of fossils through time, but demonstrate that this history is relevant to Earth and biological processes now and into the future, as well as in the past. It should be process oriented. You note, Peter, that you were able to line up 5 positions at your place. That's great. At our place, we have had vacant positions for years that we cannot fill because of administrative and/or departmental failures, decisions or desires and needs to hire in other disciplines, especially in biology. Hopefully, we will fill a couple of paleo positions in the next year, and we will be able to do what I advocate above at the department/college level, although I am deeply concerned. Has anyone else had success lately in this regard?

In summary, much more can be done, as you suggested, but it must be done with NSF by intelligent, relevant and compelling presentations. Everyone complains, far fewer think about how to approach the problem. Rich Lane, to his credit, has tried to work with the paleo community at meetings and other venues on developing better funding. I am not sure where his latest efforts, started 3 years ago with the PS, have led but we should find out at the GSA meeting later this month (look for the results of the NSF Workshop on Future Research Directions in Paleontology). No matter how paleo at NSF is funded, it will not be enough to sustain the entire community. Other sources in other federal and private sectors do exist, as you know — NASA, DOE, DOS, private philanthropic organizations, and internal funding at universities and museums, but these require a bit of searching. Maybe PS could help in identifying some of these and even paving the way into certain philanthropies (they usually fund in specific areas, and these areas are what the Boards are familiar with. Perhaps a letter from PS identifying important issues would refocus some of them). We certainly need more vision when it comes to funding and innovative project designs.

I have made a number of serious suggestions here that require careful discussion and action. Some of this is underway. You can help by asking the PS to take the leadership, as suggested just the other day by Roger Thomas, once again to contact the NSF at levels higher than Rich Lane (GEO division and up), to organize a well thought-out campaign to inform Congress of NSF's poor situation through cooperation with other societies (no single science can pull this off alone) and urge more funding, an organized and orchestrated letter-writing campaign on behalf of paleo

(or history of life, biodiversity through time, or some other more common words) to Congress with a common theme that includes our colleagues in the life sciences, and a more effective way to engage in this effort all scientists that use fossils in any way (paleoceanographers, paleoclimatologists, evolutionary biologists, biostratigraphers, historical biogeographers and phylogeographers, 'historical conservation biologists', even general geologists, among others, as well as the traditional micro, invert, vert, plant paleo types, and maybe even our supporters among the amateur/commercial paleo community). With a general collection of fossil users broadly defined, we make an impressive and numerically large group. We could help everyone by working on these things together.

I urge every paleo group meeting at GSA next week to address some of these and other related issues in their own annual meetings (PS, Cushman, MicropaleoProject, friends of this or that fossil group or time, *etc.*). Now is the time for action, not next year. Go to the NSF exhibit and ask a lot of questions about funding and what's up there, contact Rich Lane and talk to him about your ideas for improving funding resources and how to do it (he and NSF know your complaints and doesn't need more of that, I'm sure). Individuals should take care in discussing these issues for fear of clouding the larger and more general problems we see as a profession with their own issues. This requires coordination best done by input from many people, and presented by people without vested interests in particular projects who represent the profession generally — hence the PS coordinated with the other fossil-oriented societies are the only way to go. Of course, as Peter suggests, the big-shots of the profession could go collectively to Congress or GEO and make a case. That takes leadership from within that group or maybe just a push from the PS...

David Campbell (pleuronaia@gmail.com - 22.10.07) added: Peter's example of successfully getting several paleontologists into a biology department is not universal. In one case where I had some inside information, my graduate degrees being from a geology program was deemed grounds for tossing my application in the reject pile for a biology job. On the other hand, I do know of several paleontologists in biology departments, so it probably depends on the search committee. Given that the average unsuccessful job application receives either no notice at all or "We regret to inform you that out of the many well-qualified applicants, we picked someone else", it's rarely easy to determine a reason.

Jere Lipps (jlipps@berkeley.edu - 22.10.07) replied: *Peter's example of successfully getting several paleontologists into a biology department is not universal. ...It is the only one I can think of too. In fact, it may be the only occurrence of new, previously non-existent paleo positions being filled. Nearly all jobs are replacements made by wise departments.*

...my graduate degrees being from a geology program was deemed grounds for tossing my application in the reject pile for a biology job. This happens a lot. When many ap-

plicants are in the pool, then sorting becomes almost arbitrary. All are good, all might do the job, but how do you select just one? Tough. You set aside the ones that are unusual, you toss out the ones that you think can't teach the topics you need taught (geologists, in your case), you throw out those whose research is deemed 'not close enough' to either perceived specific needs, you leave out those whose research is not compatible with other research programs, and lastly you toss out people you don't know very well for those who are your friends (but not if you are truly fair and unbiased, of course). This means that applicants for jobs must do a careful research job on the department and each of its members, find out what's really behind the hire, who wants what, and then emphasize those aspects of your own CV. Don't lie, because that's sure death, but emphasis is important to get a hearing. A close look is what you are after — that's when your own credentials can shine. Geologists will always have a tough time in biology departments and *vice versa* (although I think geology departments are more open to biologists in paleo). On the other hand, I do know of several paleontologists in biology departments, so it probably depends on the search committee. ...Sometimes I think the departments would themselves not be able to articulate a reason they hired a specific person. After all, almost every applicant is qualified, most are quite acceptable, but there's only one slot. Makes for difficult and strange voting patterns.

Anne Weil (anne.weil@okstate.edu - 23.10.07) also responded: If I may be forgiven a couple of plugs here, those of us in vp have another option — anatomy departments. More and more positions for paleontologists are opening up in medical schools because PhDs in human anatomy are pretty much no longer awarded. Medical schools, needing vertebrate morphologists (and preferring those with active research) *do* have openings for vertebrate paleontologists. The downside is, one won't be teaching solely paleo, and one will spend a week of lab with one's hands in people's intestines. The up side is, the salary is usually much better than those in arts and sciences. Start-up can be high, too. In fact, we at OSU-CHS may be advertising a paleo-friendly anatomy position very soon — watch this space! Dr. Kent Smith and I are starting what amounts to a new VP program here in Tulsa. We are also looking for graduate students. Degrees here are in Biomedical Sciences, and we have both master's and PhD programs — of course students will take Gross Anatomy and Histology, and have the chance to TA too, in order to develop teaching credentials. Dr. Smith and I are both 'classically trained' paleontologists with degrees in Geology and Biology, but the exciting thing here for students will be the chance to learn methods more in use in biomedical fields and apply them to paleontological study. Anyone interested in the program here should give me an e-mail.

Roy Plotnick (plotnick@uic.edu - 23.10.07) added: I, for one, would be delighted if we could get positions for vertebrate paleontologists over at our large medical center. When I joined the faculty at UIC in the early 80s, there

were 5 other paleontologists on campus: a vertebrate paleontologist in my department, a paleobotanist and v.p. in biology, and a v.p. at the dental school. All have now retired and have not been replaced. At the Urbana-Champaign campus, there is still no replacement for Dan Blake. This leaves me the only paleontologist in the entire UI system. The issue extends to other areas of 'natural history'. I strongly recommend reading: Steven Vogel (1998). Academically correct biological science. *American Scientist*, **86**(6): 504 (<http://www.americanscientist.org/>). What Vogel says here is extremely relevant to these discussions.

David Campbell (pleuronaia@gmail.com - 23.10.07) further contributed: I had a paleobotanist from the Biology Department on my PhD committee. I think most of the others I run across are vert, but I'm not too good at keeping up with people's exact affiliations - it's just that in browsing university websites I've spotted some paleo research areas on the Biology Department page. With most mollusks having a good fossil record, the line between paleontologists and neontologists is not too clear among my immediate taxonomic colleagues. In theory, invertebrate paleontologists might have a shot at parasitology, agricultural entomology, *etc.* positions. However, there don't seem to be huge numbers of jobs in those fields, and the organisms of interest for those don't all have great fossil records.

Harold Lane (hlane@nsf.gov - 23.10.07), in response to Jere Lipps' points:

1. Jere is correct in saying that paleo is funded from a lot of sources at NSF. In addition to what he has stated, some paleo is also supported in anthropology, in association with hominid research, and in geobiology and low-temperature geochemistry. I have kept figures on the number of paleontology proposals submitted to the SGP Program since I first started at NSF, and in general stratigraphy and paleontology proposals have been submitted at a 60/40 ratio, respectively. This has changed somewhat recently with the addition of paleoclimate. Actually, paleoclimate has always been there, but variously assigned to stratigraphy or paleontology. With the culling out of paleoclimate in the last couple years, the split is more like 40/37/33. I have not kept track of paleontology in other programs, but as Jere says, it is public information and can be searched out on the NSF website. I would be very happy if someone could compile those figures.

2. Databases are largely funded through the Geoinformatics part of the Instrumentation and Facilities Program. They carry the bulk of the budget if a paleo proposal succeeds in their competition. However, I am usually asked to manage the grant if it is stratigraphic or paleontologic in nature. The same is true with Assembling the Tree of Life (AToL). In the case of AToL, the money comes from Biology, but I have usually managed those grants also. SGP's success rate is not unusually low at NSF and to make a big deal out of it is probably not politic at this time, but as a community, you do need to keep pressure on the issue. However, there are a few programs that have high success rates (+30%). Some of the causes for this might be: 1) a

preproposal phase that eliminates lower-scoring proposals early on, 2) major contracts (ship construction, seismograph emplacements and the like), *etc.* that take most of the money in a program, limiting the number of proposals they receive and awards given. However, a portion of these are programs that just have a lot of money and fewer proposals.

3. Jere is right. I am not even allowed to question overhead charges.

4. Actually, our success rates have been in the mid-teens (14-16%) for a couple of years and last year it jumped to 18%. It jumped because we had access to an additional \$2.4 million of paleoclimate money that went toward paleoclimate grants. That money has disappeared this year. This \$2.4 million was shared with 3 other programs. The mid-teen success rates follow many years of rates at the 25-30% level, so it has been somewhat of a bitter pill to swallow. The average success rate across all of NSF is 15%, I am told. I will not comment on Jere's last point, but I will say, never resubmit a proposal without taking previous reviewers and panel comments into account. Modify your resubmission and build on the community input you received, unless you think it is just wrong. If so, state that you think the comments were wrong and that you do not agree.

5. I have suggested that some sort of hybrid program around the theme of paleobiology be set up and cofunded by both the GEO and BIO Directorates. Breaking down walls between such organizational entities is not that easy. However, such a suggestion from the community outside NSF would carry a lot more weight than I am able to give it internally. Paleo is probably one of the most newsworthy core science areas in GEO and BIO.

6. Programmatic funding levels at NSF are historical and no one is willing, or sees the need, to take a hard look at how they might be readjusted (at any level of management). Budgets grow incrementally, except where one community might get a large infusion at a time of societal crisis (climate change, volcanic eruptions, earthquakes, tsunamis). That infusion is not taken away once the crisis has passed. Some communities are very active, having formed outside organizations that lobby Congress and make frequent visits to NSF's higher management. These communities usually have a major societal scientific issue(s) they are addressing (hazards, weather, climate-change, earthquakes, volcanic activity, *etc.*) and they usually have large NSF-funded infrastructures (ships, planes, seismographs, computing, *etc.*). Program Directors and federal employees are not allowed by law to lobby. EAR program budgets range from as high as \$20mil (geophysics) down to \$3.5mil (geomorphology), with disproportionate scientific population sizes and proposal loads drawing on those budgets. The dollar break between directorates is Oceans - \$350mil, Atmospheric - \$250mil, Solid Earth — \$160mil. My impression is that there is little cognizance of the Earth's sedimentary carapace and its importance to human existence and the evolution of life. Some communities dominate running NSF (commonly physi-

cists), and in the GEO directorate, Oceans and Atmosphere have always held the Assistant Director's position. Not once has a solid Earth scientist (let alone a paleontologist) been the head of GEO.

7. What is a saleable infrastructure scenario for 'paleo'? By the way, the near-modern paleoclimatologists call themselves 'paleos' also, so be careful to understand when you see or hear that term in the future just what community it is referring to. Examples of infrastructures that are not readily available to paleontologists and stratigraphers in the US include: 1) a workhorse drilling program (it almost seems that we can drill to the mantle easier than we can fund a series of shallow holes to test a soft rock or paleontologic hypothesis); 2) seismic reflection; 3) computing infrastructure, *etc.* What other kinds of infrastructure can we have (fieldwork, fossil preparation, *etc.*). Once Congress funds a major infrastructure package, NSF is obligated to fund the research that goes along with it. That is why Earthscope is taking so much of the available funds this year in EAR.

8. Actually, Sedimentary Geology and Paleobiology is in the Surface Earth Processes Section of the Earth Science Division. Earth Science is one of three divisions in the GEO Directorate. The other two divisions are the Oceans and Atmosphere. I know there is a lot of fear out there about making waves at NSF, but Jere hit the nail on the head, the squeaky wheel gets the oil. Squeak long and squeak loud. I gave you budgets for each of the Directorates above in [point] 6.

9. Paleo is well regarded from a media standpoint. We have all the interesting things and I am commonly told that by our press and media reps. Paleo needs to play to that strong suit. Publish as much as you can in *Science*, *Nature*, *PNAS*, *etc.*, because that is what is monitored here at NSF. (Note that when you join AAAS and AGU, you cannot choose to be a paleontologist - it is not an option they present. I think I've listed myself as a biological oceanographer when I joined both. However, *Science* does accept and receives a lot of good press with its prolific paleontology publications.) An argument I keep hearing here at NSF is that paleo research is not competitive with other parts of EAR. I don't know how a paleo proposal can be compared to one in volcanology or geophysics, but it is an argument I commonly hear. Actually, this is leveled largely at the entire Surface Earth Processes Section (not just paleontology) by the deep Earth people. There is no question that the revision of a particular order of fossils or that the stratigraphic ordering and correlation of fossil occurrences does not sell as well as it used to. But then it is the community through the Merit Review process that is deciding that, not NSF. Biological paleontology is a harder sell in GEO than a fossil project that is more geologically oriented. That is just the nature of the beast.

10. I agree 100% with this statement. Why does there have to be 4+ watered down societies in the US that are discipline-specific when we could have one with a *lot* of clout. Consider an international unified paleontology society, as,

for example, under IPA. It could provide a lot of international coordination with national funding agencies and maximize international issues, which of course is the nature of paleontology.

11. Oceans and Atmosphere do a lot of soft money funding. We cannot afford it in EAR.

12. NSF functions on a 5% overhead, which is nearly unheard of. That limits our staffing and travel. We have scant resources to study the history of major basins of sedimentation and the larger context they provide in understanding the history of life.

13. I will be at GSA and more than happy to discuss these issues with any of you in any venue.

Jere Lipps (jlipps@berkeley.edu - 24.10.07) responded:

Thanks for the informative responses. You fill important gaps and clarify some misconceptions. This is exactly the sort of interaction we'd like to see. If we can build a line of communication such as you have provided then we will all be better off. NSF should be regarded as a friend of paleo, but without input from both sides, it cannot be. ...I am hopeful that Roger Thomas will continue to pursue his ideas with the PS at its meeting next week.

A single large paleo society is attractive. Some may suggest that it would dilute the impact of subdiscipline societies, but they could be sections of a larger organization and operate semi-independently. This organization might also help us over the difficult publication and membership issues that electronic journal access has caused and create better representation in the job market. These are new issues for many societies and a single effort might be better than a bunch of separate ones. It's a good idea that deserves discussion by the PS Council next week. In any case, these issues of funding, jobs, publication, and subsidiary ones are critical to our future, if it will be anything other than more of the same (which, I quickly add, is not all so bad), and a prompt discussion of them is desirable. I will bring it up as items for the agendas of the organizations I will meet with, and I hope Roger and the PS Council will join this effort with action next week too.

Peter Ward (argo@u.washington.edu - 24.10.07) summed up: Thanks for keeping this string going David and Jere, and I think we all owe a debt of gratitude to Roger Thomas (and the other PS officers) for a lifetime of service to paleontology at who knows what cost in research, as well as for the deep considerations of funding as well as membership changes to reach out wider into the community.

There is much to a name in hiring, as David pointed out. We now hire 'geobiologists' exclusively in the old paleo slots at the University of Washington (there were two - John Rensberger and myself) and have hired as well in astrobiology (two more people, including ex-paleontologist Roger Buick). Getting a group together to discuss and ultimately conduct research in either geobiology and/or astrobiology is a wonderful, multi-disciplinary experience, where one can talk with many other disciplines not ordinarily in conversations with paleontologists. Add in our ex-

cellent Curator of Invertebrate Fossils at our Burke Museum (Liz Nesbitt) and we have gotten the number of paleo types to seven full time tenured or tenure track FTEs spread out in three different administrative bodies. It just took a while for the departments around here to see the light, as well as getting necessary permission/paperwork to share students across departmental boundaries.

As for biology departments, we paleontologists are indeed 'evolutionary biologists' (the name we used in hiring in Biology) - but the research path must include integration of molecular as well as more traditional systematics. Another burgeoning new field is in biomarker work - Dr. Ken Williford, just graduated from my school, and now on a post-doc in Perth, Australia, in the large lab of Dr. Kliti Grice, began with traditional paleontology of the T/J mass extinction, moved into stable isotope analyses of boundary sections, and then realized that biomarker work - establishing microbial 'regimes' before, during, and after the mass extinction, enabled him to integrate the three. But the down side, as we all well know, is that we are slowly losing the first-class ability to identify fossils in many groups, as specialists retire or become fossils themselves. To that end I think many of us should figure out ways to use digital photos to provide non-specialists ways of accurately identifying key species. For example, in my old field (which I have returned to, joy of joys!) of Cretaceous ammonite systematics, there seem to be few or no new students conversant with cross sections, ornament, and suture lines. But there are ways to establish key identifications, such as for the Western Interior baculites and scaphitids that Bill Cobban, Jim Kennedy and Neil Landman, among others, have so ably described. The ImageJ program of NIH can work wonders, if we can typify species by ranges of measurable values from photographs as well as specimens.

Roger Thomas (roger.thomas@fandm.edu - 17.10.07) contributed: Thanks to many of you who responded in a variety of very constructive ways to discussion of NSF and other funding of research and staff positions in paleontology, initiated by Peter Ward. Several contributors to the debate have noted that the balkanization of paleontology in North America limits the cohesion of our efforts. The PS is very much aware of this problem. It was in part for this reason that the Society decided to change the longstanding policy, enshrined in our constitution, that all members of the PS must receive the *Journal of Paleontology*. Actually, we have not abandoned this policy, we have enhanced it. The PS Council decided that, as of January 1, 2007, membership in the PS, including electronic access to both the *Journal of Paleontology* and *Paleobiology*, should be made available for an annual membership fee of only \$50. Student membership with the same privileges is available at half that price and these fees have been maintained at the same level for 2008. Full details of PS membership fees, benefits of membership, and subscription rates for paper copies of our journals are available on the PS website at <http://www.paleosoc.org/>. Download the membership application as a pdf file, using the link on the left, to learn the

full benefits of membership. Then, you can join the Society electronically using the other link. The PS's two journals are very different in character, as most of you will know. However, both carry papers written by scholars working in all subdisciplines of paleontology. Both journals are very highly regarded, serving the profession in very different ways. The PS has often been incorrectly characterized as if it were an organization dedicated to serve the interests only of invertebrate paleontologists. In fact, the Society seeks to serve the profession as a whole, as some of the actions noted in my earlier message show. It is worth noting that positions are reserved on our Committee on Nominations and on the committees that assign our awards for micropaleontologists, vertebrate paleontologists, and paleobotanists. Take a look at the lists of our past and current officers and winners of our awards, and you will see that all fields are represented amongst them. Jere Lipps, Peter Crane and Craig Black have served as Presidents of the PS within the past dozen years. In short, the PS welcomes members from all subdisciplines of paleontology, as well as newly emerging interdisciplinary fields, such as geobiology. Our mission is to advance the science of paleontology, conceived in the broadest possible terms.

Jere Lipps (jlipps@berkeley.edu - 6.11.07) noted: This latest analysis of the growth in funding relates to discussions we've had here...: "Universities report stalled growth in Federal R&D funding in FY 2006" at <http://www.nsf.gov/statistics/infbrief/nsf07336/>.

Roy Plotnick (plotnick@uic.edu - 2.1.08) advertised: According to *Wired*, two of the 'Top 10 Scientific Breakthroughs of 2007' are paleontological (http://www.wired.com/science/discoveries/news/2007/12/YE_10_breakthroughs/):

6. Soft Tissue from *T. Rex* Leg Bone Analyzed

This spring, the oldest patient in the pathology department of Beth Israel Deaconess Medical Center in Boston was a 68-million-year-old *Tyrannosaurus rex*. For the first time, scientists have analyzed biological molecules from the ancient creatures. Working with soft tissue from a leg bone that was extremely well-preserved in prehistoric Montana sediments, John Asara read the chemical recipe of a protein that served as a springy structural element in the dinosaur's bones. In the April 13 issue of *Science*, he and his colleagues compared the deadly predator to animals that roam the earth today and concluded that it has a lot in common with chickens.

3. Mummified Dinosaur Excavated and Scanned

Paleontologists from England's University of Manchester have excavated the mummy of a nearly intact plant-eating dinosaur. Preserved by minerals for over 65 million years, the petrified body is in such pristine condition that the researchers could see a striped pattern on what remains of its scales. The scientists transported the fossilized hadrosaur this fall to a giant CT scanner in Canoga Park, California, where technicians captured terabytes of 3-D images that have already revealed surprises about the creature's muscle

mass and the spacing of its bones. Tyler Lyson, now a graduate student in geology at Yale University, made the initial find seven years ago while fossil hunting in the Hell Creek Formation of North Dakota.

2. Jere Lipps (jlipps@berkeley.edu - 23.10.07) noted: I found the article that Flessa and his associate Dena Smith wrote for *Paleontology in the 21st Century*. This is online at http://www.nhm.ac.uk/hosted_sites/paleonet/paleo21/rr/academia.html. Their data is from AGI's surveys of geological departments, they discuss these trends, and they have a few recommendations for job seekers... We still need up-to-date info and info on non-geological academic paleontologists in biology, geography and medicine.

Alycia Stigall (stigall@ohio.edu - 23.10.07) replied: The topic of funding and job opportunities in paleontology has been a great one for this forum. I routinely advise new invert paleo master's students that walk bright-eyed into my office with fuzzy plans of 'maybe I'll be a professor' to take a serious look at that goal in light of the job market - since they are usually blissfully unaware of the low numbers of tenure track positions. The low number of positions, however, seems to be largely a problem (and a significant problem at that) for those people who wish to work in geology or biology departments, where systematists in general and specialities with low funding rates/grant dollars are in decline. Medical schools, however, have not yet been discussed in this thread, and they offer great opportunities for vertebrate paleontologists. One place that I have seen many of my colleagues and their students find excellent employment opportunities are in medical schools - this of course applies mostly to vertebrate paleontologists. But our students at Ohio University that are trained to teach gross anatomy have been very successful in finding employment. In fact, we have also used this to increase our complement of paleontologists on campus. This year, Ohio University has 15 paleontology faculty across campus in four departments, 3 in geology (1 retired), 2 in botany (1 retired), 1 in biology, and 9 in the biomedical department of our medical school (there's more info on our group paleo website at www.ohiou.edu/paleo). Reaching this size of a paleo contingent has involved specific efforts by our vertebrate faculty to encourage young vp PhDs to apply, and the end result is a really vibrant interdisciplinary group of paleontology faculty who share strong research interests in evolutionary biology, biogeography, and paleoecology across clades. I would suggest that if your campus has a med school, you might consider encouraging young vp PhDs to apply for your positions or just take a walk across campus, you might be pleasantly surprised by new colleagues you may encounter there.

Jere Lipps (jlipps@berkeley.edu - 23.10.07) responded: Thanks, Alycia, for discussing this aspect of academic employment in better detail. It's an important thing to remember - vertebrate paleontologists really know their anatomy so wherever anatomists are required, they should apply. I addressed only academic positions, but included in

that (mentally) vertebrate paleontologists. I am not sure they were included in Flessa's analysis however, but they would add some more positions to that 480 figure. Does anyone know how many vps are employed in med schools? I also did not discuss museums, environmental impact firms, environmental monitoring, teachers in general, outreach opportunities, federal administrative jobs in NSF, NASA and other agencies, and a few others. All of these may provide rewarding employment of one kind or another. One thing I am sure of: You won't get a job if you don't apply. So apply for everything that looks good to you. Do it right, however, so your chances are improved. Academia is changing fast. It's becoming more corporate, encumbered by more non-academic tasks and labor, more efforts all the way down to assistant professors for fund raising, and along with all that, more political. While I will not discuss these, professors advising students should.

John Pojeta (pojetaj@si.edu - 23.10.07) responded: Check the *JP* (1991, **65**: 347-354) for other numbers.

3. Suellen Cook (sscook@utas.edu.au - 8.11.07) advertised: ...I thought some of you may be interested to hear about the research I am doing as part of my PhD here at the University of Tasmania (Australia). Much has been made of the various morphotypes that investigators have found when studying *Emiliania* and the like in the Northern Hemisphere. I (and others) have found a number from the Southern Hemisphere. It appears that, specifically, the Type B/C can be found almost exclusively within the Southern Ocean and particularly around the sub-Antarctic Front (>50°S). Overcalcified versions of Type A have also arisen in culture and from preserved samples. So far, no work has been available to assess the genetic basis of this particular morphotype.

My research was inspired by the microsatellite work published by Iglesias-Rodrigues *et al.* (2006), where the intraspecific genetic diversity of 83 Northern Hemisphere strains and 4 Southern Hemisphere strains was investigated, using 10 microsatellite markers they had developed previously. I have since constructed a culture collection of 469 strains, consisting of strains from across the Southern Ocean, from the East Australian Current (Pacific Ocean), coastal Tasmania and the Zeehan Current (Indian Ocean), extracted their DNA and am starting to use the Iglesias-Rodrigues *et al.* markers to characterise the genetic diversity within and between these populations. Considering the results that were published in by Iglesias-Rodrigues *et al.*, and some preliminary (but incomplete) data from a subset of my cultures, I anticipate some very interesting results, particularly in respect of strains originating from around the Polar Front. I intend, once the population genetics analysis is complete, to further investigate any genetic variability in respect of the photophysiology and morphology of a select group of strains.

If any members are interested in supporting my research through advice/contacts/experience, *etc.*, I would be very appreciative of your input. I welcome your feedback

on my project.

Jeremy Young (j.young@nhm.ac.uk - 8.11.07) responded: Hi - nice to see there is an Australian cocco research group getting going - I have been in touch with Joanna Cubillos as well. I am working with Ian Probert and Kyoko Hagino on *E. huxleyi* variability and it will certainly be good to collaborate.

Maria Triantaphyllou (mtriant@geol.uoa.gr - 8.11.07) added: We are also looking for *E. huxleyi* morphotypes in the Aegean Sea (eastern Mediterranean). We have observed overcalcified type A in winter samples. I would be interested in your research.

4. Roy Plotnick (plotnick@uic.edu - 27.11.07) said: With the help of Cindy Martinez of AGI, I have compiled the distribution of ranks among paleontologists, geochemists, and geophysicists listed in the current version of the *AGI Directory of Geoscience Departments*. This was an attempt to update the information compiled by Karl Flessa and Dean Smith in 1997 (http://www.nhm.ac.uk/hosted_sites/paleonet/paleo21/rr/academia.html). Although not exactly comparable, the numbers suggest that the trends they identified have persisted. See table below. We are a graying field (it's not just me personally)!

	Assist. Prof.	Assoc. Prof.	Full Prof.	Emeritus
Paleontologists	81	127	333	184
Geophysicists	126	133	406	126
Geochemists	129	142	313	100

Distribution of faculty by rank in the 2007 *Directory of Geoscience Departments*. Full professors include those listed as Heads or Chairs.

Jere Lipps (jlipps@berkeley.edu - 27.11.07) responded: That's interesting data, Roy. If I read the columns right, we have 541 active faculty, and this would be an increase of 60 and 62 over Flessa's figures of 481 (1980) and 479 (1995). Is this good news for us, or has AGI tabulated the figures differently between between 1995 and now? If AGI, Flessa and you did it the same way, then we should be happy. Someone should do your study, Roy, over the past 13 years to see how this addition was added - *i.e.*, gradually or in punctuations (I assume no Signor/Lipps effects!). And why would this be? Perhaps more institutions coming on line and hiring paleontologists, or are they new additions to old departments or new departments within old institutions hiring paleontologists? My optimism is running away with me, so I suspect that something is wrong. What do you think Roy?

Roy Plotnick (plotnick@uic.edu - 27.11.07) replied: I would be very hesitant to make too much of this yet. My impression is that the *AGI Directory* has become more and more inclusive. The total data are not really comparable, in that Flessa & Smith restricted their analyses to 540 institutions that were in the 1980 directory. I don't have their list (Karl? Dena?), so I don't know if I have the same institutions. I do have institution names, as well as a breakdown by discipline (*e.g.* vert. paleo.), and other ranks, such as adjuncts and lecturers. If you add all those individuals in,

plus museum and survey scientists, the total number more than doubles. I tried to keep this first pass restricted to the traditional academic ranks. I will try to produce a more detailed analysis soon. I will be glad to take suggestions of what people would like to see.

Harold Lane (hlane@nsf.gov - 28.11.07) commented: I am surprised this data implies the paleo population in academic positions is rather stable. Has the Lone Paleontologist syndrome strengthened or weakened? If universities are not replacing paleontologists, and we are graying as a population, then we should expect an impending downturn in numbers. Is it real this time? I have been hearing the 'graying sirens' for at least 25 years and a real serious downturn in numbers still hasn't happened. Can we project future trends? If so, how can we manage these trends to paleo's benefit? Lots of questions this community should be considering as a population, and working together to benefit the entire science. We have too many splinter societies and not enough working across these artificial boundaries. It is my opinion that these artificial 'turf' boundaries are debilitating the paleosciences as a whole.

Jere Lipps (jlipps@berkeley.edu - 28.11.07) replied: My interest is in the total number of academic positions and how they have grown or declined over the decades. If Flessa did not get all of the academic institutions, then someone needs to go back and do it again. If he did, then we need the same data (not the same institutions, although that would be interesting, to know if they added or lost positions and why) for all institutions today. The kind of employers is the only item that needs to be comparable for this kind of data — *i.e.*, earth science departments and not biology or other departments, unless they were also included (they were not, since Flessa used the AGI *Earth Science Directory*). We should also tabulate the same data for all other employers of paleontologists. All of this is critical for those of us advising students. Every one of them wants to know where they can get a job. Right now, other than for academia and museums, that's hard info to get. We also need this information to plan curricula and departmental goals. If no jobs exist for paleontologists, we have a hard row to hoe in justifying replacements or additions on educational criteria (others may exist, like research goals). Rich's question about replacing paleontologists cannot be answered yet.

I suspect we may be headed for hard times, if we remain passive. Universities in America are developing 'evaluation criteria' for programs and individual faculty to assess their contributions to the teaching programs and to student success. This does not bode well for a great many disciplines. (Run a search in Ask.com on 'Commission on the Future of Higher Education' or 'Spellings Commission' for info and comments on this movement nationally.) We need to be prepared to effectively take part in this discussion at the departmental and college levels with solid data about what we do and where.

We are not the only greying discipline, of course. I suspect that many disciplines that grew in the 50s and 60s are

grey, including physics and chemistry. Molecular biology will grey soon too. A greying population is good for students, since they will have jobs if we can justify keeping those positions. This should be easier to do in Earth science departments where we can make a case that modern paleo addresses how the biosphere interacted with Earth processes. In modern biology departments, with components of molecular biology, bioengineering, and so many other developing or exciting fields, paleo will be threatened by greater needs elsewhere. Again, data on who we are, how many we are, and what we do is critical. Keep on digging, Roy. It is important that we have this info. NSF knows that — they collect all kinds of data like this for science, but not at the paleo level.

Peter Sheehan (sheehan@mpm.edu - 28.11.07) added: Another positive feature may be present in Roy's data. Paleontology has far more assistant professors relative to tenured professors than geochem or geophysics. We are less gray than these fields, and this does not rely on comparisons with past data. (Or paleontologists don't make tenure as often.)

Paleo	184 Assistants, 460 tenured
Geophys	126 Assistants, 539 tenured
Geochem	100 Assistants, 455 tenured

Anne Weil (anne.weil@okstate.edu - 28.11.07) asked: My question would be whether paleontology is 'graying' in general, or if — as I suspect is the case — younger paleontologists are more likely to be employed in biology departments.

Roy Plotnick (plotnick@uic.edu - 28.11.07) explained: ...I have parsed this further to remove state surveys and museums, including those associated with departments. The following thus includes university, college and community college departments (paleontologists only):

Assistant:	65
Associate:	114
Full:	274
Emeritus:	154

Again, use caution in comparing this with Flessa & Smith's numbers, since I don't have their list of departments.

5. Paul Palmqvist (ppb@uma.es - 6.12.07) stated: Several postings on Paleonet during the last weeks dealt in the uncertain future of paleontology as a scientific discipline, given the loss of academic positions and research funding. In the past, I have heard reproaches from other Spanish scientists who think that we paleontologists are always in conflict (this would ultimately result from the low number of Spanish paleontologists, which translates into everybody knowing all other colleagues, and this seems to lead some of us to consider them as potential competitors). On this matter, I think that Paleonetters should know what has happened to one of our colleagues, Dr. Manuel Mendoza, during his work in an institution recently created in Spain, the Catalan Institute of Paleontology, directed by Dr. Salvador Moyà Solà. Manuel collaborates with me in the ecomorphology and palaeoecology of ungulates, the subject of his PhD thesis dissertation in 2002, after which he

was awarded a Fulbright Grant at Brown University. All other scientists who have collaborated with Manuel also consider the treatment that he has received in this institution as unfair. These include, for example, Dr. Miquel De Renzi (Professor of Paleontology), Dr. Miguel Ángel Medina (Associate Professor of Biochemistry), Dr. Carlos Criado (Associate Professor of Theoretical Physics), Dr. Raimundo Real (Associate Professor of Animal Biology) and Dr. Carlos Cotta (Associate Professor of Languages and Computation Sciences). In the following letter, written by Manuel, you can find the details.

“Dear colleagues, On May 1, 2007 I was contracted in the Catalan Institute of Paleontology (ICP) as staff scientist by his Director, Dr. Salvador Moyà Solà, for a period of three years, joining the research group headed by Dr. Meike Köhler, his wife, to work on evolution of life history (a matter in which I had little experience at that moment) and continue my work on theoretical evolution and ecomorphology. After a period of seven months, I have contributed to the scientific production of the ICP with a paper published in a journal included in SCI records (other two are currently in review), an article in a book edited by Dr. Norman MacLeod, and four communications presented to workshops held in three different countries. The goal of this letter is to report that I have been dismissed now from the ICP for defending some results of a research which apparently are in conflict with the personal expectancies of Dr. Moyà Solà and, specially, of Dr. Köhler. The latter has a close collaboration with Dr. Lloyd Demetrius, Professor at Harvard University and member of the Max Plank Institute. Dr. Demetrius suggested me to implement a computer model with which his Directionality Theory had been confirmed (Kowald & Demetrius, 2005. *Proc. R. Soc. B*, 272). After the examination of the model, I realized that it has serious errors. Once implemented, in collaboration with Dr. Carlos Cotta – an expert in evolutionary computation - we confirmed the scope of these failures. This conclusion, as well as the development of a new alternative model, were initially received with pleasure by Dr. Köhler. However, according to the reaction of Dr. Köhler and Dr. Moyà Solà when she came back from a visit to Harvard, Dr. Demetrius was in disagreement with our results. Dr. Moyà Solà accused me then of putting in danger the collaboration with this important scientist. He argued that “how could I put in doubt the knowledge of an expert who has been working during decades in the matter, if you had no idea about demography four months ago?”. Obviously, this is a new version of the old Principle of Authority, which is incompatible with the nature of science and its method, something that should not happen at the beginning of the 21st Century. Dr. Moyà Solà ordered me to follow the instructions of Dr. Köhler and, when I tried to defend myself and explain my position, he rescinded my contract with the ICP. Officially, I have been dismissed for organizational reasons, and others with an even more difficult justification have been argued, including my lack of integration in the research group headed by Dr. Köhler (she is now the

only member of this team). I want to express that it is not coherent or humane to contract me for three years, to encourage me for moving from a distant city with all my family (I have two children in school age, my wife had to left her job, *etc.*) and now, seven months later, to be fired out for organizational reasons. Moreover, this is not an isolated fact. Only two months ago, Victor Fernandez Tascón, who came also from a distant city, was contracted for three years to perform a PhD thesis under the direction of Dr. Köhler. Shortly after, he was pressed to leave the ICP without apparent reasons, since I can testify to his capacity and dedication. It is worth noting that Victor and I were, up to that date, the only collaborators of Dr. Köhler in the ICP. Manuel Mendoza”

Carlos Cotta (ccottap@lcc.uma.es - 6.12.07) responded: In regard to the incidents [experienced] by Dr. Manuel Mendoza during his stay in the Catalan Institute of Paleontology (ICP), I want to confirm some of the points that he exposed, of which I have been an indirect witness, because these incidents were put in my knowledge while they were taking place, before the dismissal of Dr. Mendoza. For approximately four months, Dr. Mendoza and I have been collaborating on models of life history based on the work of Dr. Demetrius and collaborators. During this time, we arrived at some conclusions about the algorithmic model of Kowald & Demetrius that make it unrealistic. Following these observations, Dr. Mendoza explained to me, in different conversations, a series of problems that he was having in the ICP, as a consequence of these conclusions, being even afraid of losing his job, after having been scolded by Dr. Moyà for contradicting a renowned investigator of the area (Dr. Demetrius), seemingly compromising the collaboration of him with the ICP. Sadly these [fears] were demonstrated to be founded. It is lamentable that, in these moments in which the science community is so concerned about scientific excellence, not only the scientific career of a young scientist is interrupted so unfairly, but also he and his family suffer this personal damage.

Jere Lipps (jlipps@berkeley.edu - 6.12.07) commented: Clearly, if this is true, Spanish science is in deep trouble. Alternative hypotheses and testing is what science is, and scholarly freedom to do that is essential. This cannot bode well for science there or for the people involved. It is often the sign of an immature or insecure science. However, that too is a hypothesis based on one side, and sometimes there's another side. I'd not want to condemn my Spanish colleagues without knowing more. The general topic of suppression of alternative views is worth talking about on PaleoNet because it happens a lot, even in my country. Here it's based on egos trying to win, more than anything else. Kind of a result of the human condition and without which science would not advance much. That's why we all need to be on guard all the time for this kind of thing.

6. Joana Cubillos (joanacc@postoffice.utas.edu.au - 13.12.07) asked: For the purpose of studying absolute

abundance [of nannos] in core sediment samples, I have been using a filtering technique similar to that of Andruleit (1996). As I just had access to his article, I realised I haven't added the use of a rotary sample splitter. I am aware that it promotes even particle density, but could anyone explain to me further advantages of it? My problem is that I haven't got access to one, so my concern is whether this part of the process is crucial, or in fact can be omitted without major damage to the whole analysis, and whether my results could be still subject to comparison with other analyses.

Jeremy Young (j.young@nhm.ac.uk - 13.12.07) responded: A rotary sample splitter is a nice piece of kit if you have one, but the simple alternative is to mix the sample well then subsample a known volume using a micropipettor. The error in sampling will probably be minimal, and less than those from counting, inconsistent preservation, etc. To control for possible errors, you can do several replicate samplings of one preparation and observe the variation in your results.

7. Jeremy Young (j.young@nhm.ac.uk - 8.1.08) advertised: With much encouragement from Mike Styzen, I have been slowly getting to grips with an interactive on-line database system being hosted by the NHM as part of an EU program - EDIT (European Distributed Institute of Taxonomy). It's taken a while, but there is now a reasonably functional prototype system live on the web called nannotax (www.nannotax.org) with fairly comprehensive coverage of Neogene nannofossil taxonomy. There is plenty more to do to the site but it is in a state which is worth launching, especially as I hope people will help with it. [See advert, p.34]

8. John Laurie (John.Laurie@ga.gov.au - 25.1.08) volunteered: Part of my job is to provide standardised time-scales for my organisation and in so doing I have to familiarise myself with lots of rather arcane names of stages from all over the place. All seem reasonable and sensible to me, considering my limited knowledge of most of the time-scale; that is until one gets into the Carboniferous. Here we have a system unlike any other in its subdivision. It is divided into the Mississippian and Pennsylvanian as one would expect, but these are categorised as subsystems, each of which has three series. Five of these six series correspond exactly to single stages in the Carboniferous. The only justification seems to be that the "terminology is flexible, because if any of the longer stages are later subdivided into two or more globally recognised stages, then the current stage name would be elevated in rank to series with equivalency (sic) to the positional series name" (Heckel & Clayton, 2006, p.404). If it is the case that such flexibility is needed, then why do no other subcommissions seem to think it necessary in their part of the time-scale where some of the stages are almost as long and perhaps equally likely to be subdivided? The Upper Cretaceous series does not need to be of Subsystem rank just in case the Campanian

may be subdivided at some future time. The Upper Triassic series seems to cope reasonably well with the Norian stage being subdivided into the Lacinian, Alaunian and Sevastian substages. What is wrong with using substages if such a refinement of the Viséan were to eventuate? I realise there were all sorts of political considerations which may have caused such a camel of an outcome, but there were political considerations in other systems as well and the results of those deliberations necessarily dispensed with many a security blanket, despite squeals of protest. We now have the Carboniferous divided into two subsystems, comprising six series and seven stages. To have two levels in a hierarchy which are effectively (~83.3%) the same is ludicrous. The Pliocene is an epoch subdivided into Lower, Middle and Upper, each of which comprises one stage. I don't hear anyone shouting that the Pliocene should be elevated to subsystem rank, or the late Pliocene should be elevated to series rank. Surely to do so would cause people to point and laugh, or to suggest that one hadn't taken one's medication. While the above may seem outrageous to those who are not Carboniferous-neutral, the current 'system' seems silly to me. However, I would welcome any arguments to show me where I may be in error.

9. Omar Ahmed al Badrani (omar_badrani@yahoo.com - 2.2.08) asked: ...I began work in Cenozoic calcareous nannofossils, and it is the first PhD in this work in my country. There are very few references available to me, and I need information about anything relevant to help me...can you send to me books or papers or other informations, please? (Dept. of Geology, College of Science, Mosul University, Mosul, Iraq).

10. Bryan Ladner (bryan.ladner@gmail.com - 2.2.08) asked: Was anyone aware that they are selling digital reprints of *Plankton Stratigraphy*? Amazon shows it as in stock for US\$95. Anyone have a new copy and wish to comment on the quality? Here's a link: http://www.amazon.com/Plankton-Stratigraphy-Cambridge-Earth-Science/dp/0521367190/ref=pd_bbs_sr_1?ie=UTF8&s=books&qid=1202006047&sr=8-11It's.

Jackie Lees (j.lees@ucl.ac.uk - 7.2.08) responded: Along with Bryan, having recently seen a very poor quality reprint of the 'black book' (Ed. Bown, 1998) – the plates look to have been photocopied on an ancient copier in need of a new toner cartridge! – selling for GBP90, I would be interested also to hear about the quality of the new *Plankton Strat.* Has the [new and used] price (from US\$67.33) got anything to do with the quality? As some of you may remember, I tried for about 18 months to get CUP to produce a new version of this, or to sign the copyright over to the INA, but was unsuccessful. Now, it seems, they have taken a unilateral decision to squeeze some more money out of this without consulting anyone – although, interestingly, this book is not available on the UK Amazon website...

Alicia Kahn (kahn@chevron.com - 22.2.08) replied:

We just bought a copy of the reprinted *Plankton Stratigraphy*. It is simply a scanned copy of the book, but the quality of the photographs remains pretty good. The text actually copied worse than the photos.

11. Mario Cournoyer (paleovision@videotron.ca - 3.2.08) enquired: We are looking into buying a stereomicroscope, but we have not a lot of funding (in fact none whatsoever), the only money comes from donations and membership fees. Anyway, we would like to have some opinion on the AMscopes found on eBay. Has anyone worked with one of these, are they reliable? Also what type of lighting is best for taking pictures (with the digital camera they fit with the microscopes), fluorescent, led light or fiber optic?

Jere Lipps (jlipps@berkeley.edu - 13.2.08) responded: Fiber optic [lighting] is best. We use it for live and dead forams. Make sure your camera is set properly and play around with the light.

Aidan Karley (aidan_karley@mail.ru - 22.2.08) replied: In the past, I have bought my own 'scope, for personal use and for rental to go offshore for cuttings examination. Spending my own money, and living in Aberdeen, I felt obligated to get performance per penny. As it was, I actually managed to make a profit on the deal with just a month of renting it out. Then the burglars had it. Without a link to a specific item, I'm not sure what exactly you're looking at. I see a lot from a supplier calling himself 'lowestpricemicroscopes', such as item 190199788509; are these comparable to what you're seeing? These do look to be a fairly good deal. I wouldn't spend my money these days on a 'scope which didn't have trinocular capability. I don't have a digital camera which has fittings for mounting onto other devices, but I spent £200 (about \$390, excluding postage) of a client's money on a camera specifically for cuttings and core photography at the wellsite. (While shopping, I used one of those aide memoire grain size cards to test the camera; if the photographs are capable of distinguishing the 'fine sand' graphic from the 'very fine sand', I considered that acceptable; a 6-mega-pixel sensor on a digital SLR body did the business, I'd have to check my expenses paperwork to find if it was a Fuji or a Panasonic. But that's a sideline - any decent camera can be fitted up to a 'scope for around £40 of parts.)

What I bought with my own money was a Russian-made 'scope system with the series number 'MBC-10'. There's one on eBay at the moment as item 250217708016. As a 'scope, it's perfectly respectable, though this one lacks the trinocular adaptor (it's a modular design that stacks one element on top of the next; the trinocular adaptor is just one more unit in the stack) but it does appear to have everything else, including the totally useless arm rests. It doesn't have zoom, but it does have 10 different magnifications available. Many of my colleagues fear the idea of a non-zoom microscope, but if you're doing documentary microphotography, then being able to read the magnification off the side of the scope is, to my mind, an advantage. My

colleagues may disagree, but they didn't have to decide whether to spend money; I did. Finding a trinocular head for this may be a regular [pain]; the company I bought mine from now lists it as a discontinued model. Pity. About 6 months after the burglars had my 'scope, I was sent to a job in Siberia (the Shell-Yukos Salym joint venture) where I was to train-up a crew of local geologists. They'd bought one of these systems, which we made extensive use of. It works; it's economical. ...I see from <http://www.microscopes.com/ms-la-mi-sf.html> that this 'scope is still available in the States, with the trinocular adaptor.

I'd prefer to use a poor microscope with a good light over a good microscope and a poor light. I actually carry a diving mini-torch in my rig bag because I've had to spend so many headache-inducing hours using inadequate illumination. (I use a diving torch for other reasons - I sometimes need light in explosive atmospheres, so I need to carry an EEx-D rated torch.) The illuminators included in most stereo 'scopes (and I have to include the MBC-10 in this category) are [rubbish]. They're simply not worth bothering with. My preferred illuminator is a twin-swan-neck fibre-optic system, using a halogen bulb for a good, white light. This page <http://www.labtek.net/Dolan-Jenner.htm#Fiber%20Optic%20Illuminators> has several such about half way down. From my experience, these are the Rolls-Royce ... of illuminators. They also cost hundreds of quid. If I get one, I happily use it. but when I'm kitting up a laboratory to go offshore, I put in two little desk lamps with halogen lamps. Cost about £10 each, and you can get the lamps at the local hardware store. Fit for purpose and value for money. Being able to get replacement lamps easily is important. Which is another reason for me having a torch in my rig bag. 300km out at sea is not within reach of your local hardware store. For photographic illumination, you can generally achieve adequate illumination with several of the desk lamps; you often need to re-position the lamps to get a good contrast of light and shade on the subject. Flexibility is good in this context - again, multiple desk lamps are a fit-for-purpose and economical solution. If you are doing film photography, you can normally rig up an external flash gun to a wired fitting on your camera body. But most DSLRs (all?) don't have this fitting, since they have an integrated flash gun. Which is almost totally useless for microphotography. Almost. Your camera store should be able to find a device called a flash slave adaptor (my regular can't-be-bothered-to-search-in-detail camera store has them at <http://www.jessops.com/Store/s9094/0/Slave-Units/Jessops/Minicell-Slave-Universal/details.aspx>) which you then rig up with an off-the-shelf flash gun (on a mini-tripod?) aimed at the microscope stage and with the slave sensor where it'll be illuminated by the camera's flash. With a little practice and careful record keeping, you should be able to get reproducible results. It's not easy, but it's not rocket science either...

12. Bruno Granier (granierbruno@orange.fr - 16.2.08) contributed: The 'subject' of my message might

look provocative! I did it on purpose in order to initiate a discussion on a set of nomenclatural problems that probably deserve to be solved. Among them, the question of the nature of the type(s) and variety of 'types' (holo-, lecto-, para-, topo-, pleiso-) has been partly addressed and will generate more discussion. I would like to address 2 other problems:

1. Suppose that we are dealing with a fossil genus (A) that includes several species: the revision of the type-species leads us to consider it should be ascribed to another pre-existing genus (B). (A) is therefore considered as a junior synonym of (B). All species ascribed to (A) should be transferred into (B). The author of the revision did not revise the remaining species ascribed to (A), *but*

1.1. provides the new combinations for all of them. He is considered as the author of the new combinations, isn't he?

1.2. did not provide any new combinations for all of them. Can he be considered as the author of the new combinations? Or would it be the first person that published the 'transliteration' (that is, who gave the new combination without a preliminary revision of the species, but just to take into account the synonymy at the generic level)? (Example: the numerous species formerly ascribed to the fossil red algae *Archaeolithothamnium* [with *Archaeolithothamnium rude* as the type-species] and their new combinations with the modern genus *Sporolithon*!)

2. The type of a species is lost, the description is poor (XIXth Century), the type-locality includes several [similar-]looking forms, and it is not possible to discriminate which is the closest to the type, the type-locality cannot be found, none of the generic or suprageneric diagnostic features are visible on the material...The Code(s) of Nomenclature (Botanical and Zoological) list some conserved names, as well as rejected names. Rejected names are the ones that did not fit with the Code and those that were rejected in favor of a conserved name, *but* there is no 'category' to list names that are effectively abandoned, and while establishing lists of species, we still find these 'one-time-quoted'/'no longer used' forms which are just 'polluting the scene'. I cannot remember where and when I read that they were given an informal category name by analogy to some software ('Abandonware' refers to computer software that is no longer claimed, owned, or copyrighted). Would you support the implementation of such a category?

Pierre Kruse (Pierre.Kruse@nt.gov.au - 20.2.08) responded: To address your second question, there is already a category for taxa that are poorly understood to the extent that they are unrecognisable: *nomen dubium*. The easy way to deal with such a taxon is to treat it as a *nomen dubium*, and then proceed taxonomically as if that taxon did not exist. You will run the 'risk' that the *nomen dubium* will eventually be properly diagnosed (e.g. according to Article 75.5), which may make some of your new taxa junior subjective synonyms. The longer way is to apply to the ICZN to have the *nomen dubium* either suppressed, or a neotype specimen nominated, which adequately characterises the taxon (Article 75.5). This will definitively rid

the scene of the 'polluting' taxonomic name.

John Laurie (John.Laurie@ga.gov.au - 20.2.08) answered Bruno Granier:

1. If type species of genus A is revised by Jones and it is considered that it is better assigned to genus B, then unless statements to the contrary are made by Jones, it is assumed that all other species of genus A are assigned to genus B. However, you should realise that this may only be a matter of opinion and that Smith may not agree with Jones. Smith may maintain that the type species of genus A is not better assigned to genus B. The concept of genus A still exists and it has a type species, even if everyone in that field now agrees with Jones that that type species is better assigned to genus B. Rather than dealing in such hypothetical situations, I find it more instructive to deal with real examples. Has anyone got some good examples?

1.1. As far as invertebrates go, this doesn't matter; it is dealt with in synonymy lists. From my experience, little attention is paid to the initiator of a new combination where it is simply a matter of subjective synonymy.

1.2. See above.

2. If the type of a species is lost, and if there is other material available which is of fairly good quality, you can select one of these as a neotype. Even if there are several similar-looking species at the type locality, you can still select a neotype from among that material. It doesn't matter. The specimen you select as neotype becomes the type of the species. End of story, unless, of course, someone subsequently finds the original type specimen in their backyard shed. If the type of a poorly understood species still exists, but shows no features which can allow it to be distinguished from, say, a pebble (e.g. *Grandagnostus vermontensis* Howell), then you should illustrate the specimen, demonstrate that it cannot be characterised in any substantial way, restrict the specific and generic names to that single specimen, then effectively forget about it until you have to compile a treatise volume. Eventually everybody will get the message, the names will fall into disuse and after a time you can apply to the ICZN to have the name officially given the boot. In the interim, there is no real need to keep a list of dodgy names. The people who work in the particular phylum, class or order will know the name is no longer used, so there seems to be little point in keeping a register, although I am willing to be convinced otherwise.

13. Roy Plotnick (plotnick@uic.edu - 20.2.08) opined: To those who don't receive *American Paleontologist*, here is a link to an opinion piece on the status of the field I just published there: <http://tigger.uic.edu/~plotnick/AmerPaleoEssay.pdf>. There [is] a follow-up essay in *Palaeo. Elect.* (2008. A Somewhat Fuzzy Snapshot of Employment in Paleontology in the United States. **11**(1); http://palaeo-electronica.org/2008_1/toc.htm)...[the upshot being]: "paleontology as a discipline has numerous strengths and opportunities but has clear weaknesses and is facing significant threats, not the least of which is the erosion of funding and positions. The issues and suggestions raised a

decade [ago] by Flessa & Smith remain. Continued efforts to address these issues, by our societies, by high profile paleontologists, such as members of the National Academy of Sciences, and by the community as a whole are necessary”.

Aidan Karley (aidan_karley@mail.ru - 22.2.08) responded: In article mailman.1.1203595211.1134.paleonet@nhm.ac.uk, **Roy Plotnick** wrote: “A related weakness is the marked decline of paleontology at major oil companies. At one time, most companies had large in-house paleontological programs for paleoecology and biostratigraphy, including associated databases and collections. Today, many of these programs are either gone or much smaller, with much of the work being contracted out. Farley & Armentrout (2000) noted that the number of paleontologists employed at major oil companies declined 90% from 1985 to 2000! They also pointed to the accompanying decline of oil company support for paleontological research at universities...”. The broad brush of my initial comment is - sure, the oil companies themselves don’t employ many bug watchers themselves (Shell UK has only 3 or 4, for example). But they don’t do much microscope time themselves - they’ll typically have around one bug watcher out on a rig somewhere (with several projects in work at any one time), with however many others slaving away over a hot microscope in North Wales on background work. I’d be more concerned over the prospect of a Tunguska-esque event over North Wales seriously decimating the European bug watching community. There’s a strange concentration of companies working in this field in that area - more than the ‘Robertson’s’ effect could realistically explain...

Martin Farley (mbfarley@hal-pc.org - 22.2.08) responded: Farley & Armentrout (2000) compiled figures for paleontologists working for oil companies in North America, so Karley’s comments are parallel but not directly relevant. We had accurate numbers for paleontological staffing by company in North America over the period covered by our article. I presume the trends would have been similar for paleontologists outside North America in non-state oil companies. Much worldwide oil industry paleo was done by paleontologists in North America, however. The numbers didn’t include consultants, who now do much of the microscope work in North America. While we don’t have good historical numbers for consultants, consultants have existed for a long time. There was no reason to believe that the loss of company paleontologists was even remotely balanced by an increase in the number of consultants. Thus, there has been a striking population crash to near-extinction levels in industry paleontology.

The disappearance of the support for research and education offered to academia by oil companies in the ‘old days’ remains a loss to the profession. As Plotnick points out, many academic institutions are very good at counting money, so an alternate source to limited governmental funding would be valuable.

It might be time to revisit the paleontological numbers

at oil companies. The numbers couldn’t fall much from their 2000 levels (can’t really go below ‘zero’). Some oil companies have hired paleontologists since our article, although this may really just balance losses (e.g., retirements). While I have good contacts in the industry, I have not been employed there since before Farley & Armentrout (2000) appeared. The *Geotimes* article resulted in a solicitation to Armentrout and me to write an article for the industry trade journal *Offshore* in 2002. This article was mostly a description aimed at industry managers on how to use paleontology effectively. After discussion with the journal editor, I added a sidebar on the changes to the training and development of industry paleontologists. Basically, it described how the old system of training paleontologists for and in the industry was broken (including that North American consultants historically started as oil company paleontologists) and it was not clear what new system would appear. Oil industry support was not merely in biostratigraphy, but for some groups (e.g. dinoflagellates) involved fundamental research on systematics and basic morphology. This research was done inhouse at oil companies as well as in supported academic institutions. As Plotnick notes, the end of this effort over the last 20 years in the oil industry reinforces the weaknesses that have developed in these areas in academia...

Georgiana Wingard (lwingard@usgs.gov - 31.3.08) enquired: I enjoyed reading Roy Plotnick’s update of Karl Flessa’s (1997) assessment of paleontology, but was curious why those of us in the federal government were excluded, but state governments were included... I still count myself as a paleontologist!

Roy Plotnick (plotnick@uic.edu - 31.3.08) responded: I had to rely principally on the Directory of Geoscience Department’s database, which does not include federal employees. I suspect that I also missed a lot of state survey people. That’s why it’s a ‘fuzzy snapshot’.

14. Stacia Spaulding (jrice@tds.net - 1.3.08) asked: I have been having trouble with my light source dimming, so I decided to change my halogen bulb. Now, no light comes through at all. Has anybody had this problem? I tried a couple of other light bulbs, but still no luck. I have an Olympus microscope - model BH-2. I’ve decided that I may need a new halogen lamp holder. This microscope is 18 years old and I bought it used! Any thoughts?!

Jackie Lees (j.lees@ucl.ac.uk - 1.3.08) responded: Have you checked the fuse?

Jean Self-Trail (jstrail@usgs.gov -3.3.08) replied: I had a similar problem with my Zeiss Photomicroscope 3 a couple of years ago. The light kept dimming at odd moments. Additionally, I would occasionally get a shock when I touched the light source. Eventually, it kept blowing out any bulb I put in. It turned out that I had a short in the light source and that some minor rewiring took care of the problem. You might try rewiring before you chuck the old source for a new one.

Ron Morin (ronmorin@airmail.net - 3.3.08) added:

Like Jean, I have experienced this problem with my Zeiss Photomicroscope 3 several times. I have had one short, as Jean had, but all the other times the ceramic socket for the bulb had cracked and needed to be replaced. It was not necessary to get a new light source, which is fortunate because the Zeiss Photomicroscope 3 is an old model, and I don't think new light sources are available. Of course I did not replace the ceramic socket myself, I had it done professionally.

15. Mary McGann (mmcgann@usgs.gov - 20.3.08) asked: Help! So I'm confused. Is the proper usage foraminifera or foraminifers? Here are some examples: In the presence of increased dissolved organic matter, the abundance and diversity of foraminifera increase (Bandy and others, 1964b; Watkins, 1961)... Resig (1960) first documented the general distribution of foraminifera near four of the outfalls...Can you shed some light on this subject?

Ken Miller (kgm@rci.rutgers.edu - 20.3.08) replied: My recollection is that common usage was foraminifera, foraminiferal (though there was a movement to the awful foraminiferids). Then came DSDP and foraminifers became their style. Because so much of the foraminiferal literature was published in DSDP and its successors ODP and IODP, it has become more common to use foraminifers. That said, I prefer foraminifera, foraminiferal. Now how about plankton, planktonic (correct), or planktic (an abomination promulgated by the USGS as I recollect); benthos, benthonic or benthic (I prefer benthic over the now archaic benthonic), but you say Van Wyck (Van Wick) or I say Van Wyck (Van Wike) and both are correct...just be consistent.

Ken Finger (kfinger@berkeley.edu - 20.3.08) opined: I like foraminifers when referring to specific ones (e.g. these foraminifers are reworked; one foraminifer was pyritized), as opposed to forams in general (e.g. our study of foraminifera shows...). And I tend to use Foraminifera when I am specifically referring to the suborder (e.g. I decided to study Foraminifera because they are fascinating ...), but foraminifera can be used as well in most of those cases. Mary, your usage of foraminifera in the sentences you provide looks just fine to me.

Jere Lipps (jlipps@berkeley.edu - 20.3.08) replied: Hi, Mary - I like foraminifera for one or more forams; foraminiferan sometimes for one; foraminiferal as an adjective. I am sure Ken can help you out too, most likely by destroying my uses.

Ken Finger (kfinger@berkeley.edu - 21.3.08) responded: Ken M. - Don't blame the USGS for 'planktic'! I suspect the deletion of the 'on' from '-onic' followed Anders Martinsson. He had a series of papers in *Lethaia* that I thought had resolved several semantics issues, even though many haven't stopped embracing erroneous terminology. Offhand, I don't recall if there are any published rebuttals to his conclusions:

1974 - Planktic, nektic, benthic. *Lethaia*, **8**: 193-194.

1979 - Ostracodes, nematodes and cestodes. *Lethaia*, **12**: 152.

1979 - Planktic vs. planktonic once more. *Lethaia*, **12**: 244.

1979 - The case for 'ostracod'. *Lethaia*, **12**: 264.

1981 - Conifers, rotifers and foraminifera. *Lethaia*, **14**: 82.

1982 - How to retain planktic organisms and escape Platic love. *Lethaia*, **15**: 30.

Ken Miller (kgm@rci.rutgers.edu - 21.3.08) came back with: Ken F. - Lucy corrected me and in fact the USGS has no official position on planktic, so my apologies to my USGS friends and colleagues. I do remember now the 1982 paper. Ahh, the point is, each to his own.

Jere Lipps (jlipps@berkeley.edu - 1.4.08) opined: Loeblich & Tappan would be rolling in their graves. Helen would have researched it well, hence foraminifers is good for several of them, foraminifer is good for one of them, foraminiferal is a good adjective. Foraminifera is not good because it is not the proper name of the group. Foraminiferida is the proper noun. Foraminifera should therefore never be capitalized unless you refer back to some ancient use of that word as the proper noun for the group. I think I will keep using foraminifera for everything, and forget about foraminiferan and all the rest. I like it. Benthos (= depth of the sea), nektos (= swimmer) and planktos (= wanderer) are all Greek. The AGI *Glossary of Geology* accepts benthic and benthonic, does not record nektic or nektonic, and lists only planktonic. It is not useful. Surely the Greeks must have some grammatical rules that control what the suffixes are when these nouns are used as adjectives. I like benthonic, nektonic and planktonic, too.

Sue Goldstein (sgoldst@gly.uga.edu - 2.4.08) added: Current classification recognizes our beloved forams as a taxonomic Class, Foraminifera, rather than as an order, the Foraminiferida, in which case Foraminifera should be capitalized. Loeblich & Tappan (1992) elevated the forams to the rank of class. See also the Society of Protozoologists' *The Illustrated Guide to the Protozoa* (2000), and the chapter on foram systematics in Sen Gupta's *Modern Foraminifera* (1999) for discussion. The Adl *et al.* (2005. *J. Eukaryotic Microbiol.*) paper recognizes the Foraminifera as a 'first rank' group within the 'super-group' Rhizaria Cavalier-Smith, 2002, but does not otherwise assign them to a traditional higher taxonomic category. In this context, foraminifer(s) and foraminiferan(s) should both be valid for informal use.

Jere Lipps (jlipps@berkeley.edu - 2.4.08) replied: You are correct, Sue. However, the problem is that all of these classifications are temporary, not complete (Sen Gupta's, 1999, dealt only with modern taxa), or tentative (Adl *et al.*, 2005) and already out of date (Parfrey *et al.*, 2006, *PLoS Genetics*). As soon as we get the higher levels of eukaryote classification worked out, we will have something to go on. I'd not capitalize any of them, and not use Foraminiferida either (which at least is clearly defined but incorrect). Forams are a major group well above the traditional kingdoms we used to recognize. I doubt that the traditional Linnean classification ranks will work in the future, and we should get prepared mentally for that to happen. A strictly evolutionarily-based classification, with

proper evaluation of morphology and genetics, will require it. We'll see how it all works out fairly soon I hope. But right now it's a mess. So if you must use a classification, be sure to specify which one you use carefully and don't mix and match, since none are much comparable. For most of us doing ecologic or stratigraphic work, I'd use the most comprehensive treatment, which would be one of L&T's books, so that others know what you mean.

When I try to teach this stuff, I use diagrams showing the branching patterns either as solid lines, when secure, or as dashed lines when not secure, as with forams. Putting foram classifications into the larger eukaryote scheme using only words confuses the current uncertain situation. A diagram also shows the place of the traditional kingdoms of Animals, Plants, Fungi, Protists more clearly with a little explanation. Of course, within forams, we can still use the traditional ranks, perhaps without names, except for genera and species, for the time being until the genetics/morphology mess is reconciled. [These are] exciting times in foram systematics, from the species to the domain level. Loeblich & Tappan would be enjoying it all and be quite happy to see the new information, and, yes, to stop spinning in their graves and accept new spellings and nomenclature (as long as you follow the rules!).

John Frampton (biostrat@carib-link.net - 2.4.08) added: Given that Helen Tappan would have researched it well the following can be found in *Foraminiferal Genera and their Classification*. Page 7 in the description of the Order Foraminiferida: "benthic and attached or motile, or pelagic"; and on p.452 in the description of the *Globigerinina*: "Planktonic in habit". I also prefer foraminifera for everything.

16. Maria Triantaphyllou (mtriant@geol.uoa.gr - 18.4.08): Hi everyone, can you please take a look at these photos and tell me your opinion? Could these coccoliths be *E. huxleyi*? The sample contained abundant *Gephyrocapsa*, including *G. protohuxleyi*. These specimens didn't have any bridge. Could they be the first representatives of *E. huxleyi*?

Osman Varol (osman_varol@hotmail.com - 18.4.08) replied: It looks to me [like] *Crenalithus daronicoides*.

Mike Styzen (michael.styzen@shell.com - 21.4.08) opined: This is a good place to insert a commercial for www.nannotax.org! Lots of people pick something they call *C. daronicoides*. In the 'black book', Jeremy presents a pretty good case for the non-existence of this taxon. I don't use SEM so I suspect that I would lump these specimens into a junk box called '*Reticulofenestra* small', which I suspect in many cases is the same box as *C. daronicoides*. Several people I've talked to will quite emphatically defend one side or the other of this argument. Those of us in the '*Reticulofenestra* small' camp just can't wait till you work it out... The best place to discuss and illustrate this is the nannotax website. [See advert, p.34]

