INFORME GEOBRASIL
(www.geobrasil.net)

******As pessoas interessadas em receber nossa newsletter via mail, podem escrever para acfonseca@geobrasil.net ou revistadegeologia@yahoo.com.br pedindo sua adesão.***

♦ DICAS DA SEMANA

SITE DA UNESCO

Visitem o site da Unesco http://upo.unesco.org/ muito interessante

ARSÊNIO - ALERTAR DE PERIGO...SLIDES PALESTRA

Wilson Scarpelli (GEOMÉDICA) http://www.cprm.gov.br/pgagem/arsenio.pdf

♦ AVISO IMPORTANTE

ICAM 2004 - PRAZO FINAL PARA ENVIO DE RESUMOS PRORROGADO PARA 20 DE NOVEMBRO

O prazo final para o envio de resumos para o ICAM 2004 (8th International Congress on Applied Mineralogical) foi prorrogado para 20 de novembro de 2003 até às 24:00 horas (horário de Brasília). Após essa data, a submissão eletrônica estará encerrada, não havendo possibilidade de envio por outros meios.

A Comissão Organizadora informa a todos os participantes brasileiros que estará solicitando, junto às agências de fomento (CNPq e FAPESP), recursos visando financiar a participação de doutores que tenham trabalhos inscritos e que estejam ligados a instituições de ensino e institutos de pesquisa (taxa de inscrição, custeio de estadia em Águas de Lindóia e transporte São Paulo/Águas de Lindóia/São Paulo

Independentemente do resultado dos pleitos aos órgãos de fomento, informamos ainda que haverá uma diferenciação de preço para participantes brasileiros nas categorias de autor e estudante, como segue:

- Inscrição de autor (máximo de 3 trabalhos por inscrição): R$ 600,00, a ser pago via boleto bancário
- Alunos de graduação e de pós-graduação: R$ 300,00, a ser pago através de boleto bancário.

Dessa forma, a Comissão Organizadora espera poder contar com a maior participação possível dos nossos pesquisadores, de modo a transformar este Congresso num evento agradável e de alto nível técnico, cobrindo todas as áreas da mineralogia aplicada.

O endereço eletrônico para envio dos resumos é http://www.icam2004.org/adm/paper/index.php. Todos os trabalhos deverão ser encaminhados em inglês.

Maiores informações e instruções de envio do "Preliminar Abstract" estão disponíveis "on-line" no endereço http://www.icam2004.org/call/call.htm ou na própria página do congresso http://www.icam2004.org/

A Comissão Organizadora gostaria de encorajá-lo a enviar um trabalho relativo à sua área de atuação e espera contar com a sua presença em Águas de Lindóia.

Cordialmente,
A Comissão Organizadora

♦ OFERTA DE TRABALHO

EMPRESA ÁGUA AZUL

A empresa Água Azul - SC está contratando Geólogo.
Maiores informações www.perfuradores.com.br

CONCURSO PARA PROFESSOR NO CEFET-CAMPOS

Há vagas para geografia, biologia, física, automação, telecomunicações e espanhol
Algumas observações ficaram de foras do edital:
1) No regime de 40h DE há um aumenta de 55% no salário.
2) Quem tem mestrado e doutorado é promovido automaticamente para o nível E1, equivalente a 16 anos de promoção.
3) GID (ate R$ 1.500,00 para quem tem doutorado).
A carreira é composta de três níveis (C,D,E) com 4 subníveis cada.

Mais informações no site: http://www.cefetcampos.br

♦ CURSOS E PALESTRAS

SBG- RJ/ES

Dia : 18/11/2003
Local: Clube de Engenharia - Av. Rio Branco, 124 - Centro Tel: 2509-6177
Palestra: Recuperação do Rio Carioca
Horário: 18 horas
Palestrante:Professora Simone Berger

FIRJAN - RJ

CURSO SOBRE LEGISLAÇÃO E NORMAS PARA O LICENCIAMENTO AMBIENTAL
25, 26 E 27 de novembro de 2003

Horário: 09:00 às 18:00 h

OBJETIVO
Orientar quanto à necessidade de vinculação ao Sistema de Licenciamento de Atividades Poluidoras – SLAP, do Estado do Rio de Janeiro, instituído pelo Decreto 1633/77.
JUSTIFICATIVA
Atender a legislação ambiental vigente e a conseqüente exigência dos órgãos financiadores, prefeituras e outros órgãos governamentais, para fins de licenciamento obrigatório.
COORDENAÇÃO
TÉCNICA - Eng Claudia Semis Vitório Gomes – Departamento de Controle Ambiental - FEEMA
PEDAGÓGICA - Com Social. Gisela Torres Homem – Coordenação de Treinamento da FEEMA
PROGRAMA:
Legislação ambiental básica federal e estadual, Legislação sobre controle de atividades não industriais (infra-estrutura, urbanização e extração mineral, esgotamento sanitário); controle de atividade industrial, controle de resíduo industrial, estudo de impacto ambiental, auditoria ambiental, aspectos jurídicos no âmbito estadual e federal, lei de crimes ambientais, termo de ajustamento de conduta, sanções administrativas no Estado do Rio de Janeiro.
CARGA HORÁRIA: 24 horas
TAXA DE INSCRIÇÃO: R$ 350,00 (trezentos e cinqüenta reais)
Inclui material didático, coffee-break e certificado.
PAGAMENTO E INSCRIÇÃO:
Depósito em cheque nominal ao Conselho Regional de Biologia – CRBIO2, no Banco do Brasil, acrescentando na guia o nome do curso a ser realizado.
Agência: 2234-9 .C/C: 260349-7
Enviar cópia da guia do depósito bancário, informando o nome do aluno e do curso correspondente, para o fax da FEEMA. Tel/Fax: (21) 2549-1814, (21)2255-9292 r.3395
A vaga só estará confirmada mediante este procedimento.
LOCAL DO CURSO - Centro de Tecnologia Ambiental (CTA) da FIRJAN
Rua Moraes e Silva, 53 - Maracanã - Rio de Janeiro
VAGAS: São oferecidas 40 vagas
Outras informações:

FEEMA/CODEAT – Av. Nossa Senhora de Copacabana, 493/6º Andar – Copacabana-RJ

Tel/Fax: (21) 2549-1814, (21) 2255-9292 Ramal 3395
CRBIO2 – Rua álvaro Alvim, 21/12º Andar – Cinelândia – RJ

Tel/Fax: (21)2220-2655

♦ CONGRESSOS E SIMPÓSIOS

SEMANA DE ESTUDOS GEOLÓGICOS DO PARANAÁ - SEGEPAR -2003

Estará acontecendo de 24 a 28 de novembro na UFPR - Campus Centro Politécnico.
As inscrições estarão sendo feitas de segunda (17) a quarta (19) com a Maria Luísa Martini (Malu) e com o Rafael Henchen (Gaúcho). Quinta (20) e sexta (21) com a Gabriela ferreira Santos (Cristal).

Valor:
R$ 10,00 para estudantes + 1 kg de alimento não perecível
R$ 15,00 professores, profissionais e pós-graduandos. + 1 kg de alimento não perecível
Lembramos que as inscrições para os mini-cursos não serão cobradas a parte e que por isso as inscrições serão feitas por ordem de interesse - "chegada".
Nesta semana eu e o Marcel estaremos no campo, mas qualquer dúvida falem com o Jean Vargas (9185-9867) - Oreia - ou escrevam para segepar2003@hotmail.com.
Alice Bonatto de Castro
Comissão organizadora da SEGEPAR 2003

♦ ÍNDICE DE NOTÍCIAS

• AMBIENTE BRASIL

CAPACITAÇÃO TÉCNICA EM ENERGIA EÓLICA

O CURSO VAI TREINAR, CERTIFICAR E HABILITAR PESSOAL PARA TRABALHAR NO SETOR. OS MELHORES ALUNOS PODERÃO SER CONTRATADOS PARA PARTICIPAREM DE UM PROJETO DE ENERGIA EÓLICA PIONEIRA NO BRASIL.

SEMINÁRIO EM FOZ ANALISA QUESTÃO DA MINERAÇÃO EM ZONAS URBANAS

A SOCIEDADE BRASILEIRA DE RECUPERAÇÃO DE ÁREAS DEGRADADAS, COM O APOIO DA UNIVERSIDADE FEDERAL DO PARANÁ, PROMOVERÁ O "SEMINÁRIO NACIONAL DEGRADAÇÃO E RECUPERAÇÃO AMBIENTAL - PERSPECTIVA SOCIAL", NO PERÍODO DE 24 A 26 DE NOVEMBRO DE 2003, EM FOZ DO IGUAÇU, NO PARANÁ.

PT REALIZA SEMINÁRIO SOBRE MEIO AMBIENTE

AS POLÍTICAS MUNICIPAIS NA ÁREA AMBIENTAL, A AGENDA 21 LOCAL, A ANÁLISE DA PESQUISA "O PERFIL DOS MUNICÍPIOS", O ECOTURISMO E A CAMPANHA ELEITORAL DE 2004 SÃO ALGUNS DOS TEMAS DISCUTIDOS COM OS GESTORES GOVERNAMENTAIS DO SETOR.

DEPUTADOS QUESTIONAM LICENCIAMENTO DE REFINARIA NO RJ

A COMISSÃO DE DEFESA DO CONSUMIDOR, MEIO AMBIENTE E MINORIAS REALIZA AUDIÊNCIA PÚBLICA NESTA QUINTA-FEIRA (20), PARA DISCUTIR O LICENCIAMENTO DE OPERAÇÃO, O EIA/RIMA E O TERMO DE AJUSTE DE CONDUTA DA REFINARIA DE PETRÓLEO DE MANGUINHOS, NO RIO DE JANEIRO.

SEMANA DE EVENTOS NACIONAIS DA RESERVA DA BIOSFERA DA MATA ATLÂNTICA ACONTECE EM OURO PRETO / MG

OS MEMBROS DO CONSELHO NACIONAL E OS COORDENADORES DOS COMITÊS ESTADUAIS DA RESERVA SE REUNIRÃO, DE 7 A 12 DE DEZEMBRO, PARA FAZER UM BALANÇO DAS ATIVIDADES DO ANO E DEFINIR OS PLANOS FUTUROS. ENTRE OS EVENTOS ABERTOS AO PÚBLICO, ESTÁ O SEMINÁRIO NACIONAL SOBRE COMPENSAÇÃO AMBIENTAL.

USAID PROMOVE ENCONTRO ANUAL DO PROGRAMA DE MEIO AMBIENTE EM BRASÍLIA / DF

O ENCONTRO DA AGÊNCIA NORTE-AMERICANA PARA O DESENVOLVIMENTO INTERNACIONAL TEM COMO OBJETIVO PROMOVER O DEBATE E A TROCA DE EXPERIÊNCIAS RELACIONADAS À CONSERVAÇÃO DA BIODIVERSIDADE E AO DESENVOLVIMENTO SUSTENTÁVEL NO BRASIL.

COMISSÃO EUROPÉIA FINANCIA PROJETO SÓCIO-AMBIENTAL NA AMAZÔNIA

O projeto visa apoiar atividades de desenvolvimento sustentável na zona de influência da rodovia Cuiabá-Santarém, ao longo do rio Tapajós, bem como na várzea do rio Amazonas próxima a Santarém, em antecipação ao provável asfaltamento da estrada.

SEMINÁRIO EM FOZ DO IGUAÇU TEM COMO TEMA CENTRAL A RECUPERAÇÃO DE ÁREAS DEGRADADAS

Paralelamente ao Seminário serão ofertados 3 minicursos para capacitar pessoas que atuam na mineração, construção de estradas, grandes barragens, urbanização e agricultura.

PETROBRAS BUSCA, AINDA ESTE ANO, IMPULSIONAR PROJETOS QUE AMPLIAM OFERTA DE PETRÓLEO E GÁS

A Comissão Mista de Orçamento da Câmara ouviu nesta quarta-feira (12) em audiência pública o diretor financeiro da Petrobras, José Sérgio Gabrielli Azevedo, a respeito da reestruturação orçamentária da estatal neste ano.

- **JORNAL DA CIÊNCIA**

IBICT VAI ORGANIZAR A BIBLIOTECA BRASILEIRA DE TESES E DISSERTAÇÕES

O Conselho Técnico e Científico (CTC) da Capes aprovou a obrigatoriedade de passarem a ser depositadas todas os trabalhos de pós-graduação na Biblioteca Brasileira de Teses e Dissertações do Instituto Brasileiro de Informação em C&T (Ibict)

A notícia foi dada pelo diretor do Ibict, Nilson Lage, no V Encontro Nacional de Ciências da Informação (Enancib), recentemente realizado.

Com a decisão do CCT, a emissão de diploma fica na dependência do depósito da respectiva tese ou dissertação, além das formalidades tradicionais.

Ao autor é dato o direito de suprimir do texto depositado trechos que considerar de valor mercadológica ou que não desejar divulgar.

Para concretizar a medida será agora preciso elaborar e assinar um convênio entre Capes e Ibict e preparar uma Portaria da Capes para o Sistema Nacional de Pós-Graduação. A seguir, haverá que criar o Comitê Gestor da Biblioteca.

A produção de teses de mestrado chega a 30 mil por ano, segundo se calcula, o que dá uma idéia a relevância da medida agora aprovada pela Capes.

PLOS E SCIELO DÃO O QUE FALAR, ARTIGO DE MARCELO LEITE

O Brasil já tem um sistema próprio - apesar do nome colonizado - de livre acesso, a 'Scientific Electronic Library Online' (http://www.scielo.br), uma biblioteca eletrônica com 114 periódicos nacionais, a maioria de interesse bem mais restrito que 'Nature' ou 'Science'

Marcelo Leite, editor de Ciência da 'Folha de SP', mantém a coluna 'Ciência em Dia', criada por José Reis (cienciaemdia@uol.com.br), no caderno 'Mais!', onde publicou este texto:

Um espectro ronda as publicações científicas internacionais. Com um nome em aparência inofensivo, 'PLoS', o fantasma transita pelas conexões de banda larga na internet.

É o espírito do livre acesso, que está dando o que falar com seu potencial para virar de pernas para o ar o primeiro time das revistas, como 'Nature', 'Science' e 'Cell'.

'PLoS' quer dizer 'Public Library of Science', ou biblioteca pública de ciência. Trata-se de um guarda-chuva editorial para a família de revistas eletrônicas que por ora gerou uma filha única, 'PLoS Biology', lançada há coisa de um mês.

A proposta é que qualquer cientista do planeta possa ler os artigos de pesquisa que publica, bastando ter acesso à internet e saber inglês - o mínimo, hoje.

Essa tentativa de furar o esquema das revistas tradicionais, que exigem caras assinaturas mesmo para uma consulta on-line, teve o impulso inicial de US$ 9 milhões da Fundação Gordon e Betty Moore (sendo Gordon Moore um fundador da indústria de chips Intel).

Um dos cabeças do movimento, que chegou a recolher 30 mil assinaturas de apoio, é o Nobel em Medicina americano Harold Varmus.

Outro é Patrick Brown, um pioneiro dos chips de DNA, que já se envolveu na primeira encrenca do ramo: retirou seu nome da lista de autores de um trabalho que seria publicado na

famosa 'New England Journal of Medicine' (http://www.nejm.org), depois que a revista recusou o compromisso de pôr o artigo no domínio público.

O 'paper' sobre transplantes renais saiu na 'NEJM' de 10 de julho (vol. 349, págs. 125-138), tendo Minnie Sarwal como autora principal.

O galho com a PLoS (http://www.plos.org) é que, se ela não cobra para ser lida, cobra - e bem - para ser recheada. O pesquisador que quiser publicar no novo órgão terá de pagar US$ 1.500 de 'taxa de disseminação'.

O preço é proibitivo para muitos cientistas de países mais pobres, que de resto já contam com toda espécie de dificuldade para conseguir publicar nas revistas chiques (de alto impacto).

Além disso, há quem duvide que esse valor possa de fato cobrir os custos de edição, mesmo que a distribuição sobretudo eletrônica permita economia de uns 20%.

Ocorre que revistas do calibre da 'Cell' rejeitam até 90% dos manuscritos que recebem, mas submetem todos os que chegam a uma avaliação por especialistas, uma maneira segura de encarecer astronomicamente a operação. Nem é preciso dizer que a torcida contra vem das revistas estabelecidas na praça.

A favor já se pronunciaram alguns pesos-pesados entre os financiadores de pesquisa, como o Wellcome Trust britânico e o Howard Hughes Medical Institute norte-americano. Ambas as instituições anunciaram que cobrirão até US$ 3.000 de 'taxas de disseminação' para pesquisas por elas custeadas.

O Wellcome Trust pôs o dedo na ferida em um relatório recente, afirmando que o sistema atual de milhares de publicações especializadas com assinaturas dispendiosas 'não trabalha no interesse de cientistas e do público, mas é antes dominado pela determinação comercial de mercado em melhorar a própria posição mercadológica'.

A boa notícia, para quem tem interesse em publicações científicas brasileiras, é que o país já tem um sistema próprio - apesar do nome colonizado - de livre acesso, a 'Scientific Electronic Library Online' (http://www.scielo.br), uma biblioteca eletrônica com 114 periódicos nacionais, a maioria de interesse bem mais restrito que 'Nature' ou 'Science'.

A SciELO tem recebido mais de 326 mil consultas por dia - o tipo da aparição bem-vinda.

Folha de SP, 16/11

- **AGUAONLINE**

PLÁSTICO BIODEGRADÁVEL CONQUISTA O MERCADO

Até dezembro deste ano, pelo menos 132 toneladas de embalagens plásticas biodegradáveis - que se decompõem em até 18 meses em contato com o ar, a água e o solo - serão produzidas no Brasil. No final de 2004, outros 150 milhões de sacolas por mês estarão em fabricação com esse material, com perspectiva de 100% de aumento a cada ano, pelas projeções de uma das maiores indústrias nacionais do ramo. Essas são as perspectivas de apenas duas das seis fabricantes do setor de plásticos que utilizam matéria-prima importada com exclusividade pela rEs Brasil, empresa nacional de representação, distribuição e licenciamento industrial.

Detentora de tecnologias inéditas no Brasil, a rEs Brasil, fornece às fábricas aditivos que, adicionados aos plásticos comuns, tornam o produto final degradável e biodegradável. Em outros casos, ela distribui matéria-prima de origem 100% vegetal para fabricação de artigos que, além de biodegradáveis, são compostáveis. Outros produtos podem ainda ser solúveis em água. Dessa forma, são rapidamente absorvidos na natureza e em alguns casos podem até servir de adubo e alimentação animal, eliminando o descarte em aterros sanitários (onde levam até 100 anos para se decompor) e deixando de poluir rios, lagos e oceanos.

A ampliação do nicho dos plásticos biodegradáveis tende a seguir também o aumento da produção no setor de embalagens em geral. A Associação Brasileira de Embalagem (Abre) aposta também na elevação das exportações de embalagens vazias, que já representaram 7% do total da produção nacional no ano passado e, em 2003, devem ficar em 10%.

Nesse contexto, a expectativa é que, apesar de em média 30% mais caras, as embalagens do plástico biodegradável se popularizem na mesma velocidade do aumento do consumo ecologicamente correto e socialmente responsável, na avaliação do diretor superintendente da rEs Brasil, Eduardo Van Roost. Segundo ele, a provável receptividade do mercado, em tempos "ambientalmente exigentes", pode deixar o custo dos produtos de plástico biodegradável, mais especificamente o das sacolas, apenas cerca de 15% acima do preço daqueles que utilizam a versão comum da matéria-prima.

Como exemplos desse panorama favorável ao mercado de plásticos em geral e, mais especificamente, à sua versão biodegradável, Van Roost cita que uma das compradoras dos aditivos é a Sol Embalagens, fornecedora de sacolas plásticas para o Pão de Açúcar, o Carrefour e o Wall-Mart, entre outros gigantes do setor varejista. A empresa planeja implementar as sacolas

biodegradáveis em uma grande rede nacional de supermercados ainda este ano e espera atingir a marca de 150 milhões de peças do gênero fabricadas por mês ate o final de 2004. No Brasil, cerca de 700 milhões de sacolas plásticas de compras são utilizadas mensalmente pelas redes de supermercados.

Outra parceira, a Antilhas Soluções Integradas para Embalagens fabricará as 132 toneladas de embalagens biodegradáveis que embalarão os produtos comercializados nas 2,3 mil lojas da rede O Boticário no próximo Natal.

Já a Nobelplast - fabricante de sacolas, materiais promocionais, filmes técnicos, envelopes e envelopes de segurança para bancos, Correios e Telégrafos e couriers - espera incrementar em até 40% o seu faturamento de R$ 25 milhões (em 2003) nos próximos três anos, apenas com a transformação do plástico ecologicamente correto.

Segundo Van Roost o aditivo fragiliza as ligações entre as moléculas de carbono que formam o plástico, fazendo com que o material comece a se degradar sob condições comuns ao meio ambiente ao ser descartado no lixo. Posteriormente à degradação, os pequenos fragmentos resultantes serão mais facilmente digeridos pelas bactérias e fungos existentes na natureza. "Uma vez quebradas as cadeias de carbono e hidrogênio do plástico comum, os átomos de carbono livres se ligam ao oxigênio da atmosfera formando dióxido de carbono. Os átomos de hidrogênio livres se ligam também ao oxigênio, formando água. Essas são as mesmas substâncias que os seres vivos exalam na respiração", afirma.

O tempo de decomposição, acrescenta Van Roost, também pode ser regulado de acordo com a finalidade do produto. Essas propriedades não alteram nenhuma das características originais do plástico comum. Os produtos finais aditivados são totalmente recicláveis, de acordo com o superintendente da rEs Brasil.

- **COMCIÊNCIA**

- **DNPM**

Esta semana, o Departamento Nacional de Produção Mineral - DNPM repassou aos municípios, onde existe atividade mineração, a importância de R$ 14,8 milhões, parcela referente ao mês de novembro. O acumulado no ano já soma R$ 169,1 milhões, somente para os municípios. Estes repasses fazem referência ao estabelecido pela Constituição Federal que é a Compensação Financeira Sobre a Exploração de Recursos Minerais - CFEM, que é devida pelas empresas produtoras de bens minerais aos Estados, Municípios e União. Também foram distribuídos aos estados mineradores R$ 5,3 milhões. O acumulado no ano, para os estados, já soma 59,4 milhões. Na distribuição da CFEM, a União fica com a menor fatia - 12%; sendo 23% para os Estados e 65% para os Municípios. Somente de janeiro a outubro já foram arrecadados R$ 257,3 milhões.

- **MUNDOGEO**

Imagem promove GIS Day 2003
Instituto Acqua usa geoprocessamento para mapear a dengue no Grande ABC
Pesquisador do Inpe recebe prêmio na área de sensoriamento remoto
Federal do Piauí realiza concurso para professor de Ciências Geodésicas
Spot Image lança novo site
Lançado mapa geológico do Ceará
Sisgraph oferece curso de Oracle para GeoMedia
Divulgada imagem da câmera de alta resolução do satélite CBERS-2
Instituto de Terras de São Paulo promoverá Seminário de Política Fundiária
Casa do Desenho promoverá curso de GPS em Porto Alegre

- **NATURE**

Hydrocarbons and the evolution of human culture 318
CHARLES HALL, PRADEEP THARAKAN, JOHN HALLOCK, CUTLER CLEVELAND & MICHAEL JEFFERSON
doi:10.1038/nature02130
Summary | Full Text

- **SCIENCE**

GEOCHEMISTRY

Richard A. Kerr
GEOCHEMISTRY: Minerals Cooked Up in the Laboratory Call Ancient Microfossils Into Question.
Science 14 Nov 2003 302(5648): p. 1134.
http://highwire.stanford.edu/cgi/medline/pmid;14615504

CJ Evans, RP Evershed, HI Black, and P Ineson
Compound-specific stable isotope analysis of soil mesofauna using thermally assisted hydrolysis and methylation for ecological investigations.
Anal Chem 15 Nov 2003 75(22): p. 6056.
http://highwire.stanford.edu/cgi/medline/pmid;14615981

Use of Alkaline Extraction to Quantify Sulfate Concentration in Oxidized Mine Tailings
Guohong Yin and Lionel J. J. Catalan
J. Environ. Qual. 2003 November 1; 32(6): p. 2410-2413
http://jeq.scijournals.org/cgi/content/abstract/32/6/2410?ct

Enhancing Phytoextraction: The Effect of Chemical Soil Manipulation on Mobility, Plant Accumulation, and Leaching of Heavy Metals
Ulrich Schmidt
J. Environ. Qual. 2003 November 1; 32(6): p. 1939-1954
http://jeq.scijournals.org/cgi/content/abstract/32/6/1939?ct

Major and Trace Elements of Selected Pedons in the USA
R. Burt, M. A. Wilson, M. D. Mays, and C. W. Lee
J. Environ. Qual. 2003 November 1; 32(6): p. 2109-2121

http://jeq.scijournals.org/cgi/content/abstract/32/6/2109?ct

Mineralogical Characteristics and Transformations during Long-Term Operation of a Zerovalent Iron Reactive Barrier
D. H. Phillips, D. B. Watson, Y. Roh, and B. Gu
J. Environ. Qual. 2003 November 1; 32(6): p. 2033-2045
http://jeq.scijournals.org/cgi/content/abstract/32/6/2033?ct

Environmental Soil Chemistry, Second Edition
Andrew N. Sharpley
J. Environ. Qual. 2003 November 1; 32(6): p. 2444
http://jeq.scijournals.org/cgi/content/full/32/6/2444?ct

Accumulation, Release, and Solubility of Arsenic, Molybdenum, and Vanadium in Wetland Sediments
Patricia M. Fox and Harvey E. Doner
J. Environ. Qual. 2003 November 1; 32(6): p. 2428-2435
http://jeq.scijournals.org/cgi/content/abstract/32/6/2428?ct

Effect of Peroxide on Neutralization-Potential Values of Siderite and OtherCarbonate Minerals
J. L. Jambor, J. E. Dutrizac, M. Raudsepp, and L. A. Groat
J. Environ. Qual. 2003 November 1; 32(6): p. 2373-2378
http://jeq.scijournals.org/cgi/content/abstract/32/6/2373?ct

Aluminum Effect on Dissolution and Precipitation under Hyperalkaline Conditions: II. Solid Phase Transformations
Nikolla P. Qafoku, Calvin C. Ainsworth, James E. Szecsody, David L.
Bish, James S. Young, David E. McCready, and Odeta S. Qafoku
J. Environ. Qual. 2003 November 1; 32(6): p. 2364-2372
http://jeq.scijournals.org/cgi/content/abstract/32/6/2364?ct

Compartmentalization of Metals within the Diverse Colloidal Matrices Comprising Activated Sludge Microbial Flocs
Gary G. Leppard, Ian G. Droppo, M. Marcia West, and Steven N. Liss
J. Environ. Qual. 2003 November 1; 32(6): p. 2100-2108
http://jeq.scijournals.org/cgi/content/abstract/32/6/2100?ct

Sorption of Arsenic from Soil-Washing Leachate by Surfactant-Modified Zeolite
Enid J. Sullivan, Robert S. Bowman, and Irene A. Legiec
J. Environ. Qual. 2003 November 1; 32(6): p. 2387-2391
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Minerals Cooked Up in the Laboratory Call Ancient Microfossils Into Question (p. 1134)
-Richard A. Kerr
On page 1194, a group of researchers details how to cook up minerals in the laboratory that bear a striking resemblance to reported microfossils.
Full story at
http://www.sciencemag.org/cgi/content/full/302/5648/1134a?etoc

Stability of Peroxide-Containing Uranyl Minerals
Karrie-Ann Hughes Kubatko, Katheryn B. Helean, Alexandra Navrotsky, and Peter C. Burns
http://www.sciencemag.org/cgi/content/abstract/302/5648/1191?etoc
p. 1191

Intraslab Earthquakes: Dehydration of the Cascadia Slab
Leiph A. Preston, Kenneth C. Creager, Robert S. Crosson, Thomas M. Brocher, and Anne M. Trehu
http://www.sciencemag.org/cgi/content/abstract/302/5648/1197?etoc
p. 1197

Self-Assembled Silica-Carbonate Structures and Detection of Ancient Microfossils
J. M. Garcia-Ruiz, S. T. Hyde, A. M. Carnerup, A. G. Christy, M. J. Van Kranendonk, and N. J. Welham

http://www.sciencemag.org/cgi/content/abstract/302/5648/1194?etoc
p. 1194

Groundwater Science.
Roger Beckie
Vadose Zone J 2003 November 1; 2(4): p. 766
http://vzj.scijournals.org/cgi/content/full/2/4/766?ct

Chromate Transport and Retention in Variably Saturated Soil Columns
J. M. Hutchison, J. C. Seaman, S. A. Aburime, and D. E. Radcliffe
Vadose Zone J 2003 November 1; 2(4): p. 702-714
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A Modified Vadose Zone Fluxmeter with Solution Collection Capability
Glendon W. Gee, Z. Fred Zhang, and Andy L. Ward
Vadose Zone J 2003 November 1; 2(4): p. 627-632
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The Early Development of TDR for Soil Measurements
G. Clarke Topp, J. Les Davis, and A. Peter Annan
Vadose Zone J 2003 November 1; 2(4): p. 492-499
http://vzj.scijournals.org/cgi/content/abstract/2/4/492?ct

GEOPHYSICS

The Great Lisbon Earthquake
Linda Rowan

On 1 November 1755, an estimated 8.5 magnitude earthquake occurred along the Africa-Eurasia plate boundary in the Atlantic Ocean southwest of Lisbon. This literally earthshaking event devastated one of the most beautiful cities in Europe, producing ground liquefaction, seiches, a tsunami, and subsequent fires. Shaking was felt throughout the rest of Portugal and in Spain, France, Italy, Switzerland, and northern Africa; the tsunami flooded much of the Atlantic and western Mediterranean coastlines; and seiches were noted as far away as Finland.
Afterward, the Portuguese government requested that priests provide information about the time and duration of shaking as well as the damage in their parishes. In addition, eyewitness accounts from inhabitants and sailors were recorded. Based on these descriptions, Vilanova et al. suggest that the initial offshore earthquake triggered within minutes another earthquake about 300 km away on the Lower Tagus Valley fault. A dynamic effect at this distance would be unusual but possible if the fault were already close to failure. The second event would account for reports of two periods of intense shaking, the sudden subsidence of the riverbed and impulsive rise of the river water, and the high intensity of the shaking within the valley region. The Lower Tagus Valley is an important component of the plate boundary and suffered ruptures in 1344, 1531, and 1909. Addinganother event in 1755 would reduce the recurrence interval and likely increase the estimated seismic hazard. -- LR
Bull. Seismol. Soc. Am. 93, 2056 (2003).

PALEONTOLOGY

Self-Assembled Silica-Carbonate Structures and Detection of Ancient Microfossils
J. M. Garcia-Ruiz, S. T. Hyde, A. M. Carnerup, A. G. Christy, M. J. Van Kranendonk, and N. J. Welham
http://www.sciencemag.org/cgi/content/abstract/302/5648/1194?etoc
p. 1194

VILLEGAS ET AL.

Algal Clues to Antarctic Ice Shelf Ages
The naturally high variability of sea ice extent in Antarctica and the short duration of instrumental records have combined to obscure any clear record of sea ice coverage change. Curran et al. (p. 1203; see the Perspective by Wolff) present an ice core record of methanesulfonic acid, a species

produced by algae living at the edges of ice shelves, which they show is related to the position of the nearby winter-spring sea ice edge observed in satellite data. They use this relation to reconstruct changes in regional sea ice extent during the last 155 years and show that the modern decline began in the 1950s.

Did Filaments Form Faux Fossils?
The earliest purported fossils have been thought to be structures in nearly 3.5-billion-year-old Australian chert that resemble cyanobacteria and contain kerogenous material. It has recently been suggested, however, that these fossil-like structures could have formed inorganically. Garcia-Ruiz et al. (p. 1194; see the news story by Kerr) show that silica-coated carbonate crystals in a chert-like matrix can form long filaments via self-assembly. When these filaments are folded or braided, they produce structures that closely resemble bacterial fossils, and the synthesis conditions are similar to that of a chert. Furthermore, hydrocarbons--whichalso can form abiotically--can condense onto the filaments, potentially removing such an association as a biomarker.

Slab Earthquakes: To Dehydrate or to Transform
Earthquakes that occur within the slab of crust and mantle material carried down at a subduction zone present an important seismic hazard: Many urban areas are situated near subduction zones, and these earthquakes can have higher recurrence rates than interplate earthquakes. Preston et al. (p. 1197) analyzed intraslab events from the Juan de Fuca plate, which is subducting beneath northwestern Washington State, and were able to divide the events into two groups. Events in the mantle, shallower than 45 kilometers, were caused by dehydration of serpentinite, and events in the subducted crust, deeper than 45 kilometers, were caused by the transformation of basalt to ecologite.

PAGLIARINI AND XU

Peroxides in Radioactive Wastes
Although many minerals contain bound hydroxyl or water--notably the clay minerals, which commonly form as alteration phases--only a few, all uranium minerals, are known to contain peroxide. These minerals may be somewhat obscure geologically, despite being found in several localities, but they are important in the context of radioactive waste repositories, especially in terms of their stability. Hughes Kubatko et al. (p. 1191) investigated their thermodynamics and show that they are stable even at low temperatures in the presence of peroxide, in part because no other mineral can incorporate peroxide. Furthermore, peroxide can be produced from the radiolysis of water by alpha particles, so these phases are likely to be important in and around radioactive waste repositories.

- **EARTH PAGES**

ANTHROPOLOGY AND GEOARCHAEOLOGY

Recognition of African contributions to palaeoanthropology

Science continues its occasional series on individuals who make an impact on the progress of science with a review of the growing number of Africans working at the forefront of human evolutionary studies (Gibbons, A. 2003. Africans begin to make their mark in human-origins research. *Science*, v. **301**, p. 1178-1179). Ethiopians, Kenyans, Tanzanians and Eritreans have all made important finds and published their results over the last decade. Their hallmark is avid field work, backed up with growing interpretative skills. All credit the encouragement they have had from western colleagues, but now they are in a position to bring along a new generation of experts in their home countries.

The “Big Daddy” theory of human evolution!

One of the anthropological shocks of the 21st century was the discovery that the gene pool of central Asian men is dominated by such a limited range of Y-chromosome characteristics that the only conclusion is that one small group of closely related men dominated impregnation across the region about 800 years ago. They were probably all Mongols closely related to Genghis Khan (see, *Darwinian evolution of humans challenged by Y-chromosome data?* EPN March 2003). Studies by geneticists from Italy, Portugal and Spain recently suggested that sexual dominance by very few men may have been widespread before about 18 to 12 thousand years ago, around the beginning of the warming that closed the last glacial epoch (Dupanloup, I. *et al*. 2003. A recent shift from polygyny to monogamy in humans is suggested by the analysis of worldwide Y-chromosome

diversity. *Journal of Molecular Evolution*, v. **57**, p. 85-97). Mitochondrial (passed maternally) and Y-chromosome (paternal) DNA studies have been key tools in explaining the timing of migrations of humans over the last 100 thousand years, since their genetic patterns seem to cluster regionally. Molecular clock estimates that use the appearance of new genetic mutations indicate the timing of population separations. The study by Doupanloup and colleagues examined data from individuals who live on all continents. There is an odd and generally distributed difference in genetic diversity between mitochondrial and Y-chromosome DNA, which superficially suggests far more women than men during the last glacial epoch. In terms of births, that is clearly impossible. One explanation, favoured by Doupanloup *et al*., is widespread polygamy that dwarfs that which notoriously occurs within some religious sects today. Moreover, the "privilege" would have had to be passed on to successive generations of men directly related to the original "Big Daddies". Rapid shifts in power would not have left such a clear imprint on global Y-chromosomes. How that was achieved without repression or slaughter of potentially competing men, is impossible to judge. However, probable changes in EuropeanY-chromosome patterns around 70, 40 and 20 thousand years ago, that have been ascribed to either evolutionary "bottlenecks" during periods of rapidly dwindling numbers or sudden migrations, might equally have been due to the rise of new patterns of a few males' dominance over others. Dupanloup *et al*. show that the rise of agriculture around 10 thousand years ago seems to coincide with a breakdown of massive polygamy and more common monogamy. There are other possible interpretations of the data. In a largely monogamous society, if males stayed where they were born while women moved to live in their mates' home area, men would be closely related to others in their area, eventually resulting in very similar Y-chromosomes being shared by many. Different migration patterns or early deaths for most men while hunting may also have led to the genetic bias that is causing great discussion among evolutionary geneticists.

Source: Bhattacharya, S. & Le Page, M. 2003. A few prehistoric men had all the children. *New Scientist*, 6 September 2003, p. 18.

CLIMATE CHANGE AND PALAEOCLIMATOLOGY

High- and low-latitude climate changes almost match

Ten years ago the records of climate proxies from the Greenland ice sheet set new benchmarks for understanding how climate has varied over the last 100 thousand years – annual ice layers allowed division of that data to as fine as decades. Variations in the ice cores helped explain many of the variations found in more blurred data from sea-floor sediment cores in the Northern Hemisphere. Variations could be correlated with changes in the formation of North Atlantic deep water at high latitudes and the destabilisation of North American and Scandinavian glaciers. The whole hemisphere behaved in concert, through long-distance connections in climatic processes, but high-latitude processes seemed to dominate. Development of $^{234}U/^{230}Th$ dating extended high precision to carbonates that have been precipitated from groundwater to form stalagmites or speleothem. The latest results from speleothem, collected on the Indian Ocean island of Socotra, cover 14 thousand years between 56 and 42 ka, and resolve down to only 8 year intervals (Burns, S.J. *et al*. 2003. Indian Ocean climate and an absolute chronology over Dansgaard/Oeschger events 9 to 13. *Science*, v. **301**, p. 1365-1367). They show variations in rainfall on the island, though the $d^{18}O$ proxy, and thus changes in the strength of the Indian Ocean monsoon. In terms of shape, the stalagmite record closely resembles $d^{18}O$ changes in the Greenland ice cores, although the two have opposite senses, because the Greenland proxy is for air temperature above the ice cap. During the frigid Heinrich events that saw massive southward waves of icebergs, rainfall over Socotra was low. It became higher as high-latitude conditions warmed in Dansgaard-Oeschger events. The fine speleothem resolution shows a dramatic change-over that took only 25 years or so. The explanation is that warmer conditions increased equatorial evaporation from the oceans. But water vapour is the dominant "greenhouse" gas, and a wetter atmosphere would become warmer. So the question of whether low- or high latitudes drove the changes is still an open one. If North Atlantic events were the driver, then the tropical processes would greatly amplify their effects. One big problem emerges from the joint research by US, Swiss and Yemeni scientists. The highly reliable U/Th dating gives ages for each event that are about 3000 years older than those interpreted from the ice cores. The authors are convinced that the ice-core ages need revision, yet there are discrepancies with the event-ages from other similarly dated speleothems. Commenting on the paper, Frank Sirocko of Johannes Gutenberg University of Mainz in Germany (Sirocko, F. 2003. What drove past teleconnections. *Science*, v. **301**, p. 1336-1337) makes the point that maybe the quality and age of ice core records lie behind the widely accepted view that high-latitude process drive climate. He presents an excellent global image of modern sea-surface temperatures that show the main oceanic shifts of energy – the leakage of cold circum-Antarctic waters northwards, the westward movement of equatorial warm waters to which the El Niño -

Southern Oscillation (ENSO) is due, and the unique movement of warm water to Arctic regions in the North Atlantic that is connected to deep water formation. To that he adds the major effect of continental winter snow cover in central Eurasia, that affects albedo and the size of the winter high-pressure zone there. Is there a teleconnection between that and events in the North Atlantic? Nobody knows, because there are no data to compare, yet. Another uncharted but likely linkage is between the ENSO and processes in the circum-Antarctic current. Using currently accepted dating of ice cores, records from those in the Antarctic show air temperature changes that precede those from Greenland by several thousand years. In that respect, the Socotra record possibly has a link with the South Polar climate. Until the issue of dating is sorted out, it will always be difficult to make concrete statements about global climate change.
Interestingly, in the same issue of *Science*, sea-floor data (between 9 and 16 ka) from the Cariaco Basin off Venezuela, at about the same latitude as Socotra, mimic the Greenland records to within 30 to 90 years (Lea, D.W. *et al*, 2003. Synchroneity of tropical and high-latitude Atlantic temperatures over the last glacial termination. *Science*, v. **301**, p. 1361-1364).

"Greenhouse" controls challenged

There's data gathering and there's theorising. In palaeoclimate studies the two come into conflict. Theory suggests that CO_2 is likely to be the principal driver for climatic ups and downs, probably on all time scales. Atmospheric CO_2 estimates from the past are based on proxies of different kind, and the various models that they support do not tally vary well. Worst of all they do not fit climate records through the Phanerozoic at all well, except in the crudest possible way. Only the long-lived Carboniferous to Permian "icehouse" and Tertiary cooling tally, and then only in Berner's GeocarbIII model. One of the best records of major climate shifts, aside from continental tillites, are marine sediments that contain ice-rafted debris, in particular the palaeolatitudes to which they extend. They record four major cooling episodes: Late Ordovician; Devonian to Late Permian; Late Jurassic to Mid Cretaceous; and those since about 35 Ma ago. The oxygen isotope record from Phanerozoic fossils, partly correlated with ocean temperatures also suggest 4 global coolings in the last 545 Ma. Either the CO_2 modelling needs more detail, or the whole issue of the "greenhouse" effect is under question. That is the conclusion of a study by Nir Shaviv of the Hebrew University of Jerusalem, and Ján Veiser of the Ruhr University and The University of Ottawa (Shaviv, N.J. & Veiser, J. 2003. Celestial driver of Phanerozoic climate? *GSA Today*, Huly 2003, p. 4-10). Veiser has been analysing the chemistry of carbonates, especially their oxygen isotopes, for his 30 year career, and has amassed more data than any other geochemist on carbonate-related issues. The two have worked together because their interests fit together extremely well. Shaviv has reconstructed the variation of cosmic ray flux from studies of the exposure of iron meteorites to them, blended with analysis of how the Solar System moves through the spiral arms of our galaxy. Cosmic rays are known to affect the Earth's cloudiness and therefore albedo. Greater cosmic ray flux should increase the amount of solar energy reflected away by the Earth, thereby causing global cooling. The degree of fit between the cosmic ray flux and palaeoclimatic records is so good that up to 2/3 of climate variation may be connected with the Earth's celestial position. That is, as it passes through the star-rich spiral arms cosmic rays intensities go up. This happens every 140 Ma or so, which fits very well with the 4 icehouse periods during the Phanerozoic. They even suggest that the climate-CO_2 relationship may be the opposite of that generally agreed; climate might drive carbon dioxide levels. A secondary role for "greenhouse" gases wreaks havoc on attempts at modelling climate change feared to result from increasing anthropogenic releases. Shaviv and Veiser's work comes at a particularly awkward time for climate modellers, who have just initiated a programme for running huge simulations by corralling the combined computing power of millions of home PC users, similar to the approach pioneered by the SETI Institute (Allen, M.R. Possible or probable. *Nature*, v. **425**, p. 242). Perhaps the view of Phillip Stott, that climate modelling is a complete waste of time (Stott, P. 2003. You can't control the climate. *New Scientist*, 20 September 2003, p. 25) might sink in as a result of the possible link between cosmic ray flux and climates of the past. Stott believes that acting on the output of such models might perhaps even be dangerous, since we clearly do not understand short-term climate change well enough.

Precambrian CO_2 levels

Whether or not fluctuations in the "greenhouse" effect drive climate change, the fact remains that CO_2, methane and water vapour all act to retain solar heat in the Earth system. Were it nor for their presence in the atmosphere, the Earth would be about 33 degrees colder than it is. It would be covered by ice. Theoretical modelling of how stars evolve suggests that the Sun had progressive less energy output going back in Earth's history. Only gaseous heat retention could have prevented a sterile, frigid planet. Yet periods of cooling sufficient to hold large amounts of water in surface ice have occurred only a few times, 4 in the Phanerozoic, a flurry of so-called "Snowball" epochs in the Neoproterozoic and the earliest known glaciation around 2200 Ma ago. The earliest coincided with the first evidence for free oxygen in the atmosphere, and may have been caused by that. Methane,

a more powerful “greenhouse” gas than water or carbon dioxide and abundantly produced by anaerobic decay, is easily oxidised. In later time, it has been ephemeral in the atmosphere, unless continuously released, for instance by destabilisation of gas hydrate in sea-floor sediments. Warming by CO_2 has undoubtedly kept total frigidity at bay since then. The problem is charting just how much was in the air, because most estimates have been based on studies of palaeosols that give odd and very imprecise results for the early Palaeozoic (see Shaviv and Veiser, 2003; previous item).

Photosynthetic organisms derived their carbon from CO_2, either in the air or dissolved in water through equilibration with the atmosphere. The extraction favours lighter ^{12}C, so biological activity results in their products being depleted in the heavier ^{13}C by about 25 parts per thousand (‰) relative to carbon in air and water. If organic carbon becomes buried, the remaining carbon in the surface environment gets richer in ^{13}C, and that signature becomes fixed in contemporaneous carbonates, both organic and inorganic. It is therefore possible to use the two carbon-isotope signatures to estimate the reservoir of CO_2; its proportion in contemporary air. However, the degree of fractionation depends on the specific carbon metabolism of different organisms, yet most organic carbon in sediments is a mixed product of widely differing life styles. That severely blurs estimates of atmospheric carbon dioxide content. What is needed are data from a single source with known metabolism. Acritarchs are fossil remains of single-celled marine eukaryotes that were, and still are, marine photosynthesisers. They are made of degraded hydrocarbons. Advanced ion-microprobe resolution is now sufficient to produce carbon-isotope measurements of individual fossils (about 200 micrometres across). Sediments from northern China, roughly 1400 Ma old, contain abundant little-altered acritarchs and carbon isotope data from them give good estimates of atmospheric CO_2 levels, that are independent of other methods (Kauffman, A.J. & Xiao, S. 2003. High CO_2 levels in the Proterozoic atmosphere estimated from analyses of individual microfossils. *Nature*, v. **425**, p. 279-282). The estimates suggest between 10 to 200 times higher contents than today, but just about sufficient to keep the Earth above the limit of glacial temperatures when solar luminosity was about 88% of the present. Acritarchs are present throughout the Neoproterozoic, and it should prove possible to examine the critical periods of “Snowball” conditions using this method.

ENVIRONMENTAL GEOLOGY AND GEOHAZARDS

Low-cost disaster monitoring from satellites

With little hype, a British company (Surrey Satellite Technology Limited, linked to the University of Surrey) is beginning to develop a constellation of remote sensing satellites that aim at monitoring a variety of threatening phenomena across the whole planet. The Disaster Monitoring Constellation produces images at the same resolution (about 30 metres) as the US Landsat Thematic Mapper, but is unique in two aspects. The satellites and launching them are cheap, because they are tiny by comparison with the giants normally associated with remote sensing, weighing in at only a few hundred kilograms, and they also use off-the-shelf components including the imaging devices. Second, the four current DMC satellites fly in concert to cover the whole Earth with images 600 km across (Landsat images cover less than a tenth of the area) every day. No other system is capable of that degree of timeliness, the shortest “revist” time to now having been 16 days. SSTL does not own the satellites or the data, but builds them on contract for developing countries. The first to reach orbit, in November 2002, belongs to Algeria. It was joined on 27 September 2003 by three more, sponsored by Turkey, Nigeria and the UK, which were successfully launched by a Kosmos rocket from Plesetsk in northern Russia, at a total cost of around $85 million. These will be joined by similar platforms sponsored by China, Thailand and Vietnam in the next few years. The targets are wildfires, floods, windstorms, volcanic eruptions, erosion and potential landslides, with the added benefit of very detailed information about changes in agriculture and forestry, and baseline mapping of geological and hydrological features. Perhaps most important, it gives less affluent countries independent access to space imagery, which can only boost the confidence of natural scientists in the third world who are venturing into remote sensing after years of playing second fiddle to North American, Japanese and European specialists. Organisations, such as Reuters Foundation AlertNet and the International Charter, plus other international disaster relief organisations, can tap in for images at very short notice Astonishingly, SSTL has launched and is planning imaging satellites that weigh in as little as 7 kg. The low-key announcement of the launch of the 3 latest members of the DMC (www.sstl.co.uk) coincided with US and British hype-fests centred on the current missions to Mars. There is little doubt which will provide the most lasting benefits.

GEOBIOLOGY, PALAEONTOLOGY, AND EVOLUTION

Another K-T row

Since the discovery of the buried Chicxulub impact crater off the Yucatán Peninsula, Mexico, many geologists have regarded it as the "smoking gun" for the end-Cretaceous mass extinction. Such is the heft of K-T studies that money has been raised to drill into the crater and its overlying sediments. That began in late 2001 at an onshore site on the flank of the structure, and results are starting to emerge. However, research has been slow in getting underway on the crucial part of the core that goes through the boundary itself. That section was taken from the project's headquarters in Mexico City to the Free University of Amsterdam, by Jan Smit, one of the pioneers of K-T boundary studies. Samples began to reach other researchers in December 2002, 6 months after the boundary section arrived in Amsterdam. For many, this was a little too slow and suspicions have been raised. Everyone wanted to get abstracts into the AGU/EGS/EUG bun fight in Nice in April 2003, where a conference session on Chicxulub had been scheduled. One report presented there seems set to stun the pro-impact school. Gerta Keller of Princeton University studied foraminifera in the samples immediately above the impact breccia – there were plenty. She claimed that they represented a period of about 300 thousand years of sedimentation that followed the impact. Moreover, they occurred below the level of a thin glauconite-rich horizon, which seems to represent the K-T extinction event itself. Not surprisingly, Keller concluded that the impact could not have caused the extinction. Smit dismisses the allegation of "hogging" the core samples, and also suggests that the foram-rich layers represent sediment that was washed back into the crater soon after it formed. It has always struck me as odd that whenever something startling emerges from scientific research, a sort of preciousness overwhelms supposed scientific "objectivity". Counter claims and new variants of ideas rapidly evolve on the periphery of the discovery. There are reputations to be built, and defended, and of course "sexy" themes attract cash. The initial work that led to the recognition of a global layer of mass destruction, carried out by the Alvarez father and son team in the late 1970s, was a purer form of science – driven by curiosity and little else.

Sources: Dalton, R. 2003. Hot tempers, hard core. *Nature*, v. **425**, p. 13-14. McKie, R. 2003. I've got a bone to pick with you, say feuding dinosaur experts. *The Observer*, 7 September 2003, p. 22.

Gamma-ray bursts and mass extinctions

There is a Gaelic saying, which roughly translated goes: There are more ways of killing a cat than drowning it in butter. It seems to apply to mass extinctions. A team of astrophysicists and palaeontologists from the University of Kansas and NASA, headed by Adrian Melott of the University of Kansas, has found peculiarities in the trilobite record after the Late Ordovician mass extinction (443 Ma) that are difficult to explain by the usual culprits. Planktonic trilobites were decimated, but those living in deeper water largely came through the extinction. Graptolites too incurred major changes, only the monograptids surviving until the Silurian. Many palaeontologists link the end-Ordovician extinctions to global cooling, evidenced by glacial rocks mainly in Africa. Melott and colleagues suggest that a realistic reason for a depth-related extinction pattern could be due to intense gamma rays emitted by the collapse of a nearby giant star into a black hole. Although most would be blocked by the Earth's atmosphere, that would be at the expense of nitrogen oxides being created in large volumes from oxygen and nitrogen molecules. Nitrogen dioxide, the yellow colorant in photochemical smog would prevent solar radiation reaching the surface and trigger cooling. Also acid rain would lower the pH of surface water. Such a process could also explain the Late Ordovician glaciation of Africa.

Source Hecht, J. 2003. Did a gamma-ray burst devastate life on Earth? *New Scientist*, 27 September 2003, p. 17

Fossil oddities – a golfing trilobite and the ox-sized rodent

Gamblers and golfers do not like distractions, and many wear eye shades of some design or other. So it is intriguing to learn that a Devonian trilobite, *Erbenochile*, found in Morocco evolved a similar device. Richard Fortey and Brian Chatterton, of the British Museum of Natural History and the University of Alberta, respectively, analysed the peculiar eyes of this phacopid trilobite, and found that their tops had a sort of rim. Light shining down on the beast put the compound facets in shadow (Fortey, R. & Chatterton, B. 2003. A Devonian trilobite with an eyeshade. *Science*, v. **301**, p. 1689). Not only would this arthropod have been undistracted from its activities by goings on above, but it could also see over its back.

Not since the discovery of the Late Miocene *Bullockornis* in Australia (see *The Ducks of Death* in *EPN* June 2000) have Neogene palaeontologists come up with a record beater. But now they have (Sanches-Villagra, M.R. *et al*. 2003. The anatomy of the world's largest extinct rodent. *Science*, v. **301**, p. 1708-1710). The Late Miocene of Venezuela has yielded a rodent (*Phoberomys*), whose bones suggest that it weighed in at about 0.7 tonnes. It is related to modern guinea pigs, and probably had much the same herbivorous habits. Its teeth suggest that it was grazer too, and like

the modern capybara (one tenth the size of *Phoberomys*) it lived in swamps. Rodents now rank as the mammalian order with the greatest range of sizes. Because the digestive systems of mammals cannot efficiently break down the high cellulose content of grasses without the aid of internal bacteria, the bigger their gut, the more efficient they are as herbivores. So giant rodents make sense as regards their metabolism. However, they are not as well known for galloping as many other grazers, which is why smaller rodents prefer to escape predation by diving into burrows or among boulders. That would be difficult for a creature as big as an ox. Swamp dwellers, like the capybara and *Phoberomys*, can get away with not being fleet of foot, but would not do well on open grassland.
The compiler of *EPN* welcomes news of odd and awesome fossils, and hopes soon to learn of mighty hamsters and their adaptation to natural treadmills.
See also: Alexander, R.M. 2003. A rodent as big as a buffalo. *Science*, v. **301**, p. 1678-1679).

GEOCHEMISTRY, MINERALOGY, PETROLOGY AND VOLCANOLOGY

Archaean sea-floor hydrothermal fluids

The circulation of ocean water through new oceanic crust not only cools oceanic lithosphere sufficiently for it to droop and help drive sea-floor spreading. It also re-emerges as hot submarine springs that today host curious ecosystems, which depend entirely on energy and chemicals that spew out of these “smokers”. The chemistry of life molecules, particularly the metals in them, reveals a blend that is surprisingly similar to that of hydrothermal fluids. This, along with other matters, such as the highly primitive genetics of thermophilic bacteria, make sea-floor hydrothermal vents or the crust beneath them excellent candidates for the cradle of life’s origin. So getting samples of the very earliest such fluids has to be among the most exciting discoveries relevant to palaeobiology. Jacques Touret of the Free University of Amsterdam, one of the pioneers of fluid inclusion studies, believes that he has found some (Touret , J.L.R. 2003. Remnants of early Archaean hydrothermal methane and brines in pillow-breccia from the Isua Greenstone Belt, West Greenland. *Precambrian Research*, v. **126**, p. 219-233). The host rock is an undeformed, but metamorphosed breccia made of basaltic pillows from the famous Isua greenstone belt of West Greenland, which formed about 2.8 billion years ago. Quartz crystals in amygdales and veins that cement the breccia together contain minute fluid inclusions. There is little of interest in that fact alone, for most igneous or metamorphic minerals trap samples of the fluids involved in the origin of the host rocks. What is intriguing abut the Isua fluids is their high content of methane and brine; just as expected from low temperature hydrothermal fluids. Their chemistry compares well with that of inclusions in altered basalts from modern oceanic crust, in which bacterial activity is implicated. Metamorphism generally results in carbon dioxide as the main carbon-containing gas in fluid inclusions. Formation of methane in sea-floor environments can be biologically controlled, but the hydration of deeper ultramafic rocks to serpentine can also generate enough hydrogen to reduce CO_2 to methane abiogenically. The full association at Isua suggests carbon-dominated hydrothermal activity, which today precipitates carbonates at vents, forming so-called “white smokers”. [“Black smokers” are sulphur dominated, and take their name from the massive precipitation of metal sulphides when the fluids emerge at the seabed.] These create alkaline conditions that are well suited to bacterial growth. Touret does not claim that the inclusions indicate living processes, merely that the right conditions were around in the earliest Archaean for life to thrive. It would be an immense feat if he subsequently discovers bacterial fossils in the inclusions, but that is highly unlikely. However, the brines might provide proxy evidence, because living cells uniquely accumulate bromine from sea water. Anomalous ratios of chlorine to bromine might point strongly towards life having been around during Isua times.
See also: Hecht, J. 2003. Droplets may reveal life’s oceanic beginnings. *New Scientist*, 13 September 2003, p. 25.

PLANETARY, EXTRATERRESTRIAL GEOLOGY, AND METEORITICS

Case for Martian rainfall strengthens

“Everyone knows” about the huge valley systems on Mars, which through their relationships to other aspects of the planet’s features are thought to have formed catastrophically early in its history. The high-resolution Mars Global Surveyor images and altimetry bring a new perspective to fluvial features (Hynek, B.M. & Phillips, R.J. 2003. New data reveal mature, integrated drainage systems on Mars indicative of past precipitation. *Geology*, v. **31**, p. 757-760). The authors, from Washington University in St Louis USA, show depressions extracted from the altimetry data by simulation of the paths likely to be taken by rain water falling on the surface. In some areas, the depressions link up in dendritic networks very like those that occur on the Earth’s surface. Previous

data only picked up disconnected valleys. The newly outlined valleys are V-shaped, unlike the U-shaped systems that developed on Mars probably by sapping as groundwater emerged, either slowly or catastrophically. Such profiles are good evidence for surface run-off, and that can only indicate precipitation, either of rain, or as a result of melting snow. Only 11000 kilometres of valley segments can be identified, and are probably relics of a larger ancient system that later events have masked. Some however, reach to the rims of large craters and seem to post date them. Probably, the events that carved these systems occurred in Mars' early history.

TECTONICS

Wetting oceanic lithosphere

Loss of watery fluids from downgoing subduction zones and their rise into the over-riding mantle wedge is the main reason why arc magmas form there by partial melting under high pH_2O conditions. It is usually assumed that all oceanic crust becomes thoroughly hydrated by circulation of seawater shortly after it forms at constructive plate margins. However, many oceanic basalts from ophiolites or dredged from the ocean floor are very fresh. It also seems that to explain the depth of fluid-influenced melting in some volcanic arcs, large amounts of water must be coming from the mantle part of the subducted slab. That is more difficult to hydrate by sea-floor hydrothermal processes. German and US geophysicists have found abundant evidence for faults oceanwards of where the Cocos Plate bends to descend below the Middle America Trench (Ranero, C.R. *et al*. 2003. Bending-related faulting and mantle serpentinization at the Middle America Trench. *Nature*, v. **425**, p. 367-373). The faults show up clearly on detailed bathymetric images as wrinkles on the ocean floor off Nicaragua, and high-resolution seismic reflection profiles show that they penetrate deep into the mantle part of the Cocos Plate. Water can easily make its way down to form serpentinite from mantle peridotites just before the slab plunges down the subduction zone.