Informe 3 de novembro

Caros amigos,
No proximo dia 5 termina o prazo para submissao de artigos para o primeiro volume da revista Terra Brasilis.
Os interessados em submeter artigo, enviem o material para o e-mail acfonseca@geobrasil.net
Cordialmente,
Ariadne Fonseca
INFORMATIVO: a partir desse mes o jornal Geocarioca da SBG-RJ sera divulgado no site
Revista **BRASIL MINERAL** de Setembro de 2002, n^{o} 209
Seção "Área Livre" (p. 28 e 29)
Artigo escrito por Arno Bertoldo, Geólogo (*)

Como são administrados os "Serviços Geológicos"

As atividades técnico-científicas relacionadas ao conhecimento do subsolo, à descoberta e avaliação dos recursos minerais, energéticos e hídricos, à prevenção de catástrofes naturais e à proteção do meio ambiente, em todo o mundo têm sido executadas por agências governamentais, normalmente denominadas "*geological survey*" ou "serviço geológico" na sua tradução livre para o português. Assim, temos o *United States Geological Survey*, o *Geological Survey of Canada*, o *Australian Geological Survey Organisation*, etc.
A avaliação de desempenho das atividades realizadas pelos serviços geológicos, assim como a de outras atividades relacionadas à área de ciência e tecnologia, é uma tarefa complexa. Numa visão simplista de Gerenciamento da Qualidade Total, poder-se-ia dizer que as dificuldades de avaliação dessas atividades residem no fato de os serviços geológicos não gerarem produtos manufaturados comuns, mas sim mapas e relatórios, e de seus principais clientes normalmente serem agências governamentais, ou seja, o público, que em geral não se manifesta. Na realidade, enquanto instituições públicas os serviços geológicos devem estar voltados para o atendimento de necessidades sociais – que devem ser socialmente definidas –, daí ocorrendo a complexidade de sua administração. Desse modo, o produto seria um serviço, a pesquisa direcionada para necessidades econômicas e sociais, da qual derivam mapas e relatórios, e o público seria partícipe do processo, ao mesmo tempo sujeito e objeto do trabalho.
Para enfrentar essas dificuldades gerenciais, os serviços geológicos de países avançados vêm passando por uma série de transformações, buscando promover um maior compartilhamento social de sua gestão. Programas de avaliação, estabelecidos a partir de 1990, têm constantemente recomendado a aproximação com os setores sociais envolvidos e/ou interessados na execução dos projetos/programas. Essas avaliações têm feito as seguintes recomendações comuns: a) o revigoramento dos Conselhos de Administração, com sua participação mais efetiva na definição da política e estratégia de atuação da instituição; b) a ampliação dos Conselhos de Administração, com a inclusão de um maior número de representantes de clientes, parceiros e usuários; c) o estabelecimento de Conselhos ou Comitês de Assessoramento, com a participação de clientes, parceiros e usuários, no planejamento, monitoramento e na avaliação dos projetos.
Nos Conselhos ou Comitês de Assessoramento dos serviços geológicos de países avançados, de grande extensão territorial e grandes produtores de recursos minerais e energéticos, como Estados Unidos, Canadá e Austrália, encontram-se representados: o setor privado (associações de produtores de minerais e de petróleo); a comunidade acadêmica (universidades, escolas de geologia); o setor governamental (ministérios e/ou agências governamentais); os serviços geológicos regionais (nestes países existem serviços geológicos estaduais, provinciais ou territoriais, bem estruturados); e, representação direta de associações sociais, sem fins lucrativos, no caso norte-americano, a Associação Americana dos Geólogos Estaduais.
Em resumo, pode-se dizer que o gerenciamento dos serviços geológicos de países desenvolvidos se dá através da participação de múltiplos atores, formando uma densa trama de relações sociais. Essa rede de relações sociais que se estabelece entre o estado, a sociedade e a comunidade acadêmica, além de definir critérios de relevância social e científica, direcionar as pesquisas e avaliar a qualidade do trabalho, também desempenha um importante papel na obtenção dos recursos financeiros e técnicos.
No caso de serviços geológicos de países periféricos como a África do Sul e o Brasil, essa rede de relações sociais é praticamente inexistente. No Brasil não temos serviços geológicos estaduais, mas

empresas estaduais de mineração, sendo que poucas delas desenvolvem, assim mesmo de modo descontínuo e não sistemático, atividades de mapeamento geológico. No âmbito Federal, a Companhia de Pesquisa de Recursos Minerais (CPRM), criada em 1969, subordinada ao Ministério de Minas e Energia, vem desempenhando as funções de um serviço geológico nacional. A sua transformação em Empresa Pública, em 28 de dezembro de 1994, com a incumbência governamental de executar e coordenar o Programa Nacional de Levantamentos Geológicos Básicos (decreto n. 917 de 18 de setembro de 1993), converteu-a de fato no "Serviço Geológico do Brasil".
De acordo com seu estatuto, a CPRM é administrada por um Conselho de Administração com seis membros (cinco deles indicados pelo Ministro de Estado de Minas e Energia e um pelo Ministro de Estado de Orçamento e Planejamento) e por uma Diretoria Executiva constituída por um presidente e quatro diretores, eleitos pelo Conselho de Administração. Ou seja, a escolha dos membros do Conselho de Administração e da Diretoria Executiva da CPRM tem sido um privilégio, praticamente exclusivo, do Ministério de Minas e Energia. A empresa não possui Conselhos ou Comitês de Assessoramento que promovam a aproximação com seus clientes/usuários ou com outros órgãos governamentais, a exemplo do que ocorre nos serviços geológicos dos Estados Unidos, Canadá e Austrália, e o seu Conselho de Administração tampouco inclui representantes setoriais da indústria de mineração e de petróleo, da área acadêmica, e de outras agências governamentais, como acontece nos serviços geológicos da Inglaterra, Finlândia e África do Sul.
Numa perspectiva de mudança nas diretrizes políticas do país, que privilegie o desenvolvimento econômico (o que todos os potenciais candidatos a presidente advogam), o Serviço Geológico do Brasil teria um importante papel a desempenhar. Só para dar um pequeno exemplo, a alavancagem das políticas públicas voltadas para o saneamento básico e a construção de moradias irá demandar quantidades crescentes de areia, argila, brita e cimento, além de estudos de impacto ambiental e de planejamento territorial, em todo o território nacional. O Serviço Geológico do Brasil, juntamente com outros organismos governamentais e privados, muito poderia contribuir para viabilizar essa almejada retomada de crescimento.
Todavia, o futuro do Serviço Geológico do Brasil não parece promissor. A proposta do Ministério de Minas e Energia de reestruturação do Setor Mineral contida no Programa de Reestruturação Institucional do Setor Mineral (PRISMA), colocando-se na contramão da tendência internacional, mantém a arcaica estrutura organizacional da CPRM na sua transformação oficial para Serviço Geológico do Brasil.
A pergunta que se coloca é a seguinte: estará o Serviço Geológico do Brasil apto a atender as necessidades do país ?

(*) Arno Bertoldo, geólogo, doutor na área de Administração e Política de Recursos Minerais pela UNICAMP, ex-presidente da Associação Profissional dos Geólogos do RJ <arnob@uol.com.br>

Informe 5 de novembro

Convite

A Editora Interciência tem o prazer de convidá-lo para o lançamento do livro "Guia dos Icnofósseis de Invertebrados do Brasil", de autoria dos professores Antonio Carlos Sequeira Fernandes, Leonardo Borghi, Ismar de Souza Carvalho e Carlos Jorge de Abreu, o qual ocorrerá às 17:00h do próximo dia 11 de novembro, no Auditório da Decania do CCMN, Ilha do Fundão, Cidade Universitária da UFRJ.

Aviso

"Energy Modelling in Minerals"
Palazzo Feltrinelli, c/o Università di Milano, Gargnano, Garda Lake, Italy, June 8-14, 2003
a second session of the school (#4) already held in Budapest.

For further information:
http://slamdunk.geol.ucl.ac.uk/~artem/EMU-School.html

Informe 6 de novembro

Prezado Associado,

Temos o prazer de convidá-lo a participar do lançamento oficial promovido pela Associação Brasileira de Geologia de Engenharia e Ambiental (ABGE) e pelo Instituto de Geociências da Universidade de São Paulo (IGc/USP), no dia 07/11/2002, às 17:30h, no salão Nobre do referido Instituto (Rua do Lago 562, Cidade Universitária), das seguintes publicações:

1) Artigo Técnico 17: "Os solos da cidade de São Paulo - Histórico das pesquisas" de autoria do prof. Milton Vargas.

2) Livro: "Tecnologia de rochas na construção civil" de autoria do geól. Ely Borges Frazão.

3) Livro: "Geologia de Engenharia - Conceitos, métodos e prática" de autoria do geól. Álvaro Rodrigues dos Santos.

Na ocasião, os autores comentarão brevemente sobre suas obras, após o que haverá uma sessão de autógrafos.

Na expectativa de contar com a presença de V.Sa., aproveitamos a oportunidade para renovar nossa elevada estima e consideração.

Atenciosamente,
Rômulo Machado
Diretor-Secretário da SBG

Prezados(as) Senhores(as)
O IEA/USP tem o prazer de convidar para o lançamento da segunda edição (revisada e ampliada) do livro Águas Doces no Brasil - capital ecológico, usos e conservação.
Atenciosamente,
Ines Iwashita

Informe 10 de novembro

A Ciência é uma religião e a Humildade é seu altar. No entanto, como em todos os lugares, sempre aparece um iconoclasta muito do filho da puta tentanto estragar a bela festa. O artigo aí abaixo foi publicado no jornal Público, de Portugal.
Arvão

Fraudes Científicas Levam Revistas a Desacreditar Artigos dos Laboratórios Bell

Por MARIA JOÃO RODRIGUES
Domingo, 10 de Novembro de 2002

Reacção da "Science" e "Nature"

A polémica relacionada com a falsificação de resultados de investigações no campo da física está a abalar a comunidade científica levando organizações a rever critérios de controlo de fraudes

As últimas edições das revistas científicas "Nature" e "Science" optaram por excluir os artigos resultantes da investigação conduzida por Jan Hendrik Schon, físico na área de nanotecnologia ao serviço dos Laboratórios Bell, na sequência dos resultados incriminatórios da comissão independente de investigação que analisou as suspeitas de fraude levantadas por cientistas face às incríveis descobertas no campo dos semicondutores protagonizadas por este físico.

A comissão independente - liderada por Malcolm Beasley, engenheiro electrotécnico na Universidade de Stanford, na Califórnia, Estados Unidos - considerou que Schon "mostrou uma completa desconsideração pelo carácter sagrado dos dados no sistema de valores da ciência", acusando-o de falsificação ou fabricação de dados em 16 dos 24 casos de que era acusado.

Os resultados extraordinários dos trabalhos de Schon relacionavam-se com a utilização de cristais feitos a partir de matéria orgânica (com carbono) como semicondutores para fazer transístores (funcionam como interruptores, isto é, passam a corrente eléctrica em certas circunstâncias). Esta descoberta era vista por muitos como a maneira de combater os constrangimentos de tamanho impostos por tecnologias baseadas no silício, uma vez que os cristais orgânicos eram mais leves e mais flexíveis. Schon chegou mesmo a apresentar resultados de miniaturização dos cristais orgânicos que culminaram com a realização de um transístor com apenas uma molécula orgânica. Era o primeiro investigador a fazer interruptores à escala atómico-molecular.

Além destas descobertas inéditas, Schon destacava-se pela produtividade - nos seis anos seguintes ao seu doutoramento produziu cerca de cem artigos e reclamou várias patentes.

As suspeitas começaram a ser levantadas não só porque vários investigadores não conseguiam reproduzir os resultados, como por um grupo de cientistas que informou, em Março, os Laboratórios Bell da duplicação de um gráfico em diferentes artigos. Isto levou os laboratórios a criar uma comissão de investigação independente para averiguar a validade das suspeitas sobre os trabalhos de Schon.

As conclusões do inquérito levantam sérias preocupações na comunidade científica, concretamente no que toca a meios de controlo e detecção de fraudes em investigações científicas.

"Este caso teve bastante impacto, porque envolveu tecnologias de ponta. A nanotecnologia vai revolucionar a tecnologia e não sai prejudicada com isto", comentou Carlos Fiolhais, da Sociedade Portuguesa de Física.

Perda de credibilidade é o grande castigo

"A física é um caso extremo, mas sintomático, de que a ciência se autocorrige e se autovalida. É como se existisse um tribunal sempre instalado", afirmou Carlos Fiolhais.

Não é comum a existência de fraudes nesta área da ciência. Contudo, o aparecimento de dois casos nos últimos tempos veio levantar dúvidas quanto aos sistemas de controlo e detecção de erros existentes. Além dos Laboratórios Bell, o Laboratório Nacional Lawrence Berkeley, na Califórnia, também se viu envolvido numa polémica semelhante, quando um dos seus investigadores, Victor Ninov, afirmou ter descoberto o elemento mais pesado da tabela periódica, o elemento 118. Quando cientistas independentes não conseguiram reproduzir esse resultado e foi instaurada uma comissão de inquérito, as conclusões desapontaram a comunidade científica, por não se ter confirmado o trabalho, nem se ter procedido a uma recolha de dados conveniente.

Para Carlos Fiolhais, a perda de credibilidade do investigador é o castigo mais severo que pode aplicar-se. Isto porque a credibilidade é "muito difícil de conquistar e muito fácil de perder."

A questão que a todos incomoda é a da classificação da conduta dos co-autores dos artigos. No caso dos Laboratórios Bell, Bertram Batlogg, cujo nome aparece na maior parte dos artigos de Schon, não foi responsabilizado. A comissão de inquérito apenas frisou a máxima de Carl Sagan - "afirmações extraordinárias têm de ter provas extraordinárias" -, advertindo Batlogg e futuros co-autores de que esta ideia deverá estar sempre presente na validação de um trabalho científico.

Informe 11 de novembro

Caros amigos,

Semana passada enviei um aviso sobre um novo virus. Hoje consegui detectar ao menos um endereco de mail no qual vem o informe de um simposio de arsenio com um file attachment. A mensagem e pequena, de 22 kb, mas o file attachment e um descanso de tela que formata o HD. Sejam atentos, nao abram essa mensagem. Avisei a pessoa que mandou a mensagem (roquemar@iconenet.com.br)
Chequei o site e o simposio realmente existe.
Cordialmente, Ariadne Fonseca
O texto da mensagem e o seguinte

>AOS INTERESSADOS NO TEMA ARSENIO- CONFERENCIA NA SUECIA>
>Please note that the deadline for the submission of Abstracts has been=20
>extended to November 1, 2002!!
>Also please register online
>
>http://www-conference.slu.se/7thICOBTE/registration/index.htm
>
>
>Dear ALL:
>
>I am hereby sending you the announcement for the
>Special Symposuim
>
>(Copy the folloing URLs and paste onto your browser)
>
>http://www.lwr.kth.se/personal/personer/bhattacharya.prosun/Special_Symposi=
um_arsenic.htm
>
>http://www.lwr.kth.se/People/Prosun/Special_Symposium_arsenic.htm
>
>Arsenic in Soil and Groundwater Environments: Biogeochemical Interactions,
>
>7th International Conference on Biogeochemistry of Trace=20
>Elements (ICOBTE) June 15-19, 2003.
>
> Organized by:
>
> Richard H. Loeppert (USA)
> Soil and Crop Sciences Dept., Texas A&M University, College=20
> Station, TX 77843-2474, USA
> Tel: +1-979-845-3663, Fax: +1-979-845-0456 E-mail:=20
> r-loeppert@tamu.edu
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> Dept of Land and Water Resources Engineering, Royal Institute of=20
> Technology, SE-10044 STOCKHOLM, Sweden
> Tel: +46 8 790 7399; Fax: +46 8 411 0775 E-mail: prosun@kth.se
>
> Alan H Welch (USA)
> United States Geological Survey, Carson City, Nevada, USA
> Tel: +1-775-887-7609, Fax: +1-775-887-7629 E-mail:=
ahwelch@usgs.gov
>
>
>Please circulate this information further to your colleagues so that we=20
>can come up eith state of the art research findings on arsenic=
biogeochemistry.
>
>Best wishes
>
>Prosun.

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>**********=
****
>Richard Loeppert (rloepper@taexgw.tamu.edu)
>Prosun Bhattacharya (prosun@kth.se)
>Alan H Welch (ahwelch@usgs.gov)
>Organizers
>Special Symposium
>Arsenic in Soil and Groundwater Environment: Biogeochemical Interactions
>June 15-19, 2003, Uppsala, Sweden
>URL: http://www.lwr.kth.se/PEOPLE/Prosun/Special_Symposium_arsenic.htm
>URL:=20
>http://www.lwr.kth.se/personal/personer/bhattacharya.prosun/Special_Symposi=
um_arsenic.htm
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Informe 12 de novembro

Noticias Earth Pages

Web resources

Florida Department of Environmental Protection - www.dep.state.fl.us/geology/
The department's site combines high-quality educational media and scientific data about those environmental aspects of Florida that are unique. You can access downloadable AutoCAD *.dxf files showing geological maps from the county level to smaller scales plus other GIS files, lithological logs from boreholes and detailed information on the State's oil and gas industry. Currently featured on its home page is a related web site about Florida's unique hydrogeology and its famous springs. A well-designed, easy to use site.

Anthropology and geoarchaeology

A considered view
Find after find of hominid remains (*Bonanza time for Bonzo* - August 2002) undoubtedly forces physical anthropologists to reflect on what their still tiny collections of fossils might signify about the descent of humans. There are two ways of looking at that; as a "tidy" tree and one that is essentially "untidy". The first seeks a means of connecting the earliest remains to later ones by the simplest possible connections – a touch of Occam's Razor. However, more diversity and ever increasing ranges of ages and localities for the remains inevitably challenges this kind of palaeontological "good housekeeping". Bernard Wood of George Washington University has long regarded evolution as untidy, and the finds of *Sahelanthropus tchadensis* and *Orrorin tugenensis*, around 6 to 7 Ma old, reinforce his trenchant views (Wood, B. 2002. Who are we? *New Scientist*, 26 October 2002, p. 44-47).
Because the genetic similarity between humans and their nearest relatives, chimpanzees, seems to suggest that the two clades diverged between 5 and 10 Ma ago, *Sahelanthropus* and *Orrorin* may be pretty close in age to that division. But what were they? Wood's view is interesting, and a worry to the advocates of a parsimonious set of connections. Connectivity in proposed clades rests, for obvious reasons, on purely physical characteristics. There are many examples from the fossil record of animals whose outwardly similar characters, for example those shared by sharks and dolphins, do not signify inheritance from common ancestry. This is homoplasy, and raises the awkward possibility that special characters, regarded as essentially human, need not have arisen only the once and been carried by linear descendants. The often quoted "golden characters" of big brains and upright gait, that confer an opportunity to develop consciousness through freeing of the hands, may well have arisen more than once. The truly odd thing about *Sahelanthropus* is just how "modern" its face looks. Beetling brows, thick jaw and un-apelike canine teeth would put it on a sort of par with fossils of

species of *Homo* that arose 4 to 5 million years later. Yet none of the fossils in between have this combination.; in the "tidy" scheme of things they are more "primitive", and "therefore" cannot be our ancestors. Quite a muddle! Faces, the most sought after bits of bone, isolated in time and place could well have led many up the proverbial garden path. Why, suggests Wood, shouldn't early hominids have been dead ends morphologically, with "primitive" characters making repeated comebacks? Why, too, shouldn't they have been ancestral chimps, or even neither chimp nor human? The dearth of late-Miocene and Pliocene non-hominid fossils of primates leaves all this as possible. He reckons the search for "missing links" has always been a non-starter. Whatever, by expanding enormously the area of potentially fruitful ground from the narrow confines of the East African Rift, the *Sahelanthropus* find in Chad may yet lead to a big increase in the number of hominid and other primate fossils over which physical anthropologists can ponder.

Climate change and palaeoclimatology

Africa's first ice core record

Melting of low-latitude glaciers in Africa is so rapid that, unless they are cored soon, their content of long-term climate data may soon be gone forever. So the first detailed isotopic record from Africa's highest glacier on Kilimanjaro is cause for some relief. Intrepid glaciologist Lonnie Thompson welded a large team together for this important task (Thompson, L. 2002. Kilimanjaro ice core records: evidence of Holocene climate change in tropical Africa. *Science*, v. **298**, p. 589-593). The annually layered ice goes back only about 12 ka, but nonetheless gives a precious account of climate change at the heart of the continent, far more detailed than sparse lake-bed cores from various places.

The core confirms a broad pattern of warm, wet conditions from 11 to 4 ka, before the long-term cooling and drying of historical times. These reflect likely weakening of monsoonal conditions in the late Holocene. However, assigning precise ages to depth in the cores is not as easy as in those from high-latitude ice sheets, because of a lack of good layering (presumably) and dateable carbon. At about 5200 years ago, the record shows an abrupt fall in $d^{18}O$, a sign of drying and cooling that took place over perhaps a matter of decades. This correlates with disruption of early civilisations in India, Egypt and the Middle East, and probably stemmed from cooling in the North Atlantic. However, an equally rapid deterioration occurred around 6300 years bp, although not so extreme, to presage a millennium of arid conditions at the heart of Africa. Important as these data are, the team's estimates of current retreat rates of the Kilimanjaro glaciers are alarming. Quite probably, the white cap of Africa's highest mountain will have disappeared within the next 20 years.

Lonnie Thompson is obviously both keyed- and clued up about extracting climatic data from ice at high elevations. So much so, that *Science* has printed a lengthy account of his exploits, mainly on low-latitude glaciers (Krajick, K. 2002. Ice man: Lonnie Thompson scales the peaks for science. *Science*, v. **298**, p. 518-522

Geobiology, palaeontology, and evolution

Land plants at the P-Tr boundary

The Permian to Triassic transition involved a transformation from globally cool conditions to a hothouse, as well as the largest mass extinction in the fossil record. It also spanned a time when most continental lithosphere was clumped in the Pangaea supercontinent. In the case of plants, it is not easy to sort the effects of climatic shifts from those due to catastrophic events, either the effects of the huge Siberian flood-basalt event (see *Earth Pages* August 2002, *Flood basalts of Siberian Traps doubled at a stroke*) or a yet to be proven impact. Allister Rees of the University of Chicago has painstakingly organised global Permian and Triassic floral data to see if the changes were slow (climatically influenced) or sudden (possible evidence for a catastrophic collapse),a nd if they coincide from region to region. He found that in some regions big changes happened quickly around the P-Tr boundary, but in others the shifts were protracted and unrelated to faunal extinctions (Rees, P. McA. 2002. Land-plant diversity and the end-Permian mass extinction. *Geology*, v. **30**, p. 827-830). This clearly implies caution in the interpretation of detailed local records as signs of massive events, and also points out the need to place such records in the contexts of global climate belts and biases that result from varied degrees of biotic preservation.

Dinosaurs did urinate

News is coming in (*New Scientist*, 19 October 2002, p. 26) of a startling find along a dinosaur trackway in Colorado. At the October meeting of the Society of Vertebrate Palaeontology, Katherine McCarville of the South Dakota School of Mines and Technology described a bath-sized pit preserved

among sauropod footprints. Seemingly, all the evidence points to it having been excavated by a gargantuan stream of liquid pouring from above. Ranking as a candidate for the IgNobel Awards of 2003, this evidence for dinosaurian bladder relief may shake the theory that birds are descended from dinosaur ancestors; birds do not urinate.

Continents colonised a billion years ago

The Torridonian of NW Scotland is a thick sequence of mainly terrestrial sediments that accumulated on the Laurentian craton, between 1200 and 1000 Ma ago. Much of the sequence evidences braided-stream deposition, with brief lacustrine episodes. Any geologist who examines these mainly siliciclastic rocks will find abundant evidence for subaerial conditions in the form of desiccation cracks, often affecting directional current ripples. However, it takes a keen eye and some knowledge of biofilms to spot any signs of microbial activity. In sandstones they manifest themselves by having increased the normally very low cohesiveness of wet sand by their binding action (Prave, A.R. 2002. Life on land in the Proterozoic: evidence from the Torridonian rocks of northwest Scotland. *Geology*, v. **30**, p. 811-814). Prave analysed the shapes of desiccation polygons to show that the Torridonian sands were unusually cohesive, and recognised other features likely to have been formed by microbial crusts. These finds add to the growing evidence for substantial terrestrial biomass, long before the "official" colonisation by land plants in the Silurian and Devonian. Whether or not such an expansion of the biosphere added significantly to carbon burial and drawdown of atmospheric CO_2, as it did in post-Silurian times, remains to be determined from average carbon contents of quite rare Precambrian terrestrial sediments,

Geochemistry, mineralogy, petrology and volcanology

Empirical geochemistry points to continents' role in mantle dynamics

Major-element chemistry of basalts provides proxies for key parameters involved in magmatism. Sodium content, normalized to an MgO content of 8%, relates to the degree of mantle melting, and similarly normalized iron content helps assess the depth of melt production. Such proxies help establish potential mantle temperatures - the temperature of magma that would erupt after rising adiabatically from different mantle depths. Low $Na_{8.0}$ suggests high potential temperature in a magma's source.

Vast repositories of basalt chemistry relate to every conceivable setting of magmatism, so $Na_{8.0}$ and $Fe_{8.0}$ numbers are useful in testing various hypotheses. One of these is that slabs of continental lithosphere affect mantle convection, by forming insulating "lids" that control surface heat flow. Eric Humler and Jean Besse, of the Université Denis Diderot in Paris, focus on the relationship between mantle potential temperature beneath ocean-ridge systems and their distance to passive continental margins (Humler, E. & Besse, J. 2002. A correlation between mid-ocean ridge basalt chemistry and distance to continents. *Nature*, v. **419**, p, 607-609). Leaving out the complicating factors of continental margins that involve subduction and ridges affected by hot spots, they found that recent ridge basalts show higher potential temperatures when the ridge is close to continental lithosphere than for more distant ridges. This suggests that the mantle cools away from continents by between 0.05 to 0.1°C per kilometre. This matches the well-known increase in depth to ridges as they become further from continents. Rather than being inert passengers on modern plates, continents do play a role in the mantle's thermal structure.

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Detrital platinum-group grains and "plum pudding" mantle heterogeneity

Evidence for the degree and longevity of geochemical heterogeneities in the mantle has largely stemmed from studies of basalts derived by mantle melting. The great diversity of melting and fractionation processes involved in their genesis obviously complicates assessment of whether or not the mantle is a mixture of several chemical domains, even though it is suspected. Indeed it is only to

be expected as a result of 4.5 billion years of mantle melting events and recycling of surface materials that find their way into subduction zones, unless, that is, long-term convection is an efficient means of mixing. A novel approach by a team from Stanford University, the University of Copenhagen and the US Geological Survey uses a combination of the rhenium-osmium radioactive decay scheme and the tendency for Re to enter melts, while Os is highly compatible to address this long-standing conundrum (Meibom, A. *et al*. 2002. Re-Os isotopic evidence for long-lived heterogeneity and equilibration processes in the Earth's upper mantle. *Nature*, v. **419**, p. 705-708). The novelty lies in their use of detrital grains of platinoids in alluvium derived from the many ultramafic masses in the western USA, rather than individual basalts or peridotites themselves.
Measurements of $^{187}Os/^{188}Os$ in the grains span a wide range from extremely unradiogenic values to those signifying a high component of radiogenic ^{187}Os. The data occupy a bell-shaped (Gaussian) frequency distribution. While that probably reflects equilibration of old, unradiogenic material with radiogenic Os in melts derived from the mantle ultramafic rocks, and the destruction of any age information, it does point to mantle dotted with patches with different origins.

Tectonics

Slab pull versus subduction suction
The dominant forces that drive plate tectonics are those created by subduction. Slab pull is transmitted throughout a plate system when subducted oceanic lithosphere remains mechanically attached to its parent plate. However, detached slabs that descend into the mantle, excite viscous flow that might exert traction on the base of the lithosphere, thereby sucking plates along. Attached slabs also create suction. The relative influence of the two forces is an important input to global dynamics that prevail today. Slab pull operates to draw subducting plates towards destructive margins, whereas subduction suction should act on both the under- and over-riding plates to drive them towards subduction zones.
Using plate motions, estimated from Mesozoic to Recent magnetic stripes, and subduction history at nine destructive margins, Clinton Conrad and Caroline Lithgow-Bertelloni of the University of Michigan compared them with motions predicted from slab-pull and subduction suction (Conrad, C.P. & Lithgow-Bertelloni, C. 2002. How mantle slabs drive plate tectonics. *Science*, v. **298**, p. 207-209). Much simplified, their findings suggest that slab-pull forces account for around half of the driving force of plate tectonics, with a nearly equal contribution from subduction suction induced by subducting slabs. However, both attached and detached portions of lithosphere that descend beneath the 660 km deep mantle transition zone probably do not transmit stresses into higher-level slabs, and only their suction effect adds to plate motions.

Continental insulation at the Precambrian-Cambrian boundary
Shortly before the Neoproterozoic ended with the Cambrian Explosion of animals with hard parts, much continental lithosphere clumped together in a Vendian supercontinent, called Pannotia by some geologists. If the idea described in *Empirical geochemistry points to continents' role in mantle dynamics* (earlier) is realistic, that surely would have created "pressure-cooker" conditions in the mantle beneath it. Possibly piled with as much as 2 km of ice sheet during a "Snowball Earth" episode, this assembly of cratons would also have been somewhat depressed. From about 650 to 500 Ma Pannotia experienced generally outward extensional forces. The Pan-African and Braziliano orogens, formed slightly earlier, underwent widespread magmatism unrelated to any crustal thickening and deposition in many sedimentary basins. Spanish and Moroccan geologists have tried to explain this evolution in terms of the blanketing effects of Pannotia (Doblas, M. *et al*. 202. Mantle insulation beneath the West African craton during the Precambrian-Cambrian transition. *Geology*, v. **30**, p. 839-842). Pan African and Braziliano orogens surround the West African craton, and the authors opinion is that their anorogenic magmatism stemmed from a build-up of heat resulting from insulation by thick continental lithosphere. More controversially, they see this as an escape mechanism from Snowball Earth conditions, through the associated magmatic release of CO_2. In turn, they see this addition leading to increased flux of calcium to the oceans, toxic stress from this spurring an evolutionary response by soft-bodied metazoans in the form of carbonate secretion by their cells; hence continental clustering leads to the Cambrian Explosion!

The lost world of the Galápagos hotspot track
The Galápagos islands straddle both a hotspot and the active spreading centre that generates the Cocos and Nazca Plates in the Easter Pacific. Consequently, both those plates have topography owed to former activity at the Galápagos hotspot, the Cocos Ridge and associated seamount chain, and a set of ocean-floor uplands that resulted from complex evolution of the Nazca Plate. Both plate vectors

drive this topography towards subduction zones beneath Central America and the Andes. Unsurprisingly, this gives rise to a kind of inverse tectonic constipation, as both subduction zones attempt to consume awkward knobbles on top of the downgoing slabs. Detailed seismic profiles have revealed the current state of affairs, which has been going on for around 71 Ma. Some of the seamount and aseismic ridge materials parted company with the downgoing slab, to be obducted onto the Central American arc. These ophiolites represent the lost history of the Gala Galápagos hotspot, from about 71 to 16 Ma ago, and information from them has allowed a team of German and Cost Rican geoscientists to piece together an enthralling tale that feeds into the evolution of the Central American land bridge (Hoernle, K. *et al*. 2002. Missing history (16-71 Ma) of the Galápagos hotspot: Implications for the tectonic and biological evolution of the Americas. *Geology*, v. **30**, p. 795-798). Central America not only formed a land bridge that allowed the Late Tertiary mingling of faunas from South and North America, but by disconnecting the Atlantic and Pacific Oceans it transformed low-latitude ocean currents, and probably set in motion the climatic cooling towards the Great Ice Age. However, the story now seems considerably more complex.

Galápagos-related igneous rocks bear strong geochemical similarities to those of the 90 Ma Caribbean Large Igneous Province (CLIP), now to the east of Central America. This supports a long-held view that the CLIP formed during the initial evolution of the Galápagos hotspot, and was driven eastwards by spreading from the predecessor of the East Pacific Rise. Being a huge, low-density patch of ocean floor, it failed to subduct, but passed between North and South America when it encountered the volcanic arc of the Greater Antilles, channelled by two large fracture zones. Subduction flipped beneath the Antilles, to consume Atlantic lithosphere westwards, while Pacific subduction restarted in the “lee” of the CLIP and began to generate the Central American arc. This Late Cretaceous to Palaeogene transformation formed the first land bridge connecting both continents, allowing terrestrial fauna and flora to mingle, including late dinosaurs. Emplacement of the CLIP in its present position removed the land bridge of the Antilles Arc, again separating both continents for most of the Tertiary. Assorted sloths, armadillos, elephants, ferocious cats and the like, eagerly awaited the next chance to rampage, evolving awhile. By the Early Pliocene, the growing Central American arc slid in to fill the gap, and biotic pandemonium ensued. This signal event of recent geological times was itself encouraged by the continued magmatic productivity of the Galápagos hotspot, and the failure of its low-density products to return to the mantle.

Cunning means of estimating uplift

Rises and falls of the continental surface have frustrated geologists trying to assess their timing and rates, largely because the available methods are tiresome. Fission-track, Ar-Ar and U-Th/He measurements, used to work out when rocks became sufficiently cool either to retain scarring tracks of high-energy particles or to allow radiogenic isotopes to accumulate in specific minerals, are notorious stumbling blocks to research. So it is extremely encouraging to learn that there is possibly another way. Bubbles (vesicles) that form in lavas, when dissolved gases escape from erupting magmas are sensitive to atmospheric pressure; the lower the pressure, the larger they become. Bubbles at the top of a flow form under atmospheric pressure, whereas those at the base emerge under the extra pressure of the overlying load of lava in the flow. Comparing top and base vesicle sizes, and applying the known thickness of a flow seems to be a means of calculating ancient atmospheric pressure. This lateral thinking has been applied by Dork Sahegian, Alex Proussevitch and William Carlson of the Universities of New Hampshire and Texas (Austin) to the uplift of the Colorado Plateau (Sahagian, D. *et al*. 2002. Timing of Colorado Plateau uplift: initial constraints from vesicular basalt-derived paleoelevations. *Geology*, v. **30**, p. 807-810). They first calibrated the vesicle palaeobarometer using nine samples of recent Hawaiian lavas from widely different elevations, finding that their method matched actual elevation with a statistical precision of ±410 m.

Plotting the difference between modern and ancient elevations in the Colorado Plateau against the lavas’ Ar-Ar age reveals a history of uplift that tallies well with known geomorphological evolution. The authors have been able to show that uplift began at least 20 Ma ago, at a rate of 40 mm per year, which accelerated to 220 mm per year over the last 5 Ma. This has resulted in a total uplift of almost 2 km in the two phases.

• Eventos do INPE

Inpe abre inscrições para Curso Internacional de Sensoriamento Remoto

O Inpe (Instituto Nacional de Pesquisas Espaciais) está abrindo inscrições para o Curso Internacional

de Sensoriamento Remoto que será realizado de março a dezembro do próximo ano na sede do instituto, em São José dos Campos, São Paulo. A data máxima para se candidatar é 15 de dezembro deste ano.

As instruções para se matricular no curso, os pré-requisitos exigidos e o conteúdo ministrado estão disponíveis no site oficial da internet, que pode ser acessado pelo endereço www.inpe.br/unidades/cep/atividadescep/cursointernacional/homepage.htm

Os alunos receberão mensalmente uma bolsa de estudos, dentro do convênio CAPES/CNPq/UNU, no valor de R$ 750,00, para cobrir as despesas de alimentação, moradia e outras despesas eventuais.

Para serem admitidos no Curso Internacional em Sensoriamento Remoto e Sistemas de Informações Geográficas, os candidatos devem ter título universitário (licenciatura ou bacharelado) de uma universidade reconhecida, na área de ciências naturais ou na área de computação, e ter vínculo empregatício com uma instituição que trabalhe ou pretenda trabalhar com sensoriamento remoto.

O curso é realizado no INPE em período integral, sendo que o aluno deve permanecer nas dependências do Instituto no período de 08:00 às 12:00 horas e das 13:30 às 17:30 horas. Neste horário não é permitido ao aluno ausentar-se do INPE, sem a prévia autorização da Coordenadora do Curso.

O Curso Internacional de Sensoriamento Remoto surgiu de uma orientação de agências da ONU em 1985. Com sete meses de duração, o curso de especialização é dedicado a profissionais da área de recursos naturais que estejam interessados em trabalhar com sensoriamento remoto.

O objetivo principal do Curso Internacional em Sensoriamento Remoto e Sistemas de Informação Geográfica é criar uma massa crítica em sensoriamento remoto em países da América Latina.

XI Simpósio Brasileiro de Sensoriamento Remoto (XI SBSR) - http://www.ltid.inpe.br/sbsr2003

Será realizado de 05 a 10 de abril de 2003, sendo que os dias 05 e 06 estão reservados para cursos e tutoriais.

Todos os eventos do Simpósio serão realizados no Centro de Convenções do Mercure Hotel, na cidade de Belo Horizonte - MG.

DATAS IMPORTANTES

Data limite de submissão dos trabalhos: 14 de novembro de 2002.
A submissão dos trabalhos será feita numa única fase, que consistirá no envio do texto completo. Não haverá a fase de submissão de "resumo".
As instruções para preparar e submeter trabalhos podem ser obtidas clicando no botão Submissão na barra acima.
Notificação de aceitação aos autores: 16 de dezembro de 2002.

INFORMAÇÕES E CORRESPONDÊNCIAS
Instituto Nacional de Pesquisas Espaciais - INPE
Secretaria do XI SBSR
Caixa Postal 515 - 12245-970 - São José dos Campos, SP
Tel: (12) 3945-6932 / 6450 / 6441 - Fax: (12) 3945-6460 / 6449
Email: sbsr@ltid.inpe.br
Site: <http://www.ltid.inpe.br/sbsr2003>

Curso de Especialização em Geotecnologias Aplicadas
Curso de Especialização em Geotecnologias Aplicadas, da Coordenadoria de Observação da Terra do Instituto Nacional de Pesquisas Espaciais (OBT/INPE)

Objetivo: capacitar profissionais de diferentes áreas do conhecimento na aplicação de técnicas de sensoriamento remoto e de geoprocessamento em problemas/estudos ambientais e urbanos.

Formato do Curso
O curso é composto por 10 módulos com carga horária de 36 horas, distribuídas em aulas expositivas e práticas, oferecidas às noites de sexta-feira, das 18:00 às 22:00h, e aos sábados no período integral (8 horas), totalizando 360horas.

Período de Oferecimento
O curso será oferecido de março a dezembro de 2003, nas instalações do Instituto Nacional de Pesquisas Espaciais de São José dos Campos/SP.

Critérios para Admissão
Os interessados deverão preencher o formulário de inscrição, ter curso superior e a admissão será feita mediante a análise do "Curriculum Vitae". É possível a participação em módulos específicos, respeitando o critério de pré-requisitos apresentado na descrição dos programas de cada módulo, sendo que somente terá direito ao certificado do Curso (completo) aquele participante que cumprir integralmente e satisfatoriamente todos os 10 módulos.

Custo
No ato da matrícula para os participantes admitidos será cobrado o valor de R$ 600,00 para cada um dos módulo por participante.

Público Alvo
O curso será direcionado para profissionais do setor público ou privado, com formação superior em diferentes áreas do conhecimento, que trabalham ou pretendem trabalhar aplicando técnicas de sensoriamento remoto e de geoprocessamento em estudos ambientais e/ou urbanos.

Maiores informações entrar em contato com:
Dr.Flávio Jorge Ponzoni - flavio@ltid.inpe.br
OBT/DSR - SERE II - Sala 30
Av. dos Astronautas 1758
São José dos Campos/SP/Brasil - 12227-010
Tel. +55 12 3945 6454
Fax. +55 12 3945 6488

Informe 13 de novembro

Noticias Earth Pages

Web resources

Florida Department of Environmental Protection - www.dep.state.fl.us/geology/
The department's site combines high-quality educational media and scientific data about those environmental aspects of Florida that are unique. You can access downloadable AutoCAD *.dxf files showing geological maps from the county level to smaller scales plus other GIS files, lithological logs from boreholes and detailed information on the State's oil and gas industry. Currently featured on its home page is a related web site about Florida's unique hydrogeology and its famous springs. A well-designed, easy to use site.

Anthropology and geoarchaeology

A considered view

Find after find of hominid remains (*Bonanza time for Bonzo* - August 2002) undoubtedly forces physical anthropologists to reflect on what their still tiny collections of fossils might signify about the descent of humans. There are two ways of looking at that; as a "tidy" tree and one that is essentially "untidy". The first seeks a means of connecting the earliest remains to later ones by the simplest possible connections – a touch of Occam's Razor. However, more diversity and ever increasing ranges of ages and localities for the remains inevitably challenges this kind of palaeontological "good housekeeping". Bernard Wood of George Washington University has long regarded evolution as untidy, and the finds of *Sahelanthropus tchadensis* and *Orrorin tugenensis*, around 6 to 7 Ma old, reinforce his trenchant views (Wood, B. 2002. Who are we? *New Scientist*, 26 October 2002, p. 44-47).

Because the genetic similarity between humans and their nearest relatives, chimpanzees, seems to suggest that the two clades diverged between 5 and 10 Ma ago, *Sahelanthropus* and *Orrorin* may be pretty close in age to that division. But what were they? Wood's view is interesting, and a worry to the advocates of a parsimonious set of connections. Connectivity in proposed clades rests, for obvious reasons, on purely physical characteristics. There are many examples from the fossil record of animals whose outwardly similar characters, for example those shared by sharks and dolphins, do not signify inheritance from common ancestry. This is homoplasy, and raises the awkward possibility that special characters, regarded as essentially human, need not have arisen only the once and been carried by linear descendants. The often quoted "golden characters" of big brains and upright gait, that confer an opportunity to develop consciousness through freeing of the hands, may well have arisen more than once. The truly odd thing about *Sahelanthropus* is just how "modern" its face looks. Beetling brows, thick jaw and un-apelike canine teeth would put it on a sort of par with fossils of species of *Homo* that arose 4 to 5 million years later. Yet none of the fossils in between have this combination.; in the "tidy" scheme of things they are more "primitive", and "therefore" cannot be our ancestors. Quite a muddle! Faces, the most sought after bits of bone, isolated in time and place could well have led many up the proverbial garden path. Why, suggests Wood, shouldn't early hominids have been dead ends morphologically, with "primitive" characters making repeated comebacks? Why, too, shouldn't they have been ancestral chimps, or even neither chimp nor human? The dearth of late-Miocene and Pliocene non-hominid fossils of primates leaves all this as possible. He reckons the search for "missing links" has always been a non-starter. Whatever, by expanding enormously the area of potentially fruitful ground from the narrow confines of the East African Rift, the *Sahelanthropus* find in Chad may yet lead to a big increase in the number of hominid and other primate fossils over which physical anthropologists can ponder.

Climate change and palaeoclimatology

Africa's first ice core record

Melting of low-latitude glaciers in Africa is so rapid that, unless they are cored soon, their content of long-term climate data may soon be gone forever. So the first detailed isotopic record from Africa's highest glacier on Kilimanjaro is cause for some relief. Intrepid glaciologist Lonnie Thompson welded a large team together for this important task (Thompson, L. 2002. Kilimanjaro ice core records: evidence of Holocene climate change in tropical Africa. *Science*, v. **298**, p. 589-593). The annually layered ice goes back only about 12 ka, but nonetheless gives a precious account of climate change at the heart of the continent, far more detailed than sparse lake-bed cores from various places.

The core confirms a broad pattern of warm, wet conditions from 11 to 4 ka, before the long-term cooling and drying of historical times. These reflect likely weakening of monsoonal conditions in the late Holocene. However, assigning precise ages to depth in the cores is not as easy as in those from high-latitude ice sheets, because of a lack of good layering (presumably) and dateable carbon. At about 5200 years ago, the record shows an abrupt fall in $d^{18}O$, a sign of drying and cooling that took place over perhaps a matter of decades. This correlates with disruption of early civilisations in India, Egypt and the Middle East, and probably stemmed from cooling in the North Atlantic. However, an equally rapid deterioration occurred around 6300 years bp, although not so extreme, to presage a millennium of arid conditions at the heart of Africa. Important as these data are, the team's estimates of current retreat rates of the Kilimanjaro glaciers are alarming. Quite probably, the white cap of Africa's highest mountain will have disappeared within the next 20 years.

Lonnie Thompson is obviously both keyed- and clued up about extracting climatic data from ice at high elevations. So much so, that *Science* has printed a lengthy account of his exploits, mainly on low-

latitude glaciers (Krajick, K. 2002. Ice man: Lonnie Thompson scales the peaks for science. *Science*, v. **298**, p. 518-522

Geobiology, palaeontology, and evolution

Land plants at the P-Tr boundary

The Permian to Triassic transition involved a transformation from globally cool conditions to a hothouse, as well as the largest mass extinction in the fossil record. It also spanned a time when most continental lithosphere was clumped in the Pangaea supercontinent. In the case of plants, it is not easy to sort the effects of climatic shifts from those due to catastrophic events, either the effects of the huge Siberian flood-basalt event (see *Earth Pages* August 2002, *Flood basalts of Siberian Traps doubled at a stroke*) or a yet to be proven impact. Allister Rees of the University of Chicago has painstakingly organised global Permian and Triassic floral data to see if the changes were slow (climatically influenced) or sudden (possible evidence for a catastrophic collapse),a nd if they coincide from region to region. He found that in some regions big changes happened quickly around the P-Tr boundary, but in others the shifts were protracted and unrelated to faunal extinctions (Rees, P. McA. 2002. Land-plant diversity and the end-Permian mass extinction. *Geology*, v. **30**, p. 827-830). This clearly implies caution in the interpretation of detailed local records as signs of massive events, and also points out the need to place such records in the contexts of global climate belts and biases that result from varied degrees of biotic preservation.

Dinosaurs did urinate

News is coming in (*New Scientist*, 19 October 2002, p. 26) of a startling find along a dinosaur trackway in Colorado. At the October meeting of the Society of Vertebrate Palaeontology, Katherine McCarville of the South Dakota School of Mines and Technology described a bath-sized pit preserved among sauropod footprints. Seemingly, all the evidence points to it having been excavated by a gargantuan stream of liquid pouring from above. Ranking as a candidate for the IgNobel Awards of 2003, this evidence for dinosaurian bladder relief may shake the theory that birds are descended from dinosaur ancestors; birds do not urinate.

Continents colonised a billion years ago

The Torridonian of NW Scotland is a thick sequence of mainly terrestrial sediments that accumulated on the Laurentian craton, between 1200 and 1000 Ma ago. Much of the sequence evidences braided-stream deposition, with brief lacustrine episodes. Any geologist who examines these mainly siliciclastic rocks will find abundant evidence for subaerial conditions in the form of desiccation cracks, often affecting directional current ripples. However, it takes a keen eye and some knowledge of biofilms to spot any signs of microbial activity. In sandstones they manifest themselves by having increased the normally very low cohesiveness of wet sand by their binding action (Prave, A.R. 2002. Life on land in the Proterozoic: evidence from the Torridonian rocks of northwest Scotland. *Geology*, v. **30**, p. 811-814). Prave analysed the shapes of desiccation polygons to show that the Torridonian sands were unusually cohesive, and recognised other features likely to have been formed by microbial crusts. These finds add to the growing evidence for substantial terrestrial biomass, long before the “official” colonisation by land plants in the Silurian and Devonian. Whether or not such an expansion of the biosphere added significantly to carbon burial and drawdown of atmospheric CO_2, as it did in post-Silurian times, remains to be determined from average carbon contents of quite rare Precambrian terrestrial sediments,

Geochemistry, mineralogy, petrology and volcanology

Empirical geochemistry points to continents’ role in mantle dynamics

Major-element chemistry of basalts provides proxies for key parameters involved in magmatism. Sodium content, normalized to an MgO content of 8%, relates to the degree of mantle melting, and similarly normalized iron content helps assess the depth of melt production. Such proxies help establish potential mantle temperatures - the temperature of magma that would erupt after rising adiabatically from different mantle depths. Low $Na_{8.0}$ suggests high potential temperature in a magma’s source.

Vast repositories of basalt chemistry relate to every conceivable setting of magmatism, so $Na_{8.0}$ and $Fe_{8.0}$ numbers are useful in testing various hypotheses. One of these is that slabs of continental lithosphere affect mantle convection, by forming insulating “lids” that control surface heat flow. Eric Humler and Jean Besse, of the Université Denis Diderot in Paris, focus on the relationship between

mantle potential temperature beneath ocean-ridge systems and their distance to passive continental margins (Humler, E. & Besse, J. 2002. A correlation between mid-ocean ridge basalt chemistry and distance to continents. *Nature*, v. **419**, p, 607-609). Leaving out the complicating factors of continental margins that involve subduction and ridges affected by hot spots, they found that recent ridge basalts show higher potential temperatures when the ridge is close to continental lithosphere than for more distant ridges. This suggests that the mantle cools away from continents by between 0.05 to 0.1°C per kilometre. This matches the well-known increase in depth to ridges as they become further from continents. Rather than being inert passengers on modern plates, continents do play a role in the mantle's thermal structure.

The scope for synopsis of geochemical data is boosted by wider availability of existing data. How tedious it used to be, trawling paper journals for tables of analyses with which to compare ones own. It is still quite a task, but there is light on the horizon, because geochemists at the University of Mainz in Germany have made their compilations for ocean-island volcanic rocks and those from large igneous provinces (flood basalts) available on the web as the initial input to the GEOROC (**Geo**chemistry of **R**ocks of the **O**ceans and **C**ontinents) database (http://georoc.mpch-mainz.gwdg.de). A similar database for ocean-floor basalts is PETDB at Columbia University in the USA (http://petdb.ldeo.columbia.edu/petdb/). Between them, the two web sites amass over 200 thousand analyses of major- and trace-elements, and isotopes, enough for even the most ardent user of MS Excel!

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Slab pull versus subduction suction

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Using plate motions, estimated from Mesozoic to Recent magnetic stripes, and subduction history at nine destructive margins, Clinton Conrad and Caroline Lithgow-Bertelloni of the University of Michigan compared them with motions predicted from slab-pull and subduction suction (Conrad, C.P. & Lithgow-Bertelloni, C. 2002. How mantle slabs drive plate tectonics. *Science*, v. **298**, p. 207-209). Much simplified, their findings suggest that slab-pull forces account for around half of the driving force of plate tectonics, with a nearly equal contribution from subduction suction induced by subducting slabs. However, both attached and detached portions of lithosphere that descend beneath the 660 km deep mantle transition zone probably do not transmit stresses into higher-level slabs, and only their suction effect adds to plate motions.

Continental insulation at the Precambrian-Cambrian boundary

Shortly before the Neoproterozoic ended with the Cambrian Explosion of animals with hard parts, much continental lithosphere clumped together in a Vendian supercontinent, called Pannotia by some geologists. If the idea described in *Empirical geochemistry points to continents' role in mantle dynamics* (earlier) is realistic, that surely would have created "pressure-cooker" conditions in the mantle beneath it. Possibly piled with as much as 2 km of ice sheet during a "Snowball Earth" episode, this assembly of cratons would also have been somewhat depressed. From about 650 to 500 Ma Pannotia experienced generally outward extensional forces. The Pan-African and Braziliano orogens, formed slightly earlier, underwent widespread magmatism unrelated to any crustal thickening and deposition in many sedimentary basins. Spanish and Moroccan geologists have tried to explain this evolution in terms of the blanketing effects of Pannotia (Doblas, M. *et al*. 202. Mantle insulation beneath the West African craton during the Precambrian-Cambrian transition. *Geology*, v. **30**, p. 839-842). Pan African and Braziliano orogens surround the West African craton, and the authors opinion is that their anorogenic magmatism stemmed from a build-up of heat resulting from insulation by thick continental lithosphere. More controversially, they see this as an escape mechanism from Snowball Earth conditions, through the associated magmatic release of CO_2. In turn, they see this addition leading to increased flux of calcium to the oceans, toxic stress from this spurring an evolutionary response by soft-bodied metazoans in the form of carbonate secretion by their cells; hence continental clustering leads to the Cambrian Explosion!

The lost world of the Galápagos hotspot track

The Galápagos islands straddle both a hotspot and the active spreading centre that generates the Cocos and Nazca Plates in the Easter Pacific. Consequently, both those plates have topography owed to former activity at the Galápagos hotspot, the Cocos Ridge and associated seamount chain, and a set of ocean-floor uplands that resulted from complex evolution of the Nazca Plate. Both plate vectors drive this topography towards subduction zones beneath Central America and the Andes. Unsurprisingly, this gives rise to a kind of inverse tectonic constipation, as both subduction zones attempt to consume awkward knobbles on top of the downgoing slabs. Detailed seismic profiles have revealed the current state of affairs, which has been going on for around 71 Ma. Some of the seamount and aseismic ridge materials parted company with the downgoing slab, to be obducted onto the Central American arc. These ophiolites represent the lost history of the Gala Galápagos hotspot, from about 71 to 16 Ma ago, and information from them has allowed a team of German and Cost Rican geoscientists to piece together an enthralling tale that feeds into the evolution of the Central American land bridge (Hoernle, K. *et al*. 2002. Missing history (16-71 Ma) of the Galápagos hotspot: Implications for the tectonic and biological evolution of the Americas. *Geology*, v. **30**, p. 795-798). Central America not only formed a land bridge that allowed the Late Tertiary mingling of faunas from South and North America, but by disconnecting the Atlantic and Pacific Oceans it transformed low-latitude ocean currents, and probably set in motion the climatic cooling towards the Great Ice Age. However, the story now seems considerably more complex.

Galápagos-related igneous rocks bear strong geochemical similarities to those of the 90 Ma Caribbean Large Igneous Province (CLIP), now to the east of Central America. This supports a long-held view that the CLIP formed during the initial evolution of the Galápagos hotspot, and was driven eastwards by spreading from the predecessor of the East Pacific Rise. Being a huge, low-density patch of ocean floor, it failed to subduct, but passed between North and South America when it encountered the volcanic arc of the Greater Antilles, channelled by two large fracture zones. Subduction flipped beneath the Antilles, to consume Atlantic lithosphere westwards, while Pacific subduction restarted in the "lee" of the CLIP and began to generate the Central American arc. This Late Cretaceous to Palaeogene transformation formed the first land bridge connecting both continents, allowing terrestrial fauna and flora to mingle, including late dinosaurs. Emplacement of the CLIP in its present position removed the land bridge of the Antilles Arc, again separating both continents for most of the Tertiary. Assorted sloths, armadillos, elephants, ferocious cats and the like, eagerly awaited the next chance to rampage, evolving awhile. By the Early Pliocene, the growing Central American arc slid in to fill the gap, and biotic pandemonium ensued. This signal event of recent geological times was itself encouraged by the continued magmatic productivity of the Galápagos hotspot, and the failure of its low-density products to return to the mantle.

Cunning means of estimating uplift

Rises and falls of the continental surface have frustrated geologists trying to assess their timing and rates, largely because the available methods are tiresome. Fission-track, Ar-Ar and U-Th/He measurements, used to work out when rocks became sufficiently cool either to retain scarring tracks of

high-energy particles or to allow radiogenic isotopes to accumulate in specific minerals, are notorious stumbling blocks to research. So it is extremely encouraging to learn that there is possibly another way. Bubbles (vesicles) that form in lavas, when dissolved gases escape from erupting magmas are sensitive to atmospheric pressure; the lower the pressure, the larger they become. Bubbles at the top of a flow form under atmospheric pressure, whereas those at the base emerge under the extra pressure of the overlying load of lava in the flow. Comparing top and base vesicle sizes, and applying the known thickness of a flow seems to be a means of calculating ancient atmospheric pressure. This lateral thinking has been applied by Dork Sahegian, Alex Proussevitch and William Carlson of the Universities of New Hampshire and Texas (Austin) to the uplift of the Colorado Plateau (Sahagian, D. *et al*. 2002. Timing of Colorado Plateau uplift: initial constraints from vesicular basalt-derived paleoelevations. *Geology*, v. **30**, p. 807-810). They first calibrated the vesicle palaeobarometer using nine samples of recent Hawaiian lavas from widely different elevations, finding that their method matched actual elevation with a statistical precision of ±410 m.
Plotting the difference between modern and ancient elevations in the Colorado Plateau against the lavas' Ar-Ar age reveals a history of uplift that tallies well with known geomorphological evolution. The authors have been able to show that uplift began at least 20 Ma ago, at a rate of 40 mm per year, which accelerated to 220 mm per year over the last 5 Ma. This has resulted in a total uplift of almost 2 km in the two phases.

• Eventos de Dezembro

December 4 - 5, 2002
GS/MSA Short Course: Applications of Synchrotron Radiation to Low-Temperature Geochemistry and Environmental Science
DoubleTree Hotel, Monterey, California, USA. Sponsored by the U. S. Department of Energy and Argonne National Laboratory. Web site: http://cars.uchicago.edu/shortcourse2002/

December 6 - 10, 2002
AGU Fall Metting
San Francisco, California, USA. Web site: http://www.agu.org

December 9 - 12, 2002
International Symposium - Clays in Natural and Engineered Barriers for Radioactive Waste Confinement
Reims, France. Web site: http://www.andra.fr/meeting2002

December 11 - 14, 2002
3rd European Meeting on Environmental Chemistry
Geneva, Switzerland. Web site: http://www.unige.ch/emec3

December 14 - 19, 2002
Geochemistry of Crustal Fluids
Seefeld in Tirol, Austria. Web site: http://www.esf.org/euresco/02/lc02106

Informe 14 de Novembro

• Noticias DNPM

A Comissão de Minas e Energia da Câmara dos Deputados rejeitou, por unanimidade, o Projeto de Lei nº 7.057, de 2002, do Deputado SÉRGIO CARVALHO, em sessão dia 13/11/2002. O Projeto objetivava inserir no texto do Código de Mineração a obrigação de os pretendentes à autorização de pesquisa notificarem o proprietário do solo sobre a intenção de pesquisar em seus terrenos. O Projeto vai para arquivamento.

Na mesma sessão também foi rejeitado o Substitutivo do Projeto de Lei nº 1.859/99 (Dispõe sobre a proteção ao patrimônio fossilífero), prevalece o Projeto original do Senador Lúcio Alcântara.
Clique no seguinte endereço para conhecer os Projetos
http://www.dnpm.gov.br/cnall.html
Atenciosamente,
Geól. Paulo Ribeiro de Santana
Assessor do Diretor-Geral do DNPM

- ## Noticias Mundogeo

Evento GEOBrasil reúne 30 empresas para divulgação de plano estratégico No último dia 7 de novembro foi realizado em São Paulo, pela Alcantara Machado Feiras de Negócios, promotora e organizadora do GEOBrasil 2003, um seminário para divulgação ao mercado do plano estratégico de realização do evento. Estiveram presentes 30 instituições: Aerocarta, Aerofoto Cruzeiro, ANEA - Associação Nacional de Empresas de Aerolevantamentos, AES Eletropaulo, APEAESP - Associação das Empresas de Agrimensura do Estado de São Paulo, Base, Cetil Sistemas de Informática, Char Pointer, Comdata - Companhia de Processamento de Dados de Goiânia, CTGEO, Digibase, Digimapas, Embrapa Monitoramento por Satélite, Emplasa - Empresa Paulista de Planejamento Metropolitano, Gempi, IBIS - Intelligent Business Solutions, Imagem, Revista infoGeo, Ituran, Mapograf, Orbysystem, Pentax, Prefeitura de São Paulo, Promom, Comissão de Entendimento das Concessionárias de São Paulo, Santiago & Cintra, Schlumberger, Sisgraph, TS Agrimensura e Urban Systems Brasil.
Na oportunidade, a equipe da Alcantara Machado detalhou as principais ações que já estão sendo desenvolvidas para que o evento atinja pleno sucesso. Maria Antônia Calheiros, do Departamento de Marketing, descreveu as ações de divulgação que envolvem a publicação de anúncios em revistas do setor e de interesse geral, visando atrair não só o público tradicional mas principalmente usuários novos e potenciais. Também falou sobre as viagens pelo Mercosul e sobre como a GITA Internacional fará a divulgação do evento mundialmente.
Antônio Alves, da S2 Comunicação, que é a empresa de assessoria de imprensa do GEOBrasil, analisou a evolução da visibilidade do evento desde 2000, ano de sua primeira edição. A S2 é especializada em assessoria de imprensa para empresas de tecnologia, como a Microsoft e Sun, e tem cadastrados em seus bancos de dados mais de 900 jornalistas brasileiros especializados no tema. Para ele, os jornalistas já estão mais familiarizados com as geotecnologias, o que torna mais fácil a divulgação. Entretanto, enfatizou a importância das empresas do setor divulgarem com mais persistência suas novidades e lançamentos.
Miguel Silvestre detalhou como será feita a divulgação via internet, utilizando o banco de dados da Alcantara Machado e dos seus apoiadores. Ele destacou que vários participantes de outros eventos que a empresa organiza nas áreas de segurança (INTERDEFESA), transportes, petróleo, saneamento e energia (INFRA 2002) e administração municipal (URBIS) podem também se interessar pelo GEOBrasil 2003.
Emerson Granemann, consultor técnico e coordenador do congresso, contou como está estruturada a programação de atividades do evento. Segundo ele, a idéia central que está sendo transmitida nos convites aos palestrantes brasileiros e estrangeiros é que a geoinformação é um meio de fornecer soluções de forma integrada com outras tecnologias para que o negócios sejam mais rentáveis.
Por fim, José Danghesi, diretor do evento, destacou que toda a estrutura da Alcantara Machado, que é líder do setor na América Latina, está mobilizada para que o GEOBrasil 2003 alcance seu maior objetivo: atrair um grande público selecionado. Segundo ele, não está se buscando somente quantidade, mas principalmente qualidade de expositores, visitantes da feira e participantes do congresso. "Nosso objetivo maior é que os nossos expositores façam grandes negócios e que os profissionais, nos três dias do evento, consigam revisar seus conceitos, conhecer novos lançamentos e aprender com a troca de experiências", concluiu Danghesi. Mais informações sobre o GEOBrasil 2003 - Congresso e Feira Internacional, que será realizado em São Paulo no Centro de Convenções Imigrantes entre os dias 21 e 23 de maio, através do telefone (11) 6096-5311, e-mail info@geobr.com.br ou no site www.geobr.com.br.

- **Noticias Earth Pages de outubro**

Anthropology and geoarcheology

Kennewick Man freed for research

Some years back, a near complete skeleton emerged from a terrace on the Columbia River, in the north-western USA, near to Kennewick. Preliminary examination suggested that the skull had distinct European features, and some thought that these were the remains of some early pioneer. Kennewick Man attracted considerable attention when the terrace was dated at 9300 years, because the individual would then have been among the earliest known colonizers of the Americas. Five local tribes of Native Americans laid claim to the bones under the Native American Graves Protection and Repatriation Act, considering him to be an ancestor. The bones were taken into custody, thereby halting further research. Several academics saw this in a malevolent light, since if it was proven that the skeleton was indeed of European origin instead of Asian that would undermine a major plank in Native Americans' claims for primary occupation of land; the central issue in a vast raft of legislation over ownership of mineral reserves. Pressure for release of the bones for research has built over the last two years, finally to overcome concerted opposition that wished to re-bury the bones with due resepct. The magistrate who judged the case found the original decision for sequestration "arbitrary and capricious", and so investigations can resume. Quite possibly DNA will be preserved, and that could set the cat among the pigeons in Native American circles. However, some experts who had a quick look at the skull suggested that it might well be of an Ainu, one of the earliest inhabitants of the Japanese islands, who bear passing resemblance to Caucasian people..

Climate change and Palaeoclimatology

Reviews of climate and the hydrological cycle

Earth Pages News has commented several times on developments in the connection between ocean currents and climate, over the last 3 years. The subject has many aspects, and these have been bundled and brought up to date in one of a series of review articles on the relationship between climate and the hydrological cycle in *Nature's* occasional Insight series (Rahmstorf, S. 2002. Ocean circulation and climate during the last 120,000 years. *Nature*, v. **419**, p. 207-214). Stefan Rahmsdorf covers the evidence to date that implicates changes in deep circulation in rapid and dramatic climate shifts, such as changed air temperatures over the Greenland ice cap and iceberg armadas in the North Atlantic. Another review outlines the longer-term perspective of links between atmosphere, oceans, ice sheets, solid-Earth processes and astronomical forcing in shifts of climate and sea level over the last 3 Ma. Central to this linked system is the transfer of tens of millions of cubic kilometres of water from tropics to poles, and from ice sheets to sea levels (Lambeck, K. *et al*. 2002. Links between climate and sea levels for the past three million years. *Nature*, v. **419**, p. 199-206).

Alaskan source proposed for end-Palaeocene warming

Between 58 and 52 Ma, around the Palaeocene-Eocene boundary, Earth's climate bucked the long-term cooling trend during the Cenozoic, by warming considerably. Since the warming lasted for so long, it seems likely to have been caused by an enhanced atmospheric "greenhouse" gases rather than by either astronomical or oceanic causes. Carbon isotope data around the P-E boundary can be interpreted in terms of massive releases of biogenic methane, perhaps from gas hydrates on the sea floor. However, such releases are likely to have been sudden, and a more continual release of "greenhouse" gases fits the record better; but that begs the questions where and how? Catastrophic methane release has been invoked for the dramatic rise in deep-ocean and high-latitude temperatures within 10 thousand years exactly at the P-E boundary.
Lengthy climatic warming can stem from increased volcanism and sea-floor spreading, but there is scanty evidence for either during this period. Another possibility is production of gases as a result of tectonic activity, either by involvement of carbonate sediments in metamorphism, which releases CO_2, or "stewing" organic matter in thick sedimentary sequences. Candidates for the last are the thick accretionary prisms at Pacific destructive margins, an especially appropriate example being that of the Gulf of Alaska which grew rapidly during this period (Hudson, T.I. & Magoon, I.B. 2002. Tectonic controls on greenhouse gas flux to the Paleogene atmosphere from the Gulf of Alaska accretionary prism. *Geology*, v. **30**, p. 547-550). Oceanic and continental margin sediments scraped off descending

oceanic lithosphere contain buried organic matter. Increased heat flow, perhaps associated with rising magmas, can cause organic debris to break down to hydrocarbons. Over-maturation results in the formation of methane, potentially in vast volumes, that can leak continually to the atmosphere. Methane rapidly oxidizes to CO_2, decreasing the warming effect, but able to linger for considerable periods. Hudson and Magoo calculate such enormous releases, that even disputes over the amount of accreted sediment in the Gulf of Alaska do little to rule out its being a major source for climatically implicated gases. This first suggestion of a role for accretionary prisms in climate change may spur studies of such processes elsewhere, in an attempt to remove much of the load from the BLAG hypothesis that involves metamorphic release of CO_{2-} in a difficult to verify process of lithospheric flatus.
See also: Clift, P. & Bice, K. 2002. Baked Alaska. *Science*, v. **419**, p.129-130

Economic and applied geology

Microgravity and diamonds

Prospecting for diamonds relies either on lucky finds in sediments or locating the odd kimberlite pipes that brought diamonds from depths greater than 100 km in the mantle, where they form. Such has been the centuries-old frenzy for diamonds that most deposits of the trip-over kind have been found. One of the last major diamond fields turned up in Arctic Canada, after prospectors panned their way upstream of glaciers that had dropped the odd diamond in Canadian Shield tills. It is simply too costly to keep repeating this painstaking exercise to satisfy the enduring demand for diamonds of all qualities. New sources probably exist in huge, unexplored regions of Canada, Australia, Africa and north Asia, yet kimberlites, often having broken down to clays and forming little by way of topographic features, are not easy to find. Great efforts have been made to harness conventional remote sensing that uses reflected and emitted electromagnetic radiation, but with little success. Aside from the innocuous nature of kimberlites, most prime ground is either flat, vegetated steppe in areas once affected by glacial conditions, the featureless soil covered tracts of interior Australia or tropical rain forest, where remote sensing simply does not work well enough.
Kimberlite pipes have round traces at the surface and the rock has a different density from common rocks of the upper crust, so one means of locating them is by looking for circular patterns on gravity maps. But they are small relative to the resolution of regional gravity maps, which are generally constructed by careful measurement of gravitational field potential at points on the surface. It is not that gravimeters are incapable of detecting differences due to rocks with anomalous density, but that sample spacing is too coarse (>1km) because of the high cost of field surveys. Maps of the Earth's magnetic field and emissions of gamma-rays by radioactive isotopes are routinely created at suitable resolution by aerial surveys, but kimberlites show only subtle features on them. Airborne gravity surveys have been a grail for explorationists for many physical resources, but insufficient economic interest has blunted the search for a way of overcoming the effects of turbulent accelerations during flight, which spoil measurements of the actual gravity force field. Mining company Broken Hill Proprietary – Billiton's venture into diamonds after their acquisition of the Ekati deposit in northern Canada has encouraged them to seek a cunning approach to the problem. Whereas measuring gravitational potential from the air is a tough nut to crack, the US navy had developed an instrument to measure changes in the gradient of the gravitational field that can overcome varying accelerations, to help nuclear submarines navigate without recourse to giveaway sonar "pings". BHP-Billiton is into this technology in a big way, now that it has been declassified. While gravity gradiometry offers one way of revolutionizing the precision of gravity surveys, other methods are possible, and it is rumoured that geophysicists who try to measure even tinier shifts in the gravitational field to monitor the rise and fall of magma in volcanoes are onto a cheaper and less convoluted method...
Source: Nowack, R. 2002. Pulling power. *New Scientist*, 21 September 2002,p. 42-45.

Environmental geology and geohazards

Prediction of earthquake periodicity founders

In an number of well-studied areas of chronic seismicity it appears from historical records that earthquakes recur with regularity. If that was so, it might be possible at least to prepare to throw many methods of detecting imminent movements at such areas, when they are "due" to go off. The theory behind time-predictability is that earthquakes relieve tectonic stresses along faults, and that if the forces are maintained, stress builds up again, to be released after a roughly fixed time (the same might apply to volcanism where magma production stays constant). A corollary is that high-magnitude

events have longer periodicities than those lower on the Richter scale. One of the best cases thought to support this view is a 25-km stretch of the San Andreas Fault near Parkfield in California. The area has had 5 or 6 earthquakes greater than magnitude 6 since 1857, roughly every 22 years, the last being in 1966. There ought to have been one in 1988, but the poor statistics give an uncertainty either way of 10 years. By now there should have been a magnitude-6 event in the area, but it hasn't happened. Jessica Murray and Paul Segall of Stanford University have analyzed the physics of the last event, and of the period that followed it. (Murray, J. & Segall, P 2002. Testing time-predictable earthquake recurrence by direct measurement of strain accumulation and release. *Nature*, v. **419**, p. 287-291).

Their work involved using precise geodetic measurements obtained over the last four decades to assess the 1966 Parkfield earthquake's size, which combines the movement then along the San Andreas Fault, the area involved in the slip and how "stiff" the crust is locally. Comparing this with geodetic data since then suggests strongly that the strain released in 1966 must have recovered between 1973 and 1987. They have shown that another Parkfield earthquake is long overdue. Their method rigorously allows for the effects of movements along other nearby fault, and inherent unpredictability seems inescapable. While other tests of the time-predictability principle, theoretically the most plausible approach, will continue, most devastating earthquakes continue to occur without forewarning. That reflects the fact that there are only enough seismologists with fancy equipment to cover threatened areas in a few extremely rich countries. Most people who live along active fault zones know whether or not high-magnitude earthquakes occur in their vicinity, yet will not have the privilege of scientists and equipment to provide warnings of this kind for a very long time, for simple economic reasons. Perhaps some effort and funds should be diverted to providing warnings within days of a serious event, using less "robust" methods.

See also: Stein, R.S. 2002. Parkfield's unfulfilled promise. *Nature*, v. **419**, p. 257-258.

British Geological Survey sued over arsenic

The world's largest ever class action has been launched in London against the British Geological Survey, over claims that it failed to spot arsenic contamination during a 1992water survey in Bangladesh. As many as 40 million Bengalis risk arsenic poisoning, following a major groundwater development programme in the 1970s and 80s. Arsenic poisoning at non-fatal doses often shows first as water blisters on hands and shins. Long-term exposure via drinking-water causes cancer of the skin, lungs, urinary bladder, and kidney.

Aid agencies, led by UNICEF sank four million wells deep into alluvium, in the hope that groundwater use would alleviate the chronic problem of heavily polluted surface water in Bangladesh. The arsenic is of natural origin, and stems from leaching of the toxic element from sulphide minerals by deep, reducing waters. The case hinges on BGS' failing to test for arsenic, which is easily detected using low-cost semi-quantitative methods, only 3 years after they had completed a comprehensive evaluation of groundwater quality in Britain that did include arsenic measurements. Accusations of double standards have been flying. However, UNICEF also failed to test for arsenic during the original drilling, because they did not expect to find it in the water. World Health Organization guidelines are very clear that arsenic does pose a threat in groundwater, but most cases in the past have been associated with former mining areas.

Considerable work on measures to clean up well water has been conducted since the Bengal arsenic crisis surfaced. Under oxidizing conditions, arsenic is adsorbed by ferric hydroxide, and a simple remedy is passing the water through iron wool or over ground-up rust or natural ochres.

Geobiology, Palaeontology and Evolution

Conodonts and late Devonian mass extinction

The Late Devonian saw sufficient extinctions (around 55 % of all genera) for it to rank among the Big Five, but most genera that disappeared were shallow-water marine, particularly rugose and tabulate corals. Although the Woodleigh impact structure, just north of Perth in Western Australia, has been suggested as a possible culprit, its age is not reliable. Another possible cause is climatic cooling at low-latitudes, because the extinction was followed by the spread to tropical localities of high-latitude faunas. The key to supporting a climatic influence is temperature data from areas most affected by the extinctions. Unusually, a recent study selected phosphatic conodonts (tooth-like microfossils) for oxygen-isotope investigations - carbonate-shelled creatures are the usual choice. Michael Joachimski and Werner Buggisch, of the University of Erlangen in Germany, found prominent oxygen isotope

excursions close the Frasnian-famenian boundary (Joachimski, M.M & Buggisch, W. 2002. Conodont apatite $d^{18}O$ signatures indicate climatic cooling as a trigger of the Late Devonian mass extinction. *Geology*, v. **30**, p. 711-714). Their data are well controlled stratigraphically, because the rapid evolution of conodonts in the Devonian allows fine biostratigraphic division.
The extinction event is bracketed by two espisodes of sea-surface cooling, estimated to involve a drop of 6°C from an otherwise constant ambient temperature of around 32°C. They coincide with significant positive shifts in $d^{13}C$ of seawater, interpreted by the authors as evidence of the burial of much organic carbon debris. Therein lies a possible cause for the cooling. Carbon burial would have drawn down atmospheric CO_2 levels. The extinction does seem to have been a response to temperature stress, tallying with the colonization of low-latitude seas by high-latitude faunas. However, that still begs the question of why carbon burial underwent two spurts. Was there an increase in sediment supply to the oceans that might augment burial rates, or are the positive carbon-isotope excursions reflections of the extinctions themselves? The second still leaves open the possibility that the undoubted cooling events may have had other causes, such as an increase in stratospheric aerosols, resulting either from major explosive volcanism or perhaps impacts that are yet to be found.

Geochemistry, mineralogy, petrology and volcanology

Sea level fluctuations and large igneous provinces

On a global scale, shifts in sea level recorded by stratigraphers and on seismic profiles stem from one of two main processes: changes in land-ice volume and the volume of the ocean basins. The latter most often results from changing rates of sea-floor spreading, so that when it is rapid a greater volume of the lithosphere near spreading centres retains sufficient buoyancy to displace the oceans onto continental margins. During slow spreading, cooling of the lithosphere and an increase in its density enlarges the deep abyssal plains, so that the oceans withdraw to low levels. The mid-Cretaceous saw vast outpourings of plume-related lavas onto the floor of the West Pacific. So large, that they reduced the volume of the Pacific basin enough to result in continental flooding that was unprecedented in the Phanerozoic Eon.
On a local scale, changes in sea level recorded by the stratigraphic record include those due to local processes, generally ascribed to tectonic events at continental margins, which involved rising continental lithosphere. However, one of the greatest forces for local change in the continental freeboard is changing density of the lithosphere due to thermal effects. Anywhere once affected by major igneous events should record relative falls in sea level during the acme of magmatism, and rises when activity waned. The British Tertiary Igneous Province, a precursor to the eventual rifting of the North Atlantic under the influence of the Iceland plume is a good candidate for charting magma-sea level connections. The central volcanic complexes of the Hebrides, and their enveloping flood basalt piles formed at the start of the Palaeocene (~60 Ma). Around that time, much of the British Isles underwent several kilometres of vertical uplift and exhumation, whose effects remain today. In the surrounding marine basins, this event is recorded by Palaeogene sandstone bodies, presumable derived by erosion of the uplifted crust. Yet local Palaeogene sediments also record episodes of rising sea level. John Maclennan and Brian Lovell of the French Institut de Physique du Globe and Cambridge University have modelled the likely effect on sea levels around the British Isles by crustal underplating of magmas formed during the BTIP magmatism (Maclennan, J. & Lovell, B. 2002. Control of regional sea level by surface uplift and subsidence caused by magmatic underplating of the Earth's crust. Geology, v. 30, p. 675-678).
Up to 8 km of mafic igneous rocks seem to have ponded at the base of the British Isles' crust while the BTIP was active. This estimate stems from the fact that the lavas of the province evidence high-pressure fractional crystallization. Calculations of the percentage of cumulates needed to generate the bulk chemistry of the BTIP lavas suggest that their volume far outweighs that of the volcanic part of the province. Given estimates of the volume of underplated cumulates, modelling boils down to examining the consequences for lithospheric density of initial heating and its subsequent relaxation. The Palaeogene sedimentary record provides good support for the model, with massive uplift from 60-56 Ma (the period when the BTIP was forming). Sudden sea-level rise at the end of this period never reached the level prior to magmatism; in fact it amounts to one half the estimated uplift. That is precisely in line with the underplating model.

Remote sensing

Landsat to be privatised, once more?

Remote sensing, once the domain of researchers seeking hitherto undiscovered potato fields, lost cities and the intricacies of drainage patterns, entered the commercial domain in a big way about a decade ago. As well as giving lugubrious views of factories reputed to be manufacturing weapons of mass destruction, the aftermath of their bombing and that of villages alleged to harbour agents of the "axis of evil", remote sensing helps find physical resources, spots farmers who fraudulently claim subsidies for non-existent crops and is used to site cell-phone transmitter networks. There are now several orbiting systems launched by commercial outfits that offer pin sharp and spectrally revealing information, at a cost. The workhorse of remote sensing since 1972 has been the US Landsat series. Following the addition of the Thematic Mapper in 1984, pressure grew for Landsat's privatization in 1988. Prices jumped tenfold, to the horror of researchers, and the venture became uneconomic because of insufficient private-sector interest. Landsat 7, which carries an Enhanced Thematic Mapper, made orbit in 1999, and is administered by the US Geological Survey. Landsat-7 ETM data sell at $600 per scene, which is a bargain. Such has been the demand for data that US authorities are once more trying to shed responsibility for data provision to private hands, by asking for bids to develop, launch and market the next Landsat. Prices will once again leap to profitable levels. The joint US-Japan ASTER system aboard the ostensibly research-oriented *Terra* satellite rivals Landsat ETM in quality, and many scientists have been trying out the data. Again, to their disquiet, pressure reputedly from the Japanese partners has resulted in once free data being assigned a price of $55 per scene.

Informe 17 de Novembro

Congressos

- MANGROVE

www.mangrove2003.ufba.br
20-24 de maio de 2003 /Salvador, Bahia (Brazil)

- ABEQUA

http://geocities.yahoo.com.br/ixabequa2003/

Circular Nº 1 – IX SIMPÓSIO DE GEOLOGIA DO CENTRO-OESTE

Prezados Colegas,

É com satisfação que anunciamos à comunidade geológica brasileira, a realização do IX Simpósio de Geologia do Centro-Oeste, que ocorrerá no período de 20 a 23 de julho de 2003, na cidade de Cuiabá. O mês de julho foi escolhido, dado ao fato de que a temperatura em Cuiabá normalmente é muito elevada, exceto no mês de julho, que oscila entre 20º – 30ºC.

Temos a intenção de promover mini-cursos pré-simpósio e saídas de campo pós-simpósio. Dessa forma, gostaríamos de sua colaboração no sentido de responder a este questionário, para direcionarmos nossa programação aos interesses da comunidade.

1) Pretende participar do Simpósio, de que forma?
   a) apresentando trabalho ( ) Qual o tema:…….
   b) participando de mini-cursos e/ou saídas de campos ( )

2) A data escolhida é:
   a) excelente ( )
   b) apropriada ( )
   c) prefiro outra data. ( ) Quando?…….

3) Participando de Mini-Cursos, qual o seu interesse? Marque a primeira e a segunda opção.
   a) Legislação Mineral e Ambiental
   b) Contaminação de Recursos Hidrícos
   c) Geologia Econômica
      a) Sulfetos Maciços Vulcanogênicos
      b) Depósitos de ouro controlados Estruturalmente
   d) Microtectônica
   e) Argilas
   f) Granitos como Rochas Ornamentais
   g) Caracterização de Gemas
   h) Outros( ) sugestão:…….

   Primeira opção ( ) Segunda opção ( )

4) Participando de Saídas de Campo, qual o seu interesse?

   a) Grupo Cuiabá ( )
   b) Cráton Amazônico (Faixas Cabaçal , Araputanga e Jauru) ( )
   c) Cráton Amazônico: região Peixoto de Azevedo-Aripuanã ( )
   d) Coberturas Sedimentares do Norte de Mato Grosso (Grupo Beneficente e Formação Dardanelos e Parecis) ( )
   e) Faixa Paraguaia (Região de Cuiabá, Nobres a Cáceres) ( )
   f) Aquífero Furnas (Região de Rondonópolis-Jaciara) ( )
   g) Bacia do Paraná (Chapada dos Guimarães e Dom Aquino) ( )

5) Qual o valor que você poderia gastar numa saída de campo:
   a) em torno de 150,00 reais ( )
   b) em torno de 300 reais ( )
   c) entre 500 – 800,00 reais ( )
   d) > 1000 reais ( )

6) Qual a sua disponibilidade de dias para saídas de campo?
   a) Um dia ( )
   b) Dois dias ( )
   c) Três dias ( )
   d) Até sete dias ( )

7) Se você quer receber as próximas circulares, atualize seu endereço, seu e-mail e seu telefone, para enventuais contatos.

8) Ficará hospedado em hotel ? Em caso afirmativo qual o tipo de hotel?
   a) ***** ( )
   b) **** ou *** ( )
   c) ** ou * ( )

Gostaríamos de receber as respostas a estas questões até o dia 30 de novembro de 2002. A Segunda circular deverá ser enviada até 15 de dezembro com os prazos e normas para trabalhos, preço das inscrições, estimativa de preços de hotéis e telefones para contatos.

Contamos com sua colaboração.

Cordialmente,

Comissão Organizadora Pró- IX Simpósio de Geologia do Centro-Oeste.
e-mail: drm@cpd.ufmt.br
telefone para contato: (---65) 615 8750 com Reginaldo
Endereço para correspondência:
Comissão Organizadora do IX SGCO
Rua fortaleza, Q-11 C-39 Jardim Europa Cuiabá
MT – 78.065-350

Informe 18 de Novembro

Concurso

Informamos que a CDHU - Companhia de Desenvolvimento Habitacional e Urbano do Estado de São Paulo lançou concurso para preenchimento de vagas em diversas áreas, inclusive na área de geologia.
Os interessados devem acessar a pagina : http:\\www.cdhu.sp.gov.br

Congressos

"RESTAURAÇÃO DOS RECURSOS HÍDRICOS E DA BIODIVERSIDADE DE ECOSSISTEMAS DEGRADADOS"
18 a 22 de Novembro de 2002, Belo Horizonte - MG
A Sociedade Brasileira de Recuperação de Áreas - SOBRADE, promove em conjunto com a Universidade Federal de Lavras o V Simpósio Brasileiro Sobre Recuperação de Áreas Degradadas.

Workshop de divulgação dos Resultados do Projeto GEF São Francisco "Uma discussão dos Problemas e Soluções Hidroambientais para o baixo São Francisco e Foz"
21 de novembro de 2002
Própria - Recife, Brasil
Informções:
Universidade Federal de Sergipe
Lab. Geoprocessamento e Geologia Ambiental
Fone: 79-212.6929
E-mail: labgeoambiental@bol.com.br ou labgeoambiental@ufs.br
Site: www.ufs.br

SEMINÁRIO "DURABILIDADE DE TIRANTES PERMANENTES"
21 de novembro de 2002
Auditório do Inst. de Engenharia de São Paulo/SP
Assoc. Bras. de Empresas de Eng. de Fundações e Geotecnia - ABEF
Fone: 11-3262.5104 - Fax: 11-288.5573