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Edição 4651 - Notícias de C&T - Serviço da SBPC

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AMBIENTE BRASIL

Desmatamento na Amazônia dá sinais de voltar a crescer
ONG e Inpe dizem que números preliminares dos últimos meses indicam alta no desmate, motivada pelo novo Código Florestal e pressões econômicas.

Ambientalistas aplaudem iniciativa de Obama contra mudança climática
Presidente americano disse, em discurso de posse, que iria reagir ao que chamou de a ameaça das mudanças climáticas.

Salmão com gene de enguia pode chegar em breve à mesa de jantar
A empresa de biotecnologia americana AquaBounty trabalha no Canadá para criar ovas de um salmão transgênico do Oceano Atlântico. Essas ovas podem se tornar salmões parecidos com seus primos naturais, mas devem chegar ao seu tamanho máximo duas vezes mais rápido.

Estudo culpa pesticidas por queda na população de anfíbios
Testes com fungicidas e inseticidas, quando usados nas proporções recomendadas, mataram 40% das rãs após sete dias e, em um caso, 100% dos anfíbios após apenas uma hora.

Arqueólogos descobrem nova espécie de raposa na África do Sul
O grupo encontrou a raposa no sítio de Malapa, que demonstrou ser uma arca de tesouros para os arqueólogos, paleontólogos e outros cientistas. Cinco anos atrás, fósseis pertencentes a uma nova espécie de homínido foram descobertos no mesmo local.

Grupo refaz expedição à Antártica realizada há um século por europeu
Exploradores navegarão 1,5 mil km pelo Oceano Antártico, dizem agências. Equipe reproduz trajeto de Ernest Shackleton, realizado em 1916.

Especialistas lançam projeto para rastrear arraias gigantes
Arraias gigantes são consideradas uma espécie vulnerável pela União Internacional pela Conservação da Natureza.

Ministério do Meio Ambiente vai mapear florestas brasileiras
O objetivo do governo é detalhar aspectos como a qualidade dos solos, as espécies existentes em cada área e o potencial de captura e emissão de gás carbônico pelas florestas.

Felinos ganham 'picolé' de carne para se refrescar em zoo de Gramado/RS
Refeição congelada ajuda animais em dias de calor, diz veterinário. Atividade também é usada para diminuir estresse de animais em cativeiro.

Brasil enviará cientistas para Centro Comum de Pesquisa da UE
O acordo de cooperação com o Brasil prevê a troca entre pesquisadores brasileiros e europeus, assim como a realização de seminários em áreas estratégicas.

Novo secretário de Estado dos EUA vê chance de 'transição' na Venezuela
John Kerry foi sabatinado na Comissão de Assuntos Exteriores do Senado. Ele disse querer desenvolver projetos energéticos e ambientais com Brasil.

CAR recebe apoio internacional
Iniciativa é a estratégia brasileira de controle do desmatamento e redução das emissões de gases efeito estufa.

Satélite soviético deve colidir contra a Terra na semana que vem
O satélite, que nunca chegou a cumprir sua função devido a um problema no sistema de orientação, sofreu uma explosão há dez anos e, por isso, perdeu parte de sua estrutura original.

Asiáticos e índios vêm de grupo chinês de 40 mil anos, mostra DNA
Cientistas analisaram osso de perna descoberto em 2003 em caverna. Primeiros humanos modernos em Pequim se diferenciavam de europeus.

Austrália tem de agir rápido para impedir que corais entrem na lista de patrimônios ameaçados
A Grande Barreira de Corais pode entrar na lista de patrimônios mundiais ameaçados, afirma ONU.

Rio de Janeiro já registrou mais de 3 mil casos de dengue neste ano
A principal preocupação é com os municípios da Baixada Fluminense e da região noroeste do estado.

Geleiras dos Andes derretem a ritmo mais rápido em 300 anos
Segundo pesquisa, o derretimento se deve a um aumento médio de temperatura na região.

Empresa americana lançará sondas para explorar recursos de asteroides
Primeira missão deve ocorrer em 2015, segundo previsão da companhia. Objetivo é explorar minerais no espaço com 'minissatélites' de baixo custo.

Pesquisas nos EUA deixarão de usar chimpanzés quase por completo
Os Estados Unidos são o único país industrializado a usar primatas em pesquisas científicas, especialmente nos estudos relacionados com a hepatite C, a Aids e a malária.

Morte de índia extingue idioma e cultura de tribo amazônica
Anciã Bose Yacu era a última a falar língua e manter tradições dos pacahuaras, etnia originalmente da Amazônia peruana.

Índios decidem combater extração ilegal de madeira no Maranhão e pedem presença da PF
Índios Pukobjê-Gavião da Terra Indígena Governador, em Amarante (MA), apreenderam, na semana passada, quatro caminhões e um trator que transportavam cerca de 20 metros cúbicos de ipê e de sapucaia derrubados por madeireiros que atuavam irregularmente no interior da terra indígena.

'Paraíso' das antas na América Latina tem mais de 14 mil animais, diz ONG
Parques na fronteira entre Peru e Bolívia abrigam grande número de antas. Estudos foram publicados no periódico 'Integrative Zoology'.

Pesquisadores revelam a verdade por trás do mito do El Dorado
Mítica cidade de ouro perdida na selva, cuja busca levou tantos à morte, era na verdade uma pessoa, dizem arqueólogos.

Cientistas terminam moratória de estudos de gripe aviária
Pesquisas sobre o vírus H5N1 foram embargadas no início do ano passado por conta de discussões sobre riscos de bioterrorismo com a publicação de seus resultados.

Cientistas descobrem fóssil de nova espécie de raposa
credita-se que a nova espécie, denominada 'Vulpes skinneri', em homenagem ao ecologista sul-africano John Skinner, tenha vivido cerca de dois milhões de anos atrás.

Documento em apoio à Aldeia Maracanã reúne mais de dez mil assinaturas

O prédio do antigo Museu do Índio, situado no entorno do Maracanã, deve ser demolido para obras de modernização do complexo esportivo do estádio para a Copa do Mundo.

Neozelandês faz campanha para erradicar gatos de seu país

Gareth Morgan criou site em que pede para que donos não tenham mais pets, senão população nativa de pássaros da Nova Zelândia será extinta.

Projeto ambiental em Parauapebas/PA, ajuda a preservar harpias

Durante dois anos, animais receberam tratamentos no parque da cidade. Aves foram enviadas ao Paraná, para garantir a reprodução da espécie.

Mudança na alimentação dos cães facilitou domesticação, sugere estudo

Cachorro aprendeu a digerir amido para ser 'o melhor amigo do homem'. Interesse mútuo de proteção e segurança alimentar ajudou no processo.

Egito encontra estátua da época dos faraós com mais de três mil anos

A estátua, que mede 180 centímetros de altura, representa a deusa Sejmet, que tem corpo humano e um sol e uma cobra em cima de sua cabeça.

Após notícia, Vaticano nega incentivo ao uso de marfim em peças sagradas

'National Geographic' apontou uso de material proveniente de elefantes. Porta-voz da Santa Sé rechaçou acusação e diz ser grave morte de animais.

CAR fortalece Cerrado

US\$ 32 milhões financiarão projetos de regularização ambiental no bioma.

Secretário-geral da ONU diz que fará pressão por acordo climático até 2015

Ban Ki-moon quer pressionar líderes mundiais para combater aquecimento. Em discurso de posse, presidente dos EUA disse que clima será prioridade.

Após fala de Obama, Casa Branca diz que vai agir contra mudança climática

Porta-voz reforçou que tema será prioridade no 2º mandato presidencial. Em seu discurso de posse, Obama declarou que vai 'reagir a ameaça'.

Empresa anuncia planos de exploração comercial de asteroides

Deep Space Industries vai lançar naves espaciais em 2016 para captar metais preciosos em asteroides.

Cheiro de gás não tóxico de usina francesa chega ao Reino Unido

Cheiro foi provocado por reação química em empresa na Normandia. Odor gerou preocupação em Paris; não há risco à saúde.

Marinha lança concurso para reconstrução de estação na Antártida

Em fevereiro de 2012, a estação foi parcialmente destruída por causa de um incêndio, quando dois militares morreram.

Prefeitos do noroeste fluminense e secretarias do Rio se reúnem para intensificar ações contra dengue

A região apresenta um grande número de casos neste verão, ao lado da Baixada Fluminense.

Material plástico no mar aumentará nos próximos 500 anos, diz cientista

Esforços para reter lixo no oceano não são suficientes. Partículas plásticas ameaçam a biodiversidade marinha.

Ruralista questiona ações da Procuradoria Geral contra Código Florestal

A PGR anunciou na segunda-feira (21) que encaminhou três Adins que apontam a ilegalidade de dispositivos da nova legislação, como o tratamento dado às Áreas de Preservação Permanentes, a redução da reserva legal, além da anistia para a degradação ambiental.

Mudanças climáticas: uma questão de educação

Pedagogos ambientais pesquisam maneiras mais eficientes de transmitir informações ambientais. O tema deve ser abordado em cursos universitários, escolas e na formação de jornalistas.

Pnuma e FAO lançam campanha para reduzir desperdício de alimentos no mundo

A proposta é revelar a situação atual e apresentar modelos que foram adotados com sucesso para minimizar o desperdício.

Naturalista britânico diz que humanos são 'uma praga sobre a Terra'

David Attenborough afirma que é preciso controlar população do planeta. Aos 86 anos e vencedor de prêmios, o britânico é pessimista sobre o futuro.

USP usa raios gama para esterilizar mosquito transmissor da dengue

Usando uma fonte de Cobalto-60, os pesquisadores fazem uma espécie de "bombardeio" de raios gama no inseto. A técnica, chamada de irradiação, já tem uso consagrado em várias outras aplicações, inclusive na indústria de alimentos.

Preservação da biodiversidade reúne mais de 100 países na Alemanha

Os países estão reunidos em Bonn, na Alemanha, definindo ações para ajudar na preservação da biodiversidade do mundo e evitar a extinção de espécies da fauna e flora mundial sob ameaça de desaparecimento.

Mais de 300 casos de queimaduras de águas-vivas são registradas em SC

As queimaduras podem causar reações graves em pessoas alérgicas. Segundo Bombeiros, durante o verão 2012, foram mais de 9 mil

casos.

Refúgio biológico em Foz do Iguaçu passa a abrigar duas harpias

Aves que saíram do Pará, chegaram ao oeste paranaense nesta terça (22). Elas viviam em um cativeiro particular; espécie está ameaçada de extinção.

Conter mudança climática exige US\$700 bi/ano, diz estudo

Relatório do Fórum Econômico Mundial diz que quantia é necessária para reduzir emissões de gases do efeito estufa e promover energias renováveis.

Projeto recolhe tampinhas de garrafa nas praias cariocas

O projeto da organização não governamental Onda Carioca tem o objetivo de recolher as tampas de metal do ambiente e conscientizar a população para a sua reciclagem.

Prêmio Mandacaru valoriza tecnologias sociais de convivência com a seca

A iniciativa prevê apoio financeiro a associações de agricultores familiares, instituições de pesquisa e organizações da sociedade civil para consolidar tecnologias sociais que viabilizem o manejo sustentável da água e da caatinga.

Águas-vivas não venenosas atraem curiosos a lago na Indonésia

As medusas do lago de água salgada de Kakaban, situado em uma região desabitada da ilha de Bornéu, na Indonésia, têm uma particularidade: perderam o poder urticante em um habitat sem espécies predadoras.

Seis entre dez grandes empresas adotam medidas 'verdes', diz WWF

Estudo diz que 102 de 171 companhias globais têm meta de reduzir CO2. Adotar energia limpa também é objetivo para boa parte dos executivos.

Pesquisadores descobrem nova espécie de sapo em Juiz de Fora/MG

Sapo pequeno e de coloração escura é fácil de ser confundido com folhas. Descoberta foi catalogada e publicada em uma revista científica alemã.

Pesquisa analisa nutrientes do leite de acordo com a dieta dos animais

Leite está sendo analisado na dieta de idosos de Ribeirão Preto, em SP. Estudo deve ser concluído até o mês de junho.

ONS: nível dos reservatórios sobe, mas térmicas vão continuar ligadas

Hoje, cerca de 60 usinas térmicas estão disponibilizando cerca de 13 mil megawatts médios de energia para o Sistema Interligado Nacional, de um total de aproximadamente 58 mil megawatts médios demandados.

Novas espécies de aranhas ganham nomes de Bono e Angelina Jolie

Homenagem ao cantor da banda U2 e à atriz foi feita por cientista dos EUA. Ele identificou 33 novos aracnídeos, alguns deles no Parque Joshua Tree.

Na posse, Obama discursa que não responder à mudança climática seria "traição a gerações futuras"

O presidente americano insistiu que "alguns ainda podem negar as provas arrasadoras da ciência", mas ninguém pode escapar "ao impacto devastador" de incêndios, secas e tempestades cada vez mais poderosas.

Terra 'foi atingida por explosão de raios gama na Idade Média'

Cientistas afirmam ter encontrado provas em árvores e no gelo de que planeta recebeu radiações de evento ocorrido na Via Láctea.

Primatas têm senso de justiça 'humano' para dividir recompensas, avalia estudo

A descoberta do Centro Nacional Yerkes de Pesquisas de Primatas da Universidade Emory sugere uma "história evolutiva da aversão à desigualdade" assim como uma preferência compartilhada de justiça ao ancestral comum de humanos e macacos.

Cientista diz que é possível clonar ancestral do homem a partir de fóssil

Geneticista precisaria de uma voluntária para gerar 'bebê Neandertal'. Procedimento não seria legal em muitos países por envolver clonagem.

Filhote de elefante é resgatado na Índia após ser abandonado pela mãe

Animal foi chamado de Tia, palavra que significa 'sorte' em dialeto. Elefante tem três meses de idade e é macho, segundo agências.

Indianos romperam isolamento da Austrália há 4 mil anos, diz estudo

Acreditava-se que o continente do hemisfério sul havia sido privado do convívio com outras populações até o desembarque dos europeus no final do século 18, mas as últimas evidências genéticas e arqueológicas invalidam esta teoria.

Rio de Janeiro inicia curso de formação de guarda-parques

220 guarda-parques atuarão na preservação e fiscalização de todos os parques estaduais, reservas biológicas e estações ecológicas do Rio de Janeiro.

Nasa mostra que seca de 2005 afetou área da Amazônia por anos

Em 2010, quando houve nova estiagem, ela ainda não havia se recuperado. Estudo sugere que pode estar havendo degradação por mudança climática.

Bicicletas brilham no escuro e podem ser carregadas com luz solar

Em busca de soluções para garantir mais segurança aos ciclistas, o Laboratório de Pesquisas de Transporte do Reino Unido concluiu que a visibilidade nas estradas é um fator fundamental.

Projetos para recursos hídricos passam de US\$ 8 bi em um ano
Em 2011, 29 países investiram em mais de 205 iniciativas, diz organização. Brasil tem desafio com aproximação da Copa do Mundo, afirma ONG.

Projeto pedagógico sobre manejo florestal é implantado no Pará
Oficinas do projeto Florestabilidade iniciam nesta segunda-feira (21). Primeiro município a receber o projeto é Santarém, no oeste do estado.

Convenção sobre o mercúrio é adotada por mais de 140 países
Acordo deste sábado prevê a redução das emissões globais de mercúrio. ONU diz que exposição ao mercúrio ameaça saúde de mais de 10 milhões.

Mais de 300 animais são retirados de uma casa em Ohio, nos EUA
Homem mantinha grande número de pombos, galinhas e coelhos. Autoridades foram avisadas após queixas sobre mau cheiro da casa.

Governo vai autorizar R\$ 394 milhões para obras do Projeto São Francisco
Os recursos vão permitir o início das obras complementares da Meta 1N, composta por cinco lotes e pelo canal de aproximação.

China avalia medidas de emergência para controlar poluição na capital
Regras devem incluir fechamento de fábricas e corte na queima de carvão. Cidade tem registrado níveis alarmantes de poluição do ar.

Pernilongos podem sobreviver até três meses após criadouros serem destruídos
Altas temperaturas, chuvas intercaladas e o precário saneamento básico em algumas regiões das cidades propiciam uma maior proliferação e desenvolvimento do pernilongo.

Estudo explica por que cães e lobos são tão diferentes
Pesquisadora descobriu que filhotes começam a explorar o mundo de forma distinta durante o desenvolvimento e isso explica porque lobos não conseguem ser domesticados.

Projeto concilia produção lucrativa com preservação da floresta no PA
Projeto foi implantado em Paragominas, no Pará. Agricultores e pecuaristas conciliam produção com preservação da floresta.

ONGs buscam novas formas de mobilizar colaboradores
Ativismo online traz desafios à organizações, como manter interesse de simpatizantes e tirá-los da frente do computador.

Pará concentra municípios que mais destroem a Amazônia brasileira
Desmatamento se acumula Altamira, Itaitubax e Novo Progresso. Constatação é do Imazon.

Cientistas encontram evidências de um antigo lago em Marte
Informações obtidas pelo espectrômetro MRO mostram vestígios de carbonato e minerais de argila, geralmente formados na presença de água, na parte inferior da cratera McLaughlin, a 2,2 quilômetros de profundidade.

Zoo de Belo Horizonte recebe oito mamíferos ameaçados de extinção
O zoo receberá três fêmeas de mico leão de cara dourada, um macho de elande, uma fêmea e um macho de mico leão dourado, uma fêmea de gato palheiro e uma fêmea de cervo do pantanal.

Programa de reciclagem transforma bitucas de cigarro em plástico
Lançado em maio no Canadá, o programa de reciclagem de pontas de cigarro da sua empresa TerraCycle garante a coleta do material descartado e a transformação das bitucas em plástico.

Cientistas flagram 'alquimia' de bactéria da hanseníase
Invasor transformou neurônios de hospedeiro em células-tronco e musculares.

Peixe de Fukushima tem radiação 2.500 vezes maior que limite legal
Espécime foi capturado para monitoramento em área de desastre. Tsunami atingiu usina no Japão em 2011, dispersando material nuclear.

Agência dos EUA dá recompensa a quem capturar pítons na Flórida
Órgão estadual oferece US\$ 1,5 mil a quem encontrar mais serpentes. Píton birmanesa não é nativa dos EUA e é uma ameaça ao ecossistema.

Países pobres são destino de 80% do lixo eletrônico de nações ricas, diz OIT
Nações carecem da infraestrutura e legislação para absorver elevado fluxo. Segundo Organização Internacional do Trabalho, Ásia é principal destino.

Cientistas investigam vacinas contra o mal de Alzheimer
Duas descobertas abrem caminho para futuros tratamentos e vacinas contra a doença, possivelmente nos próximos anos, talvez no máximo uma década, depois de testes em seres humanos. Os dois estudos foram feitos apenas em camundongos.

Campo Grande/MS registra 700 suspeitas de dengue por dia
Ao todo, nove cidades sul-mato-grossenses contabilizam mais de 300 casos para cada 100 mil habitantes, incidência considerada alta.

Animal com intestino em 'U' muda árvore evolutiva de espécie marinha

Com o intestino em "U" que deixa o ânus perto da boca, rodeado de pequenos tentáculos, o animal marinho pré-histórico denominado Cotyledion tylodes pode estar em condições de mudar um aspecto da árvore evolutiva das espécies marinhas.

Toninha está cada vez mais ameaçada, alerta pesquisador

Cientista estima que pelo menos mil morram por ano no litoral do Brasil. Animal é um dos menores golfinhos do mundo.

Estudo liga perda de árvores a mais mortes por doenças cardiovasculares

Óbitos por males respiratórios também aumentaram, dizem autores. Perda de vegetação nos EUA foi provocada por espécie de broca.

Qualidade de vida piora em São Paulo, informa pesquisa

Dos 16 itens que medem a qualidade de vida na capital paulista, quatro tiveram notas superiores a 5,5, consideradas o valor médio que define a satisfação média da população pelos critérios adotados pela pesquisa.

14 / 01 / 2013 Tremor de 5,2 graus na escala Richter afeta região norte do Chile

O tremor de terra deste domingo (13) foi sentido às 18h24 local (19h24, horário de Brasília) e seu epicentro ficou situado a 31 quilômetros ao norte de Pica, 1.780 quilômetros de Santiago, e a 83 quilômetros de profundidade.

14 / 01 / 2013 Área de 12,4 milhões de hectares será protegida de forma integrada

O elenco, formado por cinco UCs, uma floresta nacional e três terras indígenas, será administrado por um conselho consultivo, que atuará como instância de gestão integrada e participativa dessas áreas protegidas, como estabelece a Portaria nº 4, publicada em 3 de janeiro deste ano no Diário Oficial da União.

14 / 01 / 2013 Ciclistas cruzam a Transamazônica para analisar urbanização da floresta

Três brasileiros começaram neste domingo jornada entre o Pará e Amazonas. Dados coletados vão comparar região atual com a de 20 anos atrás.

14 / 01 / 2013 Em caminhada de 7 anos, americano refaz jornada da evolução humana

Paul Salopek deve andar 30 milhões de passos, da Etiópia à Terra do Fogo, seguindo passos de nossos antepassados há milhares de anos.

14 / 01 / 2013 Lucrativo, contrabando de alho chama atenção da Europa

Contrabandistas aproveitam que produto é produzido a preços baixos na China e sobretaxado na Europa.

14 / 01 / 2013 População de atum valioso caiu 96% no norte do Pacífico, diz pesquisa

Atum-rabilho corre risco de extinção devido à pesca predatória. Valor elevado dificulta proteção; peixe chega a custar milhões de reais.

14 / 01 / 2013 Desocupação do antigo prédio do Museu do Índio será feita a partir desta segunda-feira

Construído há 147 anos, o prédio abrigou a sede do Serviço de Proteção ao Índio, antecessor da atual Fundação Nacional do Índio (Funai). De 1953 a 1977, ali funcionou o museu, criado pelo antropólogo Darcy Ribeiro. Desde 1978, o Museu do Índio está instalado em um casarão na Rua das Palmeiras, em Botafogo, zona sul do Rio.

14 / 01 / 2013 Bioindicadores marinhos auxiliam análises de impacto ambiental

Presença de metais pesados em organismos vivos dos sedimentos marinhos de região analisada foi ligeiramente maior do que a constatada na própria água do mar, indica estudo.

14 / 01 / 2013 Após seis dias, incêndio na Chapada Diamantina/BA é controlado

Antes do final de semana o incêndio já havia consumido ao menos mil hectares de vegetação, o equivalente a área de seis parques Ibirapuera (SP).

14 / 01 / 2013 Eletronuclear contrata estudo do tráfego na rodovia onde se situam Angra 1 e 2

O foco do trabalho será o trecho da rodovia compreendido entre os municípios de Angra dos Reis e Paraty, no litoral sul fluminense, onde está situada a Central Nuclear Almirante Álvaro Alberto. Ali funcionam as usinas nucleares Angra 1 e 2 e se constrói Angra 3.

14 / 01 / 2013 Observatório espacial é ameaçado por incêndio florestal na Austrália

Siding Spring possui 10 telescópios gigantes. Local é um dos maiores e mais sofisticados observatórios do mundo.

14 / 01 / 2013 Cidade americana proíbe a venda de garrafinhas de água

Para ativistas da cidade de Concord, reduzir o uso de garrafas plásticas vai diminuir o desperdício do material e a demanda pela matéria-prima de origem fóssil usada na fabricação.

14 / 01 / 2013 Agricultura da região serrana do Rio volta a mostrar força

Municípios da região foram afetados pelas fortes chuvas que atingiram o estado em janeiro de 2011, matando mais de 900 pessoas.

14 / 01 / 2013 Cresce população de leões-marinhos ameaçados nas Ilhas Galápagos

Leve alta na quantidade de espécimes foi registrada em 2012. Censo foi realizado pelo Parque Nacional de Galápagos, no Equador.

14 / 01 / 2013 China emite alerta devido à camada de poluição que cobre metade do país

Em Pequim, pontos turísticos como a Cidade Proibida ficaram encobertos. Governo pede que máscaras sejam utilizadas por moradores.

14 / 01 / 2013 Eventos climáticos extremos se intensificam

O ano de 2012 provavelmente ficará na história como um período de eventos climáticos extremos, tendência que tem se mantido nas primeiras semanas de 2013.

14 / 01 / 2013 Termina dia 17 consulta pública para o "IPCC" brasileiro

O Volume 3: Mitigação das Mudanças Climáticas, trabalho que integra o Primeiro Relatório de Avaliação Nacional (RAN1) do Painel Brasileiro de Mudanças Climáticas.

14 / 01 / 2013 Redução imediata de CO2 pode evitar enchentes e secas
Especialistas britânicos e alemães explicaram que a redução imediata nas emissões poderia retardar alguns impactos por décadas e prevenir outros por completo.

15 / 01 / 2013 Pesquisa investiga elo entre poluição do mar e tumores em tartarugas
Espécie ameaçada sofre doença causada por contaminação química. Estudo brasileiro quer entender impacto na população de tartarugas.

15 / 01 / 2013 Chimpanzés têm senso de justiça parecido com o humano, diz estudo
Pesquisadores aplicaram jogo em 20 crianças de 2 a 7 anos e 6 primatas. Egoísmo mostrado pelos participantes aumentou quando regras mudaram.

15 / 01 / 2013 Estrela mais antiga já vista tem mais de 13 bilhões de anos, diz estudo
Astro é quase tão antigo quanto o próprio Universo, afirmam cientistas. Conhecida como HD 140283, estrela é estudada há mais de um século.

15 / 01 / 2013 Mosquitos catalogados e prontos para estudos
Projeto Temático conduzido na Faculdade de Saúde Pública da USP organiza a catalogação de mosquitos do gênero Anopheles e aumenta em 76% o número de espécies conhecidas. Material servirá para pesquisa por diversos anos.

15 / 01 / 2013 Incêndios na Austrália danificam observatório astronômico
O observatório, que é administrado pela Universidade Nacional Australiana, foi construído na cordilheira Warrumbungle, a cerca de 500 quilômetros ao noroeste da cidade de Sydney, por causa da altitude, da baixa umidade e do ar limpo da região.

15 / 01 / 2013 Controle de emissões pode baixar em até 65% impacto de aquecimento
Em um ambiente com medidas severas para reduzir as emissões, o impacto das consequências é reduzido entre 20% e 65%, dependendo da área considerada. Algumas delas, inclusive, podem ser evitadas por várias décadas.

15 / 01 / 2013 São Paulo quer aumentar coleta seletiva para 10%
Atualmente, cerca de apenas 1,2% dos resíduos produzidos na cidade são enviados às centrais municipais de triagem, que encaminham o lixo para reciclagem.

15 / 01 / 2013 Índios pedem audiência ao governador do Rio para tentar impedir demolição de antigo museu
Segundo o cacique Carlos Tukano, líder de um grupo de 20 índios de 14 etnias que desde 2006 vive na chamada Aldeia Maracanã, o local tem importância histórica por simbolizar a luta por terra e por difundir a cultura indígena.

15 / 01 / 2013 Chuvas melhoram situação dos reservatórios das usinas hidrelétricas
Segundo o Operador Nacional do Sistema, todas as térmicas estão despachando a plena carga para garantir a energia necessária ao país e que não há, portanto, qualquer risco de racionamento.

15 / 01 / 2013 Ministério vai finalizar neste ano mecanismo de Redd+
Um dos focos dessa política será avaliar o potencial da floresta amazônica como mecanismo de combate às mudanças climáticas.

15 / 01 / 2013 Incêndio na Chapada Diamantina é controlado
O fogo que começou há uma semana destruiu uma área de vegetação com cerca de 1.000 hectares.

15 / 01 / 2013 Enchente deixa 240 pessoas desabrigadas em São Luiz do Paraitinga/SP
Na sexta-feira (11), o rio ficou 3,8 metros acima do normal e nesta segunda-feira (14) permanece 2,5 metros além do nível comum. Há três anos o centro histórico do município foi praticamente destruído por uma enchente.

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EARTH PAGES

Porphyry deposits and the fracking mechanism

Posted on January 19, 2013 by Steve Drury | [Leave a comment](#)

Porphyry sculpture of two of the four co-emperors of the late Roman Empire – the Tetrarchy (credit: mhobl via Flickr)

For about a century a style of mineral deposit that develops in and around shallow, silicic magma chambers has dominated world supplies of copper, molybdenum and, more rarely, tin. They are also enriched in other valuable elements, including gold and silver, which makes these deposits even more attractive to mine. Hosting them are fine-grained diorites and granodiorites that typically contain large crystals of quartz and feldspar set in the finer material. Technically such rocks are called porphyries; well not so technical because the name derives from many porphyries having a colour much valued by Egyptian and especially Roman sculptors and architects – a reddish purple close to that on the hem of a nobleman's toga. The dye comes from the 'purple' fish – the marine mollusc *Murex brandaris* – which the ancient Greeks referred to as *porphura*. In Rome, 'The Purple' were the nobles, and today they are the cardinals.

The connection is coincidental, the best and most enduring rocks for sculpting and making pyramids are of this kind, but happen to be purple. Of course, there are igneous rocks with the eponymous texture but different colours, but stonemasons in the ancient world never bothered to give them a special name

The porphyritic texture signifies to virtually every geologist a magmatic history in which an igneous magma resided deep in the crust slowly crystallizing large mineral grains. Then, for one reason or another, it was blurted towards the surface. Porphyry copper and molybdenum deposits have a disturbingly phallic shape; a tall, rough cylinder capped by a bell-shaped zone of mineralisation. And they are pretty big, the largest at Bingham Canyon in Utah, USA once having been ~2.5 km tall and 0.5 km wide, with a 2 km, bell-shaped zone of mineralisation affecting the intrusion and its surrounding country rock.

The world's largest open-pit mine in the porphyry copper deposit at Bingham Canyon Utah (credit: Wikipedia)

Porphyry ores are not much for the rock aficionado to shout about and they are characterized by very low grades of ore, the metal-sulfide ore minerals and any gold being barely visible. They are economic because there is a great deal of rock with copper and molybdenum contents often less than 0.5%, and economic gold values less than a part per million (0.03 troy oz t-1). The bulk and the diversity of metals make mining porphyry deposits profitable. The ore minerals occur in tiny cracks that pervade the deposits forming a 'stockwork'. That is where this style of mineralisation has a link with fracking shales to release their gas content. Stockworks are produced by very high-pressure steam that explosively fractures every cubic metre of the orebody. Crystallisation of sulfides and barren minerals keeps the fractures open until the system runs out of steam and mineralising fluids. Modelling of the thermodynamics associated with porphyry intrusions now suggests that once pressure and temperature stabilise at the requisite levels the hydraulic fracturing becomes self-sustaining (Weiss, P. et al. 2012. Porphyry-copper ore shells form at stable pressure-temperature fronts within dynamic fluid plumes. *Science*, v. 338, p. 1613-1616). The key is the 'fracking' and as 'shells' with the right conditions migrate through the upper part of the intrusive system groundwater is drawn in to the freshly permeable rock to dissolve, transport and, where chemical conditions permit, to precipitate metals in the cracks. The modelling suggests a fundamental process that extends from plutonic systems, through volcanic edifices, hydrothermal processes in shallower rocks and active geothermal systems that vent to the surface.

Stockwork in copper-molybdenum porphyry deposit in Mexico (credit: Sundance Minerals)

In many respects the universality of hydraulic fracturing associated with increased heat flow, which itself can affect the crust repeatedly, may be the key to the concept of 'metallogenic provinces'. These are large areas in which economic mineralisation of many styles but with much the same 'blend' of metals seems to have formed again and again during crustal evolution. Such provinces emerged from exploration and mining to present explorationists with the old adage, 'To find an elephant go to elephant country'. Now there may be a theoretical basis on which new discoveries may be made.

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Posted in Economic and applied geology

Tagged Fracking, Hydraulic fracturing, Hydrothermal, Mineralisation, Porphyry copper deposit

On-line global geological maps

Posted on January 14, 2013 by Steve Drury | Leave a comment

Global geological map (credit: Commission for the Geological Map of the World)

Getting hold of geological maps on-line has been a hit or miss affair until recently, and those made available for free are at a variety of scales (generally less than 1:10 million) and vary in reliability and information content. Scanned versions of paper sheets rendered with JPEG compression can leave a lot to be desired. If you are able to pay, then the situation improves as there are on-line vendors of printed geological maps. But, all told, browsing the world's geological features is a slow and generally frustrating task. The best bet might seem to be the Commission for the Geological Map of the World (<http://ccgm.free.fr/>). They do, as you might expect, sell global maps, but at 1:50 million detail is sparse, although there is an alternative 3-sheet set (Old World, Americas and Polar regions) at 1:25 million, and it is possible to purchase digital versions and a variety of geophysical sheets. Maps at 1:5 million are available for Europe, Africa (6 sheets), the Middle East and South America plus various tectonic maps. However, to explore full planetary-scale geology at the modestly informative scale of 1:5 million demands visiting a lot of on-line vendors, as there is no one-stop shop for geologists

Small-scale extract from the OneGeology portal with 1:2 million maps for Ethiopia, Kenya, Tanzania and Uganda, and at 1:10 million covering surrounding areas (credit:OneGeology portal)

Such frustration is set to change, because in the last few years there have been moves to compile digital geology in a manner akin to Google Earth, now available at the OneGeology portal (<http://portal.onegeology.org/>). As soon as you enter the portal, the reason why the Commission for the Geological Map of the World is so irritating immediately becomes clear: the CGMW world map is what shows at the global scale and it doesn't show much. Progressive zooming-in removes the 1:50 million map, to be replaced by a compilation of regional maps at scales ranging from 1:2 million to 1:12.5 million scales that does cover the entire Earth's continental surface. A mouth-watering prospect until you start to look for legends! In fact, the associated tool box provides a means of pointing to individual stratigraphic units on the maps to get information (metadata), but whether and how it works depends on the source of the maps and the scale of viewing. For instance, the 1:10 million map of Africa gives no information, while the 1:5 million map of Europe gives quite a lot.

With a zoom to better than 1:10 million display, lots more detail appears in the form of country maps, but coverage is not comprehensive. In East Africa country maps are available for Ethiopia, Kenya, Rwanda and Tanzania – ranking with the current offerings from the USA. Moving to Europe, the range of scales improves on a country-by-country basis, generally 1:1 million to 1:250 thousand, but the UK truly grabs attention by providing digital geology at up to 1:50 thousand scale. The British Geological Survey has systematically rendered all its bedrock map data digitally to this scale, and is to be congratulated at making the 'Full Monty' available on the OneGeology portal. Full BGS metadata shows for all the visible stratigraphic and lithological units, together with faults and superficial deposits.

British Geological Survey bedrock mapping in Cumbria at 1:50 thousand scale. (credit: OneGeology portal)

It soon becomes clear that OneGeology is a work in progress, but what a work it will be! If I have a criticism it is that geology is not

linked to topography and cartographic features. The ever-present base data is the NASA Blue Marble mosaic of natural colour MODIS imagery. Unfortunately, outside of areas bare of vegetation this does not have any useful lithological connection, and is presented at such a large pixel size that only the coarsest topography shows up. At scales better than 1:2 million it is an irritating patchwork of square pixels. Far better would be shaded relief based on the ubiquitous ASTER GDEM data at up to 30 m resolution, especially as it is possible to vary the opacity of the geological maps to show the link with surface morphology. Maybe that is on its way and possibly oblique perspective 3-D viewing: one has to bear in mind that Google Earth wasn't built in a day and geoscientific data are not yet standardised – a hugely costly endeavour, as that would involve not only digitising all maps but lengthy negotiations.

Most geologists are likely to be interested in maps that show rock units with stratigraphic age, but Jens Hartmann and Nils Moosdorf of the University of Hamburg, German have mined regional geological maps to assemble a global, purely lithological database (Hartmann, J. & Moosdorf, N. 2012. The new global lithological map database GLiM: A representation of rock properties at the Earth surface. *Geochemistry, Geophysics, Geosystems*, v. 13, doi:10.1029/2012GC004370) in cooperation with CGMW. Their Global Lithological Map (GLiM) consists of over 1.25 million digital polygons (ESRI shape or *.shp format), classified lithologically in three levels to give a total of 42 rock-type classes, 16 used in previous global lithological maps and two more lithologically specific sets of 12 and 14 subclasses. Though the database is said to be presentable at up to 1:3.75 million scale, the version of GLiM that the reader can download is not in vector format but as a series of cells numerically coded according to class in a georeferenced grid. Since that is 360 rows x 720 columns, i.e. 0.5 degrees of latitude by 0.5 degrees of longitude, that version is useful only for rough statistics, such as the percentage of North America that is covered by evaporates, for instance. Perhaps the most useful aspect of the GLiM paper is the comprehensive referencing of the source maps. GLiM, apparently, is not an on-line resource, but no doubt the authors can provide interested parties with the *.shp files (contact jens.hartmann@zmaw.de or nils.moosdorf@zmaw.de)

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Fracking leaks

Posted on January 9, 2013 by Steve Drury | 2 Comments

David Cameron speaks (credit: Wikipedia)

The start of 2013 saw a massive puff from the British government for development of shale gas, Premier David Cameron crying 'Britain must be at the heart of the shale gas revolution'. Fearful of the rapidly growing shift from Britain's natural-gas self reliance to dependence on the Gulf, Russia and Norway the Conservative-Liberal Democrat coalition gave the green light for 'frack drilling' to restart. This followed a pause following seismicity in the Blackpool area that attended Cuadrilla's exploratory drilling into the gas-rich Carboniferous Bowland Shale thereabouts. There is also a nice sweetener for the new industry in the form of tax breaks.

Boris Johnson holds a model London red bus (Photo credit: Wikipedia)

London Mayor Boris Johnson, a possible contender for Tory leadership, seems pleased. And perhaps he should be, as the Lib-Con coalition will be tested because the junior partners depend electorally, to some extent, on 'green' credentials. The Lib-Dem Energy Minister, Ed Davey, seemingly favours an automatic halt to drilling should there be seismicity greater than 0.5 on the Richter scale; an energy level less than experienced every day in London from its Underground trains. Political commentators have forecast that green issues may exacerbate tensions within the coalition in the second half of its scheduled 5-year term, especially as the electorate seems set to reduce the Liberal Democrat partners to irrelevance in future elections.

Natural gas's biggest 'green' plus is that being a hydrocarbon its burning releases considerably less CO₂ than does its coal energy equivalent, the hydrogen content becoming water vapour. Yet the dominant gas is methane, which has a far larger greenhouse effect than the CO₂ released by its burning. To avoid that presenting increased atmospheric warming, extracting natural gas needs to avoid leakage. Unfortunately for those bawling lustily about the economic potential of fracking source rocks such as the Bowland Shale, recent aerial surveys over US gas fields will come as a major shock. At the annual meeting of the American Geophysical Union in early December 2012 methane emissions from two large gas fields in the western US were released (Tollefson, J. 2013. Methane leaks erode green credentials of natural gas. *Nature*, v. 493, p. 12). They amount to 9% of total production, which would more than offset the climatic 'benefit' of using natural gas as a coal alternative.

A shift from coal to natural gas-fuelled power generation would slow down climatic warming, if leakage is kept below the modest level of 3.2% of production. So if the latest measurements are an unavoidable norm for gas fields then natural gas burning in fact increases global warming. Even more telling is that, until the shale 'fracking revolution', gas was produced by drilling into permeable reservoir rocks capped by a seal rock – usually a shale. The gas would not have leaked except from the well itself. Fracking, by design, increases the permeability of what would otherwise be a seal rock – hydrocarbon-rich shale – over a large area.

Schematic cross-section illustrating types of natural gas deposits (credit: Wikipedia)

Aerial analyses to check emissions over oil and gas fields, let alone over shale-gas operations, are not widespread. However, the technology is not new. Where emissions are strictly enforced in populated areas, as over oil terminals and refineries, overflights to sample the air have been routine for several decades. Little mention is made of such precautionary measures in the promotion of fracking.

Another point is that as well as often being far from habitations, US shale-gas operations are generally into simple stratigraphy and structure. The Lower Carboniferous Bowland Shale now being touted as fuel for Britain's escape from a descent into economic depression, with its estimated 200 trillion cubic feet of as potential, is intensely faulted and broadly folded, having experienced the Variscan orogeny at the end of the Palaeozoic Era. The complexity and pervasiveness of this brittle deformation is amply shown by geological maps of former coalfields that incorporate subsurface information from mine workings. The Bowland Shale lies below the Upper Carboniferous Coal Measures, many of the likely targets for fracking have never been subject to intensive underground mining simply because the Coal Measures were eroded away tens of million years ago. Consequently the degree to which many fracking targets

may be riven by surface-breaking faults and fracture zones is not and possibly never will be known in the detail needed to assess widespread methane leakage.

Sometime in early 2013, the British Geological Survey is set to release estimates of the Bowland Shale gas reserves, in which its detailed mapping archives will have played the major role. That report will bear detailed scrutiny as regards the degree to which it also assesses potential leakage.

Related articles

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Publishing: is it worth the effort?

Posted on December 31, 2012 by Steve Drury | Leave a comment

A measure of the esteem in which a peer-reviewed paper is held is supposedly the number of times to which it is referred in other papers. Of course, the older a paper is the more chance that such citations will have built up; but the annual rate of citation is likely to fizzle out over time. Papers that create a frisson of initial excitement and command enduring citation are few and far between: they probably launched a new line of inquiry.

It is instructive to try to nail Alfred Wegener's influence in tectonics using the Web of Science, which ought to have been pretty high. Superficially, he had none and is remembered through that arm of Thomson Reuters for six papers: four on atmospheric physics – his speciality; one on lunar craters and a sixth on the patterns of cracking seen on rotten wood. These give him a mere 20 citations. Wegener's posthumous problem was that *Die Entstehung der Kontinente* first appeared in the fourth issue of *Geologische Rundschau* in 1912, and seemingly the Web of Science doesn't have that journal in its archives of a century ago. Later, extended editions appeared in book format which were not peer reviewed (most geoscientists would not touch his ideas with a barge pole until long after his death in 1930), and are therefore outside the academic pale. The key to a plausible mechanism for continental drift – symmetrical magnetic striping above ocean basins – was first described by Fred Vine and Drummond Matthews in an issue of *Nature* in 1963. In 50 years their work, ranking with discovering the structure of DNA, has accumulated 709 citations; i.e. 38.5 citations per year on average, which is not much for fuelling a revolution.

Alfred Wegener, the unsung hero of continental drift(credit: Wikipedia)

Of course, citation is not the same as the frequency at which a paper is read. It is no secret that a not inconsiderable number of papers that appear in published reference lists haven't been read by the authors who cite them. They are there by proxy, and you will probably find them in the bibliography of later papers that those same authors have cited. There is perhaps a certain kudos in such proxy citations, for it may be that the cited paper has achieved the equivalent of canonical status in the field.

Citation frequency is something of a lottery: language of publication; discipline (since 1953 Crick and Watson achieved three times Vine and Matthews's average citations); date of publication (E. Komatsu of the University of Texas at Austin has already had 1939 citations for his February 2011 paper 'Seven-Year Wilkinson Microwave Anisotropy Probe Observations: Cosmological Interpretations' published in a supplement to the *Astrophysical Journal*; nine times the rate of Crick and Watson, but the paper is about the origin of everything)

Interestingly, the December 2012 issue of *Geology* presents stats on the most cited papers that it has published since 2000 (Cowie, P.A. 2012. Highly cited *Geology* papers (2000-2010) – What were they and who wrote them? *Geology*, v. 40, p. 1147-1148). *Geology* is among the highest ranking journals in the geoscience field, and had an impact factor of 4.8 over the last 5 years. A journal's impact factor is the number of times all articles published in a 2-year period were cited in all indexed journals in the year following them, divided by the total number of articles published in the two years by the assessed journal. So, papers published in *Geology* between 2007 and 2011 were cited on average 4.8 times in the year following publication. This journal is a useful source of citation statistics as it covers the full range of geoscience and all papers are limited to 4 printed pages, thereby forcing authors to be concise and clear in their writing and illustration. Consequently it is popular, which, incidentally, may explain its high impact factor.

Of the 33 papers cited most between 2000 and 2010, 14 are on topics relating to Tibet and China. There are 3 on oceanography; 3 on paleontology and extinctions; 6 on palaeoclimatology; 10 on tectonics and 10 on magmatism (3 of which were about rare adakites formed by partial melting of subducted oceanic crust). I haven't read all of the papers, and the stats on topics may tell us very little, but I would bet that papers about geology in high-population emerging countries – China, India and Brazil – are met gleefully by rapidly growing communities of eager young geoscientists. It may even be worth a flutter on adakites as the 'next big thing' in petrogenesis. Mind you, it looks like I am not likely to be the best punter for hot papers, as out of the 33 'top-3' papers since 2000, only 6 made it into Earth Pages, and of those only one between 2004-2010.

The digest goes on to show that year-by-year as many as 10 % of papers in *Geology* are not cited at all, up to 70% are cited between 1 and 5 times per year, while less than 10% get 10 or more citations in a year. Oddly, the author suggests that a dip in citations of *Geology* papers in recent years may reflect the launch of *Nature Geoscience* in 2008. Yet glossy as that new addition to the *Nature* stable might be, it has become something of a desert for papers on geology. Then there is evidence for both 'vintage' and 'just-about-drinkable' years in *Geology* citations: the 'top ten' papers in 2001, 2005, 2006, 2008 and 2010 ranged from 10-15 citations for the tenth to 20-25 for the 'hottest' paper, while in 2000, 2002, 2003, 2004, 2007 and 2009 the most cited papers stood well above the rest at 32 to 55 citations per year. But that may just reflect the uneven pace at which well-received and provocative work emerges.

So, it begins to seem, from *Geology* at least, that for most geoscience authors publishing isn't going to raise much hope as far as jobs or promotions are concerned. Yet if results are not published funding agencies may become fractious about your next grant application, and of course, university science departments puff themselves with annual publication rates (though rarely citation records, which as far as geosciences goes could be a wise move). But it is a matter of academic duty to publish for the record; even if a paper fills just one tiny niche the cumulative effect of publically available knowledge does eventually result in breaks through – one never knows... It could be a

salutary lesson should publishers release data on hits for on-line PDFs of papers, as that would give some indication of how many readers individual papers have, but as for a 'like this' button or a means of star rating I think we have to venture into the deeper recesses of academic conservatism one small step at a time.

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Is the Relationship Between Journal Impact Factors and Article Citations Growing Weaker? (scholarlykitchen.sspnet.org)

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A glimpse of the deep Moon

Posted on December 30, 2012 by Steve Drury | Leave a comment

Charting the variation in gravitational potential across a planet provides a measure of the distribution of mass beneath its surface. That depends on both the planet's actual shape and on internal variations in rock density. The Earth's gravity has been mapped with varying degrees of precision, depending on sample spacing, by surface measurements using gravimeters. Doing gravity surveys from space cannot be so direct, however. One ingenious approach for the gravitational field over the oceans is to measure the mean height of the ocean surface using radar beams from a satellite. Since this is affected by variations in the gravitational field, partly due to bathymetry and partly because of varying density beneath the ocean floor, removing the calculable bathymetric effect leaves a gravitational signal from the underlying lithosphere and deeper mantle. The first satellite to illuminate the Earth with radar microwaves, Seasat, gradually built up such a gravitational map of the deep Earth over a period of 105 days in 1978, which was followed up by other satellites such as the ERS series and Topex-Poseidon.

The GRAIL satellites in lunar orbit (credit: Wikipedia)

It is not so easy to map gravity precisely above a solid planetary surface, but through the GRACE experiment this can be done by measuring very precisely the distance between a pair of satellites that follow the same orbit. As the gravitational field changes so too does the separation between the tandem of satellites; an increase in gravity pulls the satellites closer together and vice versa. GRACE has provided some fascinating data, such as estimates of the withdrawal of groundwater from large sedimentary basins and shrinkage of ice caps. However, GRACE is limited in its resolution of gravitational anomalies by the fact that Earth has an atmosphere above which such tandems must be parked in orbit to avoid burning up. The higher the orbit, the more degraded is the resolution. This effect is much less for Mars and non-existent for the Moon.

Gravity field of the moon as measured by NASA's GRAIL mission. The far side of the moon is at the centre, whereas the nearside (as viewed from Earth) is at either side. (credit: NASA/ARC/MIT)

A sister experiment to GRACE has been orbiting the Moon since September 2011: the Gravity Recovery and Interior Laboratory (GRAIL). First the tandem orbited at 55 km, then 22 and for a brief period 11 km, before running out of thruster fuel on 17 December 2012 and crashing into the lunar surface. Results from the highest orbit resolve lunar gravity to 13 km cells, recently reported on-line in three papers (Zuber, M.T. and 16 others 2012. Gravity field of the Moon from the Gravity Recovery and Interior Laboratory (GRAIL) Mission. *Science*, doi 10.1126/science.1231507; Wieczorek, M.A. and 15 others 2012. The crust of the Moon as seen by GRAIL. *Science*, doi 10.1126/science.1231530; Andrews-Hanna, J.C. and 18 others 2012. Ancient igneous intrusions and early expansion of the Moon revealed by GRAIL gravity gradiometry. *Science*, doi 10.1126/science.1231753). From crater gravitational signatures due to variations in surface topography it seems that the early bombardment of the lunar surface far exceeded previous assumptions. Impact effects dominate the GRAIL data at this resolution, but 2% of the information relates to structures hidden at depth.

500 km linear anomaly in the Moon's far-side gravitational field. (credit: NASA/JPL-Caltech/CSM)

There are linear gravity anomalies extending over hundreds of kilometres, which may be huge igneous intrusions in the form of dykes; perhaps reflections of early influences of early extensional tectonics in the Moon's lithosphere. Estimates point to this having been due to an up to 5 km increase in the lunar radius, probably as a result of thermal changes. The dominant feature of the lunar surface is not the near-side flat basaltic maria, visually prominent as they are, but the far more rugged lunar highlands which stand far higher because of the lower density of their constituent feldspar-rich anorthosites. GRAIL permitted a bulk estimate of the density of highland crust that turned out to be substantially lower, at 2550 kg m⁻³ – compared with 2600-2700 for granite and 2800-3000 for basalt – than originally estimated from samples returned by the Apollo mission. This forces a reassessment of the thickness of highland crust from 50-60 km to between 34 and 43 km, with a near-surface layer that has a porosity of around 12%, probably resulting from its awful battering. A thinner highland crust than previously assumed presents a bulk geochemical picture that need not be more enriched in 'refractory' elements, such as aluminium and calcium, than is the Earth.

Such unanticipated results from the low-resolution mode of the GRAIL experiment have its science team almost salivating at prospects from the sharper 'pictures' that will arise from the lower altitude orbits.

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Violent past revealed by map of moon's interior (sciencenews.org)

NASA moon-mapping mission to come to a crashing end (thehimalayantimes.com)

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Tagged Geology of the Moon, GRAIL, Gravity Recovery and Interior Laboratory, Moon

The Ediacaran fossils: a big surprise

Posted on December 17, 2012 by Steve Drury | 2 Comments

Ediacara sandstones in the Flinders Ranges of South Australia (credit: Wikipedia).

The first macroscopic life forms were the enigmatic bag-like and quilted fossils in sedimentary rocks dating back to 635 Ma in Australia, eastern Canada and NW Europe. They are grouped as the Ediacaran Fauna named after the Ediacara Hills in South Australia where they

are most common and diverse. Generally they are not body fossils but impressions of soft-bodied organisms, often in sandstones rather than muds. Some are believed to be animals that absorbed nutrients through their skin, whereas others are subjects of speculation. One thing seems clear; these first metazoans arose because of some kind of trigger provided by the global glacial conditions that preceded their appearance. It has always been assumed that, whatever they were, Ediacaran organisms lived on the sea floor, probably in shallow water. New sedimentological evidence found in the type locality by Gregory Retallack of the University of Oregon seems set to force a complete rethink about these hugely important life forms (Retallack, G.J 2012. Ediacaran life on land. *Nature* (online), doi:10.1038/nature11777). So momentous are his conclusions that they form the subject of a *Nature* editorial in the 13 December 2012 issue.

Retallack, a specialist on ancient soils of the Precambrian, examined reddish facies of the Ediacara Member of the Rawnsley Quartzite of South Australia, whose previous interpretation have a somewhat odd background. Originally regarded as non-marine, before their fossils were discovered, when traces of jellyfish-like organisms turned up this view was reversed to marine, the red coloration being ascribed to deep Cretaceous weathering. A range of features, such as clasts of red facies in grey Ediacaran rocks, the presence of feldspar in the red facies – unlikely to have survived deep weathering – bedding surfaces with textures very like those formed by subaerial biofilms, and desiccation cracks, suggest to Retallack that the red facies represents palaeosols in the sedimentary sequence. Moreover, some features indicate a land surface prone to freezing from time to time. The key observation is that this facies contains Ediacaran trace fossils representing many of the forms previously regarded as marine animals of some kind, including Spriggina, Dickinsonia and Charnia on which most palaeontologists would bet good money that they were animals, albeit enigmatic ones.

Specimen of Ediacaran Dickinsonia (credit: Wikipedia)

If Retallack's sedimentological observations are confirmed then organisms found in the palaeosols cannot have been animals but perhaps akin to lichens or colonial microbes, and survived freezing conditions. As they occur in other facies more likely to be subaqueous, then they were 'at home' in a variety of ecosystems. As the *Nature* editorial reminds us, from the near-certainty that early macroscopic life was marine there is a chance that views will have to revert to a terrestrial emergence first suggested in the 1950s by Jane Grey. Uncomfortable times lie ahead for the palaeontological world.

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Ediacaran study shakes the tree of life (abc.net.au)

Controversial claim puts life on land 65 million years early (nature.com)

Were Weirdo Ediacarans Really Lichens, Fungi, and Slime Molds? (blogs.scientificamerican.com)

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Posted in Geobiology, palaeontology, and evolution

Tagged Charnia, Dickinsonia, Earliest fossils, Ediacaran

Grand Canyon now the Grand Old Canyon?

Posted on December 11, 2012 by Steve Drury | Leave a comment

Grand Canyon in Winter (credit: Wikipedia)

Among the best known and certainly the most visited topographic feature on the planet, the Grand Canyon resulted from erosion by the Colorado River keeping pace with uplift of the south-central United States. It is the archetype for what is known as antecedent drainage. Since that uplift is still going on, albeit slowly, the Grand Canyon has been assumed to be a relative young landform. By dating the first appearance of debris from the eastern end of the canyon in sediments at its western limit geomorphologists estimated that incision began around 6 Ma ago. Yet a range of other observations present puzzling contradictions. One means of settling the issue is to somehow to date the uplift radiometrically.

A long-used technique is to determine 'cooling ages' of crustal rocks exposed by uplift and erosion, exploiting the way in which rock temperature determines whether or not products of radioactive decay can be preserved intact. One method uses the tracks of defects produced by electrons or helium nuclei from radioactive decay as they pass through various minerals that incorporate high amounts of elements such as uranium. Above a certain temperature the fission tracks anneal and disappear quickly, while below it they accumulate over time. Quantifying that build-up allows the date of cooling below the threshold temperature to be estimated. Similarly, gases produced by radioactive decay of some radioactive isotopes, such as argon from the decay of ^{40}K or helium from uranium and thorium isotopes, can only stay in their host mineral if it remains cooler than a narrow range of temperatures. As rock rises towards the Earth's surface, it starts out hot at depth but cools by conduction as it gets closer to the surface. For the 1.8 km of uplift of the Grand Canyon and the relatively cool nature of the underlying crust, neither the fission-track nor the $^{40}\text{Ar}/^{39}\text{Ar}$ cooling-age methods give meaningful results. However, minerals lose helium at temperatures above about 70°C , so a method based on helium accumulation from uranium and thorium isotope decay is a possible means of assessing uplift timing. But there have been plenty of snags to overcome to make this approach reliable. In the case of the Grand Canyon analytical quality and careful sample collection has given a credible result (Flowers, R.M. & Farley, K.A. 2012. Apatite $4\text{He}/3\text{He}$ and (U-Th)He evidence for an ancient Grand Canyon. *Science*, doi 10.1126/science.1229390)

Flowers and Farley from the University of Colorado at Boulder and the California Institute of Technology, Pasadena, respectively, produced a result that completely overturns previous conceptions. The western end of the Canyon had been incised to within a few hundred metres of modern depths by 70 Ma ago; more than ten times earlier than previously thought. The eastern end has a more complex history that reveals cooling events in the Neogene as well as an end-Cretaceous initiation of uplift and erosion. Their data are consistent with early incision of the Grand Canyon by a Cretaceous river flowing eastward from the Western Cordillera, with a reversal of flow in the late-Tertiary as uplift of the Colorado Plateau began and western mountains subsided. Whether or not this fits with Cretaceous and later geological history of the SW US, is beyond my ken, but you can bet there will be a storm of comment from US geomorphologists once the paper appears in the print issue of *Science*.

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Posted in Geomorphology

Tagged antecedent drainage, cooling age, erosion, Grand Canyon, tectonic uplift

Toba ash and calibrating the Pleistocene record

Posted on December 10, 2012 by Steve Drury | Leave a comment

Landsat image of the Lake Toba caldera, Sumatra (credit: Wikipedia)

The largest volcanic catastrophe during the evolution of humans formed the huge caldera at Lake Toba near the Equator in Sumatra about 70 thousand years ago. Explosive action erupted 2800 cubic kilometres of magma, of which 800 km³ was deposited as thick ash across most of South Asia and the northern Indian Ocean. Sulfates derived from the gas emissions by Toba form clear 'spikes' in ice cores from both Greenland and Antarctica. Its effects were global through the mixing of sulfate aerosols in the stratosphere of both hemispheres, encouraged by its position close to the Equator. By reflecting incoming solar energy the aerosols resulted in a century-long 10°C fall in temperature over the Greenland ice cap. Such global cooling almost certainly affected anatomically modern humans, but it is possible that in South Asia Toba had an even more devastating effect.

The Toba ash at the Jwalapuram excavations in South India (Photo credit: Sanjay P. K. via Flickr)

At several sites in the Indian state of Tamil Nadu and in Malaysia Toba ash has buried artifacts that arguably may have been made by the earliest modern emigrants from Africa. Immediately above the ash are yet more tools that suggest humans did survive the eruption. Palaeoanthropologists have argued that the stress of Toba's environmental effects on all hominins living at the time may have resulted in population crashes from which only the fittest individuals emerged. Major evolutionary changes have been ascribed to 'bottlenecks' of that kind to result in changes in human behaviour detectable from the archaeological record, such as the creation of completely new kinds of tools, art and language. However, recent finds in Africa suggest that many such shifts are much older than Toba.

Perhaps Toba's greatest contribution to palaeoanthropology is that it is an easily recognised event in the geological record, but compared with its sulfate spike in the Greenland ice core at ~71 ka the existing radiometric dates have uncertainties of several thousand years. Using the latest 40Ar/39Ar dating methods on fresh crystals of sanidine (volcanic K-feldspar) from new excavations in Malaysia these uncertainties have been reduced significantly (Storey, M. et al. 2012. Astronomically calibrated 40Ar/39Ar age for the Toba supereruption and global synchronization of late Quaternary records. *Proceedings of the National Academy of Sciences*, v. 109, p. 19684-19688). The sulfate peak and the ash can now be attributed to an age of 73.88 ± 0.32 ka; better than a golden spike in Late Pleistocene stratigraphy. The ice-cores have a check on chronology just beyond the limit of counting annual layering, as do ocean sediment cores for a time older than 14C can ever achieve. Toba now links too with events recorded by the precise U-Th series dating of cave deposits

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Probing the Earth's mantle using noise

Posted on December 4, 2012 by Steve Drury | Leave a comment

Artistic impression of a global seismic tomogram – beneath Mercator projection – dividing the mantle into 'warm' and 'cool' regions (Credit: Cornell University Geology Department – <http://www.geo.cornell.edu/geology/classes/Geo101/graphics/s12fsl.jpg>)

It goes without saying that it is difficult to sample the mantle. The only direct samples are inclusions found in igneous rocks that formed by partial melting at depth so that the magma incorporated fragments of mantle rock as it rose, or where tectonics has shoved once very deep blocks to the surface. Even if such samples were not contaminated in some way, they are isolated from any context. For 20 years geophysicists have been analysing seismograms from many stations across the globe for every digitally recordable earthquake to use in a form of depth sounding. This seismic tomography assesses variations in the speed of body (P and S) waves according to the path that they travelled through the Earth.

Unusually high speeds at a particular depth suggests more rigid rock and thus cooler temperatures whereas hotter materials slow down body waves. The result is images of deep structure in vertical 2-D slices, but the quality of such sections depends, ironically, on plate tectonics. Earthquakes, by definition mainly occur at plate boundaries, which are lines at the surface. Such a one-dimensional source for seismic tomograms inevitably leaves the bulk of the mantle as a blur. But there are more ways of killing a cat than drowning it in melted butter. All kinds of processes unconnected with tectonics, such as ocean waves hitting the shore and interfering with one another across the ocean basins, plus changes in atmospheric pressure especially associated with storms, also create waves similar in kind to seismic ones that pass through the solid Earth.

Such aseismic energy produces the background noise seen on any seismogram. Even though this noise is way below the energy and amplitude associated with earthquakes, it is continuous and all pervading: the cumulative energy. Given highly sensitive modern detectors and sophisticated processing much the same kind of depth sounding is possible using micro-seismic noise, but for the entire planet and at high resolution. Rather than imaging speed variations this approach can pick up reflections from physical boundaries in the solid Earth. Surface micro-seismic waves exactly the same as Rayleigh and Love waves from earthquakes have already been used to analyse the Mohorovičić discontinuity between crust and upper mantle as well as features in the continental crust; indeed the potential of noise was recognized in the 1960s. But the deep mantle and core are the principle targets, being far out of reach of experimental seismic surveys using artificial energy input. It seems they are now accessible using body-wave noise (Poli, P. et al. 2012. Body-wave imaging of Earth's mantle discontinuities from ambient seismic noise. *Science*, v. 338, p. 1063-1065).

Poli and colleagues from the University of Grenoble, France and Finland used a temporary network of 42 seismometers laid out in Arctic Finland to pick up noise, and sophisticated signal processing to separate surface waves from body waves. Their experiment resolved two major mantle discontinuities at ~410 and 660 km depth that define a transition zone between the upper and lower mantle, where the dominant mineral of the upper mantle – olivine – changes its molecular state to a more closely packed configuration akin to that of the mineral perovskite that is thought to characterize the lower mantle. Moreover, they were able to demonstrate that the 2-step shift to perovskite occupies depth changes of about 10-15 km.

Applying the method elsewhere doesn't need a flurry of new closely-spaced seismic networks. Data are already available from arrays that aimed at conventional seismic tomography, such as USArray that deploys 400 portable stations in area-by-area steps across the United States (<http://earth-pages.co.uk/2009/11/01/the-march-of-the-seismometers/>)

It is early days, but micro-seismic noise seems very like the dreams of planetary probing foreseen by several science fiction writers, such as Larry Niven who envisaged 'deep radar' being deployed for exploration by his piratical hero Louis Wu. Trouble is, radar of that kind would need a stupendous power source and would probably fry any living beings unwise enough to use it. Noise may be a free lunch to the well-equipped geophysicist of the future.

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Prieto, G.A. 2012. Imaging the deep Earth. *Science (Perspectives)*, v. 338, p. 1037-1038.

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[Breakthrough in human tools: the scene shifts to Africa](#)

Posted on November 22, 2012 by [Steve Drury](#) | [1 Comment](#)

A means of assessing the cognitive abilities of hominins is through the objects that they created, whether tools or artefacts with apparent symbolic significance. The latter include pigments, coloured shells, beads, artwork or even deliberately parallel and crossing lines gouged on otherwise innocuous rock. Undoubtedly valuable to their creators, possibly treasured and passed on until lost or broken – most are fragile – symbolic artefacts are rare. So although they shout 'thoughtful', their age tells us little about when such a capacity first arose. Many archaeologists and palaeoanthropologists assert that creating and/or manipulating symbols may signify a link with being able to speak. Tools are a lot easier to find, probably as discards and lost items, and a well-described and understood sequence of forms and sometimes uses has been established, which extends as far back as perhaps 3 Ma – before the genus *Homo* appeared.

In terms of their meaning in terms of the consciousness of their makers and users, there are possibly four major recognisable steps. Chimpanzees and some birds can learn to pick up natural objects, such as stones and twigs, and use them: some bands of chimps even retain the knowledge. A step beyond that is preparing a natural object for use, as with breaking a pebble to create a cutting edge: something not exclusively human because it is possible that pre-human hominins created the earliest such Oldowan tools. Being able to visualise hidden potential inside something natural is altogether more advanced, and is represented by the iconic bi-face or Acheulean 'hand-axe'. Its earliest makers, *H. ergaster* and *erectus*, literally brought such objects to light by skilfully knapping away the outer parts of substantial lumps of suitable rock. The knowledge endured for more than a million years but was eventually added to and superseded by a range of more delicate and specific stone tools, but more sophisticated tools represented the same 'liberation' of a simple idea held in rock. The fourth general cognitive leap was to add several resources together as composite tools, and arguably we have not long emerged from that phase with the creation of composite tools that help us design and make other tools: a machine-tool culture.

Example of a microlith (credit: Wikipedia)

It is that penultimate step-up in consciousness that has been engaging archaeologists since they first realised that some small, sharp chips of stone were not waste but deliberately crafted for combination with wood or bone. Such 'microliths' have been found in intact arrows and sickles of the Meso- and Neolithic, but their range steadily goes back in time with more research. Unmistakeable microliths have now been discovered at the South African coastal site at Pinnacle Point, in an occupation layer that is 71 ka old (Brown, K.S. and 8 others 2012. An early and enduring advanced technology originating 71, 000 years ago in South Africa. *Nature*, v. 491, p. 590-593).

The Pinnacle Point technology was indeed sophisticated, microlith manufacture requiring fire treatment as well as choice of rock and careful shaping and sharpening. As well as extending the microlith culture back so far the team of South African, US, Australian and Greek archaeologists compared them with 28 later African tool kits. The designs have barely changed from 71 ka to those of the last few hundred years. Kyle Brown and colleagues show that the industrial method endured, thereby laying to rest the somewhat reactionary notion that the methods were lost again and again in Africa after separate inventions and were only taken up decisively by the supposed 'advanced' anatomically modern humans who colonised Europe...

It is difficult to see how the Pinnacle Point microliths could have been useful, unless hafted in arrows or throwing sticks – maybe even saws and sickles? Crucially, they predate larger blade-tools that could have been hafted to form spears. The focus must now shift to the Zambian scene where possible microliths are reported at two 250 ka sites. If confirmed, they would link the decisive fourth cognitive step towards humanity with the very origin of fully modern humans, rather than a much later, non-African dawning of 'smarts' along with language, advanced art and much else in the chilly caves of southern Europe.

Of all human-colonised continents Africa lags far behind the rest as regards spread and density of archaeological digs. Only the 'famous' sites attract resources for investigation. Imagine what might emerge once there are more local people with research skills, equipment and transport; and, dare I say it, more independence of action and the attendant confidence in their ability.

Related articles

McBrearty, S. 2012. Sharpening the mind. *Nature*, v. 491, p. 531-532.

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