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NEWS METEORITICA DA SEMANA

http://mobile.news.com.au/national/wa-museum-reveals-golf-ball-sized-meteorite/story-e6frfkp9-1225776585694

THE Western Australian Museum today revealed a new golf ball sized meteorite that was tracked falling onto the Nullarbor Plain by a network of cameras.

The meteorite was tracked as it fell to Earth in July 2007 landing in a remote area in South Australia.

The cameras take a single time-lapse picture every night to record any fireballs in the sky.

Gallery: See how the meteorite hit the Earth

The project, the first of its kind in the southern hemisphere, has revealed unique information about where the meteorite originated from and its path around the Sun prior to falling to Earth.

A research team made up of scientists from the WA Museum, Imperial College in London and Ondrejov Observatory in the Czech Republic set up the Desert Fireball Network Project to monitor incoming meteors and track any possible meteorites to the ground so scientists could recover them.

The results of the team's research will be published in internationally prestigious magazine *Science*.

Dr Alex Bevan, Head of Earth and Planetary Sciences with the WA Museum and co-author of the research paper presented the meteorite at the Museum today.

"The more pieces, the clearer the picture gets," Dr Bevan said.

"There are 50,000 chance meteorite discoveries in the world and of them only 1100 were observed to fall and only five have precisely determined orbital information.

"It's like putting together a jigsaw puzzle with only five per cent of the pieces.

"With this information we can pinpoint where in the asteroid belt it (the meteorite) came from and try to define the original building blocks of the planets.

"With big science you need to collaborate internationally, it's a culmination of years of preparation."

The discovery and collection of meteorites on the Nullarbor allows previously unknown information to be uncovered, Dr Bevan said.

"We also find the older ones (meteorites) that have accumulated there over the years so this is a bonus."

The meteorite, the size of a golf ball, is believed to be left over from the birth of the Solar System.

Researchers from the WA Museum, the Imperial College in London and Ondrejov Observatory in the Czech Republic identified the unique meteorite and its orbit in the Solar System.

The Desert Fireball Network Project of All-Sky Cameras is set up on the Nullarbor Plain to monitor incoming meteors and track any possible meteorites to the ground so scientists can recover them.

When a meteorite falls to Earth the researchers use complex calculations to determine its orbit and where it was likely to have fallen so they can retrieve it.

Dr Alex Bevan, Head of Earth and Planetary Sciences from the WA Museum is a co-researcher on the project. He and his staff have been involved in the project since its inception in 2006.

When Dr Bevan and his co-researchers received the film from the meteorite fall in 2007 they were able to view the time-lapsed photo

showing the fireball and its trajectory as it fell to Earth.

On their first expedition to the desert the researchers discovered three fragments of the meteorite within 100m of the predicted site.

Known as Bunburra Rockhole the fragments are between the size of a cricket ball to the size of a golf ball.

The WA Museum currently has one fragment of the meteorite while the other two fragments are on loan in Europe.

The subsequent research and calculations of this meteorite fall have determined it was following an unusual orbit around the Sun.

The research team believe it started out as an asteroid in the innermost main asteroid belt between Mars and Jupiter.

It then gradually evolved into an orbit around the Sun very similar to Earth's. The data researchers have other data for show meteorites follow orbits that take them back, deep into the asteroid belt.

"This research is incredibly exciting," Dr Bevan said.

"For the majority of meteorites we have found we have little or no information about where they came from in the Solar System or their path to Earth.

"Through this project we were able to track and predict the location of the meteorite fall based only on instruments. If it were not for this research we may never have known about this meteorite falling let alone where it came from or its orbit to Earth."

The Bunburra Rockhole is unusual because it is composed of a rare type of basaltic igneous rock.

The researchers say that its composition, together with the data about where the meteorite comes from, fits with the recent theory about how the building blocks for the terrestrial planets were formed.

Chief executive officer of the WA Museum Diana Jones said the research as a great coup for Western Australia and an important project for scientific research into our Solar System.

"The All-Sky Cameras project really is an extraordinary project and opens a great deal of possibilities for future research," she said.

The findings of the Desert Fireball project will be published in *Science* magazine today.

http://www.geologypage.com/2015/03/worlds-largest-asteroid-impacts-found.html#ixzz3VDcfmp9U

World's largest asteroid impacts found in central Australia

This is Dr Andrew Glikson with a sample of suevite -- a rock with partially melted material formed during an impact.
Credit: D. Seymour

A 400 kilometre-wide impact zone from a huge meteorite that broke in two moments before it slammed into the Earth has been found in Central Australia.

The crater from the impact millions of years ago has long disappeared. But a team of geophysicists has found the twin scars of the impacts - the largest impact zone ever found on Earth - hidden deep in the earth's crust.

Lead researcher Dr Andrew Glikson from The Australian National University (ANU) said the impact zone was discovered during drilling as part of geothermal research, in an area near the borders of South Australia, Queensland and the Northern Territory.

"The two asteroids must each have been over 10 kilometres across - it would have been curtains for many life species on the planet at the time," said Dr Glikson, from the ANU School of Archaeology and Anthropology.

The revelation of such ancient violent impacts may lead to new theories about the Earth's history.

"Large impacts like these may have had a far more significant role in the Earth's evolution than previously thought," Dr Glikson said.

The exact date of the impacts remains unclear. The surrounding rocks are 300 to 600 million years old, but evidence of the type left by other meteorite strikes is lacking.

For example, a large meteorite strike 66 million years ago sent up a plume of ash which is found as a layer of sediment in rocks around the world. The plume is thought to have led to the extinction of a large proportion of the life on the planet, including many dinosaur species.
However, a similar layer has not been found in sediments around 300 million years old, Dr Glikson said.
"It's a mystery - we can't find an extinction event that matches these collisions. I have a suspicion the impact could be older than 300 million years," he said.
A geothermal research project chanced on clues to the impacts while drilling more than two kilometres into the earth's crust.
The drill core contained traces of rocks that had been turned to glass by the extreme temperature and pressure caused by a major impact.
Magnetic modelling of the deep crust in the area traced out bulges hidden deep in the Earth, rich in iron and magnesium, corresponding to the composition of the Earth mantle.
"There are two huge deep domes in the crust, formed by the Earth's crust rebounding after the huge impacts, and bringing up rock from the mantle below," Dr Glikson said.
The two impact zones total more than 400 kilometres across, in the Warburton Basin in Central Australia. They extend through the Earth's crust, which is about 30 kilometres thick in this area.
The research has been published in journal Tectonophysics.
Reference:
Geophysical anomalies and quartz deformation of the Warburton West structure, central Australia , doi:10.1016/j.tecto.2014.12.010
Note : The above story is based on materials provided by The Australian National University, Canberra.
Read more : http://www.geologypage.com/2015/03/worlds-largest-asteroid-impacts-found.html#ixzz3VDvceGDW
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AMBIENTE BRASIL

27 / 03 / 2015 Cantareira tem 20ª elevação seguida no volume de água armazenada

O nível do Sistema Cantareira, o maior manancial de abastecimento da região metropolitana de São Paulo, subiu de quarta (25) para quinta-feira (26) pela vigésima vez consecutiva, ao passar de 18% para 18,2%.

27 / 03 / 2015 ONGs apontam falha do governo e lançam guia para sobreviver à falta de água

Com o fim do período de chuvas e alguns dos principais mananciais paulistas ainda no volume morto, a Aliança pela Água - uma rede composta por quase 50 ONGs de São Paulo - criou um guia de sobrevivência à crise hídrica com dicas de economia de água.

27 / 03 / 2015 Brasil cria índice de vulnerabilidade às mudanças climáticas

Os chamados Indicadores Subnacionais de Vulnerabilidade da População à Mudança do Clima no Brasil vão considerar os aspectos regionais como conservação ambiental, dados demográficos e de desenvolvimento humano e a suscetibilidade a fenômenos extremos como tempestades e secas.

27 / 03 / 2015 Dias de Saturno são seis minutos mais curtos do que se acreditava

O novo cálculo muda o que se sabia até então sobre a velocidade rotacional do planeta e também sobre a velocidade dos ventos.

27 / 03 / 2015 Ebola sofreu menos mutações que esperado, diz estudo

Pesquisas anteriores baseadas em dados limitados havia sugerido que o Ebola estava fazendo mutações duas vezes mais rápido que no passado, disseram pesquisadores em artigo publicado na revista Science.

27 / 03 / 2015 Pesquisadores encontram no nordeste da China a flor mais antiga do mundo

O fóssil deste exemplar foi achado junto a outras espécimes em 1970 na cidade de Sanjiaocheng, na província oriental de Liaoning, pelo colecionador chinês de fósseis Kwang Pan.

27 / 03 / 2015 Capitais e grandes cidades europeias se unem contra a mudança climática

Cerca de 30 prefeitos e representantes de capitais e grandes cidades da União Europeia adotaram nesta quinta-feira (26) em Paris, por unanimidade, uma declaração na qual prometem se esforçar para reduzir em pelo menos 40% suas emissões de gases do efeito estufa antes de 2030.

27 / 03 / 2015 Espessura do gelo na Antártica sofre redução de quase 20% em 18 anos

Os paredões de gelo têm uma espessura média de entre 400 e 500 metros e podem se estender por centenas de quilômetros na costa antártica.

27 / 03 / 2015 Anta albina rara é fotografada em floresta brasileira

Fotógrafo não segurou a emoção e disse não ter acreditado ao perceber que tinha uma imagem da anta albina passeando pela floresta.

27 / 03 / 2015 Cientistas descobrem que fungo que brilha no escuro tem relógio biológico

Estudo de brasileiros e americanos investigou cogumelos bioluminescentes. Processo químico que gera luz natural atrai a atenção da ciência há tempos.

27 / 03 / 2015 **Dengue: prefeitura de São Paulo usará tendas para atendimento emergencial**

As tendas serão instaladas na zona norte da capital – área com maior incidência de transmissão da doença –, em locais próximos a unidades de Assistência Médica Ambulatorial (AMA) ou a prontos-socorros.

27 / 03 / 2015 **Índios ashaninka do Peru vivem sob a pressão do desmate na Amazônia**

Comunidade teve quatro lideranças assassinadas em setembro passado. Fotos mostram atividade intensa de extração ilegal de madeira na região.

27 / 03 / 2015 **Nova vacina experimental contra ebola é eficaz em macacos**

Resultados de teste em primatas foram publicados na revista 'Science'. Vacina proporcionou 'excelente proteção' em macacos, segundo cientistas.

27 / 03 / 2015 **Processo sobre limites do Cantareira aguardará estudos da Sabesp**

A audiência de conciliação do processo que trata das vazões de retirada do Sistema Cantareira terminou com a suspensão do caso até 11 de maio.

26 / 03 / 2015 **Perda por água desperdiçada chega a R$ 8 bilhões ao ano, aponta estudo**

Dados são de 2013, quando a perda foi de 6,5 bilhões de m³ de água. Região Norte tem maior taxa de água não faturada, diz Instituto Trata Brasil.

26 / 03 / 2015 **Robô Opportunity completa primeira 'maratona' sobre Marte**

Jipe-robô percorreu pouco mais de 42 km no solo de Marte desde 2004. Distância foi a mais longa percorrida por máquina em outro planeta.

26 / 03 / 2015 **Nasa prevê envio de submarino para explorar mar de óleo em lua de Saturno**

Veículo submerso teria acesso a 'registro' da história do clima de satélite semelhante à Terra e seria levado a Titã em espaçonave militar americana não tripulada.

26 / 03 / 2015 **Países participam de conferência contra tráfico de elefantes**

No continente africano restam 470.000 elefantes, mas entre 20.000 e 30.000 são mortos a cada ano, e a população continua a diminuir.

26 / 03 / 2015 **Cientistas criam feijões capazes de se desenvolver em temperaturas altas**

Novas variedades desenvolvem-se bem em temperatura até 4ºC mais alta. Aquecimento global pode comprometer produção de feijão em vários países.

26 / 03 / 2015 **Cientistas instalam microtransmissor em abelhas para monitorar comportamento**

Para especialista do jardim botânico de Londres, rastreador ajudará a resolver 'quebra-cabeças' sobre diminuição de população de abelhas.

26 / 03 / 2015 **Estudo destaca que Império Asteca "não era tão poderoso" como se acreditava**

O Império Asteca não era tão "poderoso" como se pensava até agora e não tinha o domínio completo da região mexicana onde se assentaram durante séculos, segundo um estudo publicado nesta quarta-feira no semanário "Journal of Archaeological Science".

26 / 03 / 2015 **Ouriço ajuda a encontrar lâmpada de 1.400 anos em Israel**

Animal cavou uma cova em sítio arqueológico e desenterrou o objeto raro.

26 / 03 / 2015 **Dois homens passarão um ano na ISS se preparando para missão a Marte**

Scott Kelly e Mikhail Kornienko se reunirão na plataforma orbital no dia 27 de março a bordo da nave espacial russa Soyouz e voltarão à Terra em março de 2016.

26 / 03 / 2015 **Ossada de 4 mil anos é o caso mais antigo de câncer de mama já achado**

Restos mortais de mulher encontrados no Egito mostram efeito da doença. Fato indica que enfermidade já existia nos períodos mais antigos.

26 / 03 / 2015 **Nasa planeja extrair fragmento de asteroide até 2020**

A Nasa decidiu lançar em 2020 um dispositivo automático para remover um pedaço de rocha de um asteroide que será então rebocado e colocado em órbita lunar, onde astronautas irão explorá-lo.

26 / 03 / 2015 **Dois 'gigantes' americanos ganham o Prêmio Abel, o "Nobel" de matemática**

Os matemáticos americanos John Nash e Louis Niremberg, considerados dois gigantes do século XX em seu campo, receberam nesta quarta-feira o Prêmio Abel de Matemática.

26 / 03 / 2015 **Mesmo sem chuva, nível do Cantareira continua subindo e chega a 18%**

É o 19º dia consecutivo em que o sistema apresenta elevação. A chuva acumulada em março, 189,9 milímetros (mm), já supera a média histórica para o mês, que é 178 mm.

26 / 03 / 2015 **Coelho que inspirou o Pikachu é visto pela primeira vez em 20 anos**

O pesquisador Li Weidong foi o responsável por ter descoberto a espécie e, agora, por ter achado e clicado o pequeno animal, que inspirou o personagem Pikachu.

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inspirou o personagem Pikachu.

25 / 03 / 2015 **Nível do Cantareira tem 18ª alta consecutiva**

O único manancial onde a média de chuva ainda não foi superada é o Sistema Rio Claro, cujo nível aumentou de 42,9% para 43,1%. A quantidade de chuva está em 227,8 mm e a média para todo o mês é 245,9 mm.

25 / 03 / 2015 **Aumento dos casos de dengue preocupa governantes**

A região Sudeste concentra as notificações no país, com 145 mil pessoas infectadas até agora – quatro vezes mais que no mesmo período do ano passado.

25 / 03 / 2015 **Anomalia em imã de acelerador de partículas atrasará seu funcionamento**

O atraso para colocar o acelerador de partículas em funcionamento integral e com o nível de energia previsto pode levar de alguns dias até algumas semanas, dependendo da opção escolhida pelos engenheiros para resolver o problema.

25 / 03 / 2015 **Sobe para mais de 1,4 mil casos de dengue em Caraguatatuba/SP**

Duas pessoas já morreram na cidade este ano vítimas da doença. Ocorrências da doença aumentaram em quase 100 casos em 24 horas.

25 / 03 / 2015 **Pesquisadores no Egito identificam o caso mais antigo de câncer de mama**

Os arqueólogos conseguiram identificar a doença durante estudos realizados na necrópole de Qoba al Hawa, localizada ao oeste da cidade de Assuã (sul), de acordo com o comunicado do ministro egípcio de Antiguidades, Mamduh al Damati.

25 / 03 / 2015 **Índia amplia em seis meses missão em Marte**

O lançamento da nave Mars Mission Orbiter, em setembro passado, transformou a Índia no primeiro país asiático a chegar ao planeta vermelho, além de fazer isso com uma verba apertada.

25 / 03 / 2015 **Cientistas holandesas usam composto vegetal para desenvolver asfalto ecologicamente correto**

Uma equipe de cientistas holandesas afirma ter criado uma forma de utilizar um composto presente nas células vegetais na substituição do betume durante a fabricação de asfalto.

25 / 03 / 2015 **Após vazante do Rio Acre, situação de bairros da capital é crítica**

Quase 10 mil toneladas de lixo, entulho e lama já foram retirados das ruas. Bairros Taquari e Habitasa são os mais afetados pela enchente histórica.

25 / 03 / 2015 **Indígenas estrangeiros acampam em terminal da zona Oeste de Boa Vista/RR**

Indígenas dormem e usam dependências do Terminal João Firmino Neto. Prefeitura diz que pediu levantamento à Secretaria de Gestão de Pessoas.

25 / 03 / 2015 **Araraquara/SP lança fábrica de vespinhas para combater greening nos pomares**

Tamaríxias, têm menos de 1 milímetro e podem impedir início do amarelão. Psilídeos são minúsculos, mas causam problemas e prejuízos a agricultores.

25 / 03 / 2015 **Comunidade quilombola encena o espetáculo 'Batuque Amazônico'**

Espetáculo Batuque Afro Amazônico estreia no próximo domingo (29). Haverá roda de tambor e palestra de conscientização ambiental.

25 / 03 / 2015 **Estudo indica forte presença de genes bascos e iorubás em genoma sul-americano**

O estudo comparou os genes dos africanos e dos europeus de hoje com mais de 4.000 amostras de DNA. A conclusão é que há grande representatividade de genes de povos como os iorubás da Nigéria e os bascos, no genoma da população atual da América do Sul.

25 / 03 / 2015 **Alerta vermelho por incêndio florestal que ameaça reservas no Chile**

Um gigantesco incêndio florestal avançava sem controle nesta terça-feira (24) em zonas protegidas da região de La Araucanía, sul do Chile, e podem colocar em perigo milenares florestas nativas.

25 / 03 / 2015 **Campinas/SP chega a 5,3 mil casos de dengue e Saúde confirma epidemia**

Balanço do CVE divulgado nesta terça-feira inclui atualizações até dia 20. Levantamento aponta 13.656 notificações em investigação no município.

24 / 03 / 2015 **Temor de colapso energético por falta de água aumenta procura por gerador**

Aluguel ou venda de equipamentos deve gerar faturamento alto a empresas. Represas que abastecem hidrelétricas estão com nível baixo e preocupam.

24 / 03 / 2015 **Homem de Vanuatu sobrevive a erupções, terremotos e ciclones**

Lik Simelum, de 76 anos, passou por vários desastres desde os 11 anos. Vanuatu é classificado como o país com mais risco de desastres naturais.

24 / 03 / 2015 **Usina de etanol produzido com batata-doce é inaugurada em Tocantins**

Além do etanol, a usina de Palmas irá produzir também glucose, álcool em gel e ração animal.

24 / 03 / 2015 **Área na Austrália pode ser a maior formada após impacto de meteorito**

Cientistas investigam se impacto causou extinção de vida na Terra. Fragmentos de meteorito foram encontrados em diferentes partes do país.

24 / 03 / 2015 **Egito cede e permitirá que Etiópia construa reservatório no Nilo**

Egito e Sudão deram aval nesta segunda-feira (23) para que a Etiópia construa uma imensa barragem no rio Nilo para repartir suas águas. O Cairo era contra o projeto por temer que a redução de seu abastecimento de água potável e de irrigação.

24 / 03 / 2015 **Amantes de animais agora podem alugar cachorros no Japão**

Meia hora de brincadeiras com os cachorros custa 950 ienes (8 dólares), enquanto que 60 minutos de passeio custa 3.600 ienes. As duas atividades podem ser conjugadas ou ampliadas com uma taxa extra.

24 / 03 / 2015 **Com diminuição de poluição, Paris não terá tráfego restrito nesta terça-feira**

Apenas carros com placas ímpares puderam circular nesta segunda-feira (23). Veículos elétricos, híbridos, a gás ou com três passageiros estavam livres.

24 / 03 / 2015 **Curiosity encontra nitrogênio fixado em sedimentos em Marte**

Nitrogênio é elemento imprescindível para a vida. Instrumento coletou amostras de três regiões diferentes do planeta.

24 / 03 / 2015 **Trinta elefantes mortos em 15 dias na República Democrática do Congo**

Esta denúncia acontece em um momento em que Botsuana realiza uma conferência internacional para a conservação dos elefantes africanos, que enfrentam a forte ameaça dos caçadores de marfim, além da destruição de seu habitat.

24 / 03 / 2015 **Um ano de ebola: ONU diz que epidemia chega ao fim em agosto**

Em balanço sobre atuação de autoridades globais, relatório da Médicos Sem Fronteiras denuncia descaso de governos e OMS no início da epidemia.

24 / 03 / 2015 **Mulheres têm papel chave na prevenção de desastres naturais**

Mulheres e crianças estão 14 vezes mais sujeitas a morrer em catástrofes. Durante desastres, elas têm mais probabilidade de ficar presas em casa.

24 / 03 / 2015 **Cientista manipula DNA de mamute pré-histórico em células de elefante**

O professor de genética na Universidade de Harvard George Church inseriu o DNA de um Mamute-Lanoso em células retiradas de um elefante vivo.

24 / 03 / 2015 **Baleias morrem após se chocarem contra quebra-mar na Austrália**

Ao menos nove animais morreram depois da colisão, segundo autoridades. Quatro exemplares estão vivos na praia e outro está em águas rasas.

24 / 03 / 2015 **Bruxelas faz alerta para bactéria que mata oliveiras**

O Comissário Europeu para a Saúde, Vytenis Andriukaitis, pediu nesta segunda-feira "vigilância absoluta" para evitar a propagação da Xylella fastidiosa, uma bactéria mortal para as plantas que apareceu no sul da Itália, onde ameaça oliveiras, vinhas e frutas cítricas.

23 / 03 / 2015 **Maior aquífero do mundo fica no Brasil e abasteceria o planeta por 250 anos**

O aquífero está posicionado nas bacias do Marajó (PA), Amazonas, Solimões (AM) e Acre - todas na região amazônica - chegando até a bacias sub-andinas. Para se ter ideia, a reserva de água equivale a mais de 150 quatrilhões de litros.

23 / 03 / 2015 **Desmatamento na Amazônia cresce 215% em um ano, segundo o Imazon**

Área desmatada é maior que a cidade de São Paulo, revela instituto de pesquisa, que monitora o desmatamento na Amazônia há mais de 20 anos.

23 / 03 / 2015 **Brasil celebra o dia de água submerso em uma severa crise hídrica**

Os atos marcados para este domingo acentuam a situação paradoxal que se apoderou da vida de milhões de brasileiros, alguns dos quais sofrem com racionamento de água, enquanto sentem os estragos das inundações causadas pelas chuvas de verão em São Paulo.

23 / 03 / 2015 **Serra Leoa ordena confinamento nacional de três dias contra ebola**

Nesta epidemia, 10.200 pessoas já foram infectadas segundo a OMS. Libéria voltou a ter caso de infecção depois de período livre da doença.

23 / 03 / 2015 **Pika-de-Ili, mamífero 'fofinho' raro, é redescoberto em montanhas da China**

Espécie foi descoberta em 1983 e foi vista raras vezes desde então. Mesmo cientista que a descobriu conseguiu fotografar exemplar em 2014.

23 / 03 / 2015 **Governo trava luta contra mal do 'chiclete de Taiwan'**

Noz de areca, usada tradicionalmente na Ásia por seus efeitos estimulantes, provoca câncer de boca e já matou milhares.

23 / 03 / 2015 **Aérea chinesa conclui primeiro voo comercial movido a óleo de cozinha**

O avião empregado, um Boeing 737, usou uma mistura 50% a 50% de querosene de aviação convencional e biocombustível feito de "óleo de cozinha usado, coletado de restaurantes na China".

23 / 03 / 2015 **Dar migalhas de pão a patos pode prejudicar ecossistemas, dizem especialistas**

Prática não só prejudica saúde do animal como coloca em risco habitat natural das aves; ambientalistas dão dicas sobre como evitar danos.

23 / 03 / 2015 **Bebê orangotango se recupera após ser resgatado de gaiola para galinhas**

Budi faz tratamento para combater desnutrição e má formação de membros; família o alimentava apenas de leite condensado.

23 / 03 / 2015 **Pesquisadores da Unesp estudam a movimentação de animais selvagens**

Eles querem tornar mais eficientes projetos de restauração ambiental. Animais receberam coleiras que enviam os dados em Rio Claro, SP.

23 / 03 / 2015 **Pesquisa quer provar eficácia de planta para reduzir efeitos do autismo**

Princípio ativo da erva de São João pode 'curar' neurônios de autistas. Avanços da ciência são apresentados em congresso em Ribeirão Preto (SP).

23 / 03 / 2015 **Povoado chinês denuncia roubo de estátua com monge mumificado**

Estátua de buda tem múmia de monge em seu interior. Peça está atualmente em exposição itinerante pela Europa.

23 / 03 / 2015 **Países amazônicos devem evitar que a água gere conflitos, segundo a OTCA**

Os países amazônicos, que "guardam" 20% da água doce do mundo, devem continuar "atuando juntos" para impedir que essas reservas sejam motivo de futuros conflitos, afirma a Organização do Tratado de Cooperação Amazônica.

23 / 03 / 2015 **Austrália apresenta plano para conservar Grande Barreira de Corais**

Maior recife de corais do planeta está em lista de patrimônios mundiais. Unesco havia ameaçado inserir barreira em lista de locais ameaçados.

23 / 03 / 2015 **Campanha chama a atenção para atropelamento de animais no Parque da Tijuca**
Pesquisa feita pela Universidade Veiga de Almeida revelou que, em um ano, mais de 30 animais foram atropelados dentro da unidade de conservação.
21 / 03 / 2015 **40% das reservas hídricas do mundo podem encolher até 2030, diz ONU**

Relatório divulgado coloca Brasil entre países com mais estresse ambiental. Nações Unidas celebram Dia Mundial da Água neste fim de semana.

21 / 03 / 2015 **ANA vai propor limites intermediários para utilização do Sistema Cantareira**

A intenção é estabelecer bandas ou cotas que definam a exploração para determinados níveis dos reservatórios. As discussões para renovação da outorga do sistema começam em abril, e a expectativa é que a questão faça parte dos debates.

21 / 03 / 2015 **Cratera gigante é identificada na Lua pela primeira vez em 100 anos**

Descoberta foi feita após cientistas medirem nível de gravidade dessa região lunar.

21 / 03 / 2015 **Pesquisadores da USP de São Carlos desenvolvem telescópios gigantes**

Projeto de cerca de R$ 700 milhões envolve 27 países e 1,3 mil cientistas. Observatório deve começar a operar em 5 anos e vai analisar radiação gama.

21 / 03 / 2015 **Eclipse solar é visto no Hemisfério Norte**

Fenômeno foi total apenas nas Ilhas Faroe e em Svalbard. Moradores de Europa, África e Ásia tiveram visão parcial.

21 / 03 / 2015 **Código Florestal reduzirá perda da biodiversidade, afirma ministra**

Izabella Teixeira faz apelo público, no Senado, para que produtores se inscrevam no CAR.

21 / 03 / 2015 **Técnica de irrigação alia produtividade na lavoura a uso sustentável da água**

O uso da tecnologia na agricultura pode reduzir perdas de água e aumentar a produtividade das culturas com racionalidade e sem desperdício.

21 / 03 / 2015 **Berço das águas, cerrado precisa de proteção para garantir abastecimento no país**

O bioma que ocupa um quarto do território brasileiro não tem rios de grande vazão, mas concentra nascentes que alimentam oito das 12 grandes regiões hidrográficas brasileiras.

21 / 03 / 2015 **Mortalidade de árvores na Amazônia diminui 'sequestro de carbono'**

A Floresta Amazônica está perdendo sua capacidade de absorver dióxido de carbono (CO2), o principal gás do efeito estufa na atmosfera, devido ao excesso de mortalidade de árvores - revela um estudo realizado por mais de 30 anos, publicado na revista Nature.

21 / 03 / 2015 **Fóssil de 17 mi de anos explica por que homem anda ereto**

A conclusão da Proceedings of the National Academy of Sciences é de que há 17 milhões de ano o planalto começou a se elevar e, com as condições climáticas modificadas e o local mais seco, os primatas (incluindo o ser humano) foram expulsos do local.

21 / 03 / 2015 **Escolas municipais de SP terão de incluir alimentos orgânicos na merenda**

A lei municipal lei prevê que, para a compra dos alimentos livres de agrotóxicos, a administração pública poderá pagar até 30% a mais em relação aos produtos similares convencionais. E obriga que os cardápios das escolas respeitem a sazonalidade da oferta dos alimentos orgânicos e ou de base agroecológicos.

21 / 03 / 2015 **Outono terá pouca chuva no Sudeste e não deve elevar reservatórios**

Estação de transição entre verão e inverno começou às 19h45 desta sexta-feira. Trimestre deve ser marcado ainda por frio intenso no Sul do Brasil.

21 / 03 / 2015 **Sistema Cantareira tem verão mais chuvoso desde 2011**

Quantidade de chuva é 123% maior do que a registrada no ano passado. Situação, porém, ainda é crítica, pois só 2º volume morto foi recuperado.

16 / 03 / 2015 **Primeiro-ministro pede tempo para ver efeitos da luta contra a poluição**

O primeiro-ministro da China, Li Keqiang, reconheceu neste domingo em entrevista coletiva que será preciso tempo para ver os efeitos da "guerra contra a poluição" que ele mesmo declarou ano passado, mas que ainda não conseguiu eliminar a neblina de grandes cidades como Pequim.

16 / 03 / 2015 **Assoreamento do Rio São Francisco prejudica pesca em Penedo, Alagoas**

Vendedores do mercado do município sofrem com a baixa dos pescados. Secretaria de Agricultura diz que última cheia foi aconteceu em 2006.

16 / 03 / 2015 **Projeto avalia a importância da polinização para a agricultura**

Esforços concentram-se em sete culturas importantes no Brasil: algodão, caju, canola, castanha, maçã, melão e tomate.

16 / 03 / 2015 **Emissões de CO2 param de subir no mundo pela primeira vez em 40 anos**

Ao mesmo tempo, economia global cresceu 3% no ano passado. Agência Internacional de Energia divulgou relatório nesta sexta-feira.

16 / 03 / 2015 **Em 15 dias, chove no Sistema Alto Tietê 75,8% do esperado para o mês**

Pluviometria acumulada está em 130,7 mm; média histórica é de 172,4 mm. Volume armazenado subiu para 21,5% neste domingo (15).

16 / 03 / 2015 **Nível de água do Sistema Cantareira registra aumento neste domingo**

Outros cinco sistemas que abastecem SP também tiveram crescimento. Situação, porém, ainda é crítica e estado vive crise hídrica.

16 / 03 / 2015 **Focos de incêndio permanecem fora de controle em Valparaíso, no Chile**

Fogo destruiu 500 hectares e provocou a morte de uma pessoa. Trinta e duas pessoas ficaram feridas, incluindo 19 bombeiros.

16 / 03 / 2015 **Aves ameaçadas de extinção são protegidas na região de Itapetininga/MG**

Segundo o Ibama, pelo menos 23 espécies ameaçadas vivem na região. Área de conservação corresponde a 40% da usada por uma empresa.

16 / 03 / 2015 **LHC processou 60 petabytes de dados para descobrir o bóson de Higgs**

Para dar conta de todo esse poder de processamento, os cientistas utilizaram a maior rede integrada de computadores do mundo, a Worldwide LHC Computing Grid.

16 / 03 / 2015 **Catadores de lixo podem aproveitar resíduos de prédios públicos de Brasília**

Chamada pública vai selecionar quatro entidades para fazer o trabalho em prédios do Ministério do Desenvolvimento Social e Combate à Fome e de outros órgãos em Brasília, por pelo menos seis meses.

16 / 03 / 2015 **Prêmio de Economia e Mercado Florestal será entregue no dia 25**

Segunda edição se destaca pela qualidade e inovação dos trabalhos

16 / 03 / 2015 **Imagens da sonda Rosetta sugerem presença de gelo no cometa 67P**

Instrumento captou mancha azulada em área que emite pó e gases. Cometa pode conter respostas sobre formação do Sistema Solar.

16 / 03 / 2015 **Conferência da ONU pede atuação contra mudança climática**

Evento começou no sábado (14) e vai até quarta-feira (18). Representantes discutem como promover o crescimento sustentável.

17 / 03 / 2015 **Prefeitura de São Paulo confirma segunda morte por dengue em 2015**

O município de São Paulo registrou 2.438 casos confirmados de dengue de 4 de janeiro a 28 de fevereiro. São 1.883 casos autóctones (contraídos no próprio município) e 555 importados – quase três vezes mais do que os números registrados em igual período do ano passado.

17 / 03 / 2015 **Não há evidência científica para uso da homeopatia, conclui extensa revisão**

Revisão sistemática de estudos foi feita por conselho de saúde australiano. Para médicos homeopatas, falta verba para fazer pesquisas maiores.

17 / 03 / 2015 **Escâner e teste de esforço têm eficácia para detectar doença cardíaca**

Constatação foi feita por especialistas após análise de 10 mil pacientes. Resultados foram divulgados no periódico 'New England Journal of Medicine'.

17 / 03 / 2015 **Nível do Cantareira atinge 15% e acumula chuva acima da média**

Em 43 dias, o volume de água dos seis reservatórios que formam esse sistema atingiu o triplo do existente no início de fevereiro (5%).

17 / 03 / 2015 **Encontrada máscara rara do deus Pan em escavação em Golã**

A máscara, datada no período Helenístico (séculos III e I a.C.), é maior do que uma cabeça humana e sua raridade e seu valor se devem ao fato de que não foi fundida, como ocorreu com a grande parte das peças de bronze daquela época.

17 / 03 / 2015 **Vanuatu tenta se recuperar após passagem de ciclone e presidente faz apelo**

O arquipélago de Vanuatu, no Pacífico Sul, foi devastado na sexta-feira (13) por um dos mais graves desastres naturais da história da região. Na capital, Port Vila, 90% das casas foram atingidas.

17 / 03 / 2015 **SP: tempestade provoca alagamentos, queda de árvores e fechamento de aeroporto**

Segundo o CGE, dois pontos de alagamento permanecem intransitáveis neste momento: um na Mooca e outro na Avenida Nações Unidas.

17 / 03 / 2015 **Ártico desencoraja visitas para ver eclipse: frio intenso e ursos à solta**

Eclipse total raro poderá ser visto apenas em Svalbard e nas ilhas Faroe. Hotéis estão reservados há anos; prefeito diz que cidade atingiu limite.

17 / 03 / 2015 **Poluição do ar pode ter relação com aumento de casos de AVC, diz estudo**

Quem vive em áreas poluídas têm mais chance de entupimento de artérias. Investigação foi feita com 300 mil pessoas em cidades dos EUA, como NY.

17 / 03 / 2015 **Drone vai ajudar municípios fluminenses a monitorar uso da água na agricultura**

A iniciativa é da Secretaria Estadual de Agricultura, em parceria com o governo do estado, e o objetivo inicial do projeto é fazer o mapeamento do ecossistema das áreas ciliares, próximas às margens dos rios, para planejar ações sustentáveis do uso da água na agricultura.

17 / 03 / 2015 **Chinês é indenizado em US$ 70 mil após ataque de urso panda**

Homem foi atacado por urso selvagem que estava em fuga em reserva. Ele foi mordido na coxa e passou por várias cirurgias.

17 / 03 / 2015 **Projeto mapeia nascentes de Viana, ES, e incentiva produtor a preservar**

Nascentes alimentam a Bacia do Rio Jucu, que abastece a Grande Vitória. Programa incentiva produtor a preservar e replantar áreas florestais.

17 / 03 / 2015 **Número de casos de dengue chega a 522 em Santa Catarina, diz Dive**

Mais 20 casos foram confirmados desde sexta-feira (13). Do total de casos, 430 foram infectados em Itajaí, que registra surto.

17 / 03 / 2015 **Quilombolas e mineradora vivem embate após expansão de exploração em Paracatu/MG**

A proximidade entre as atividades de mineração e os bairros da cidade e a possibilidade de intoxicação por metais pesados liberados durante a extração do ouro deixam a população de Paracatu preocupada.

17 / 03 / 2015 **'Republicanos terão que mudar de atitude sobre clima', diz Obama**

O presidente dos Estados Unidos, Barack Obama, previu que os republicanos terão que deixar o ceticismo sobre as mudanças climáticas de lado, de forma a não perder eleitores.

18 / 03 / 2015 **Cheia paralisa atividades de postos de saúde em Boca do Acre, no AM**

Atendimentos são realizados em barco, segundo secretário de administração. Enchente já afeta mais de 21 mil pessoas em município.

18 / 03 / 2015 **Espanha anuncia ter encontrado restos mortais de Miguel de Cervantes**

Ossada foi achada na cripta de um convento de Madri. Pesquisadores estavam buscando ossada em nichos da cripta da igreja.

GSW JOUNAL

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LOW-TEMPERATURE THERMOCHRONOLOGY

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Interactions between axial and transverse drainage systems in the Late Cretaceous Cordilleran foreland basin: Evidence from detrital zircons in the Straight Cliffs Formation, southern Utah, USA
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Interactions between axial and transverse drainage systems in the Late Cretaceous Cordilleran foreland basin: Evidence from detrital zircons in the Straight Cliffs Formation, southern Utah, USA
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RESEARCH FOCUS: The geodynamics of mantle melting
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New contributions in Baffin Bay/Labrador Sea petroleum exploration and development geoscience
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EARTH PAGES

Anthropocene: what (or who) is it for?
Posted on March 17, 2015 by Steve Drury | 2 comments

The made-up word chrononymy could be applied to the study of the names of geological divisions and their places on the International Stratigraphic Chart. Until 2008 that was something of a slow-burner, as careers go. It all began withGiovanni Arduino and Johann Gotlob Lehman in the mid- to late 18th century, during the informal historic episode known as the Enlightenment. To them we owe the first statements of stratigraphic principles and the beginning of stratigraphic divisions: rocks divided into the major segments of Primitive, Secondary, Tertiary and Quaternary (Arduino). Thus stratigraphy seeks to set up a fundamental scale or chart for expressing Earth's history as revealed by rocks. The first two divisions bit the dust long ago; Tertiary is now an informal synonym for the Cenozoic Era; only Quaternary clings on as the embattled Period at the end of the Cenozoic. All 11 Systems/Periods of the Phanerozoic, their 37 Series/Epochs and 85 Stages/Ages in the latest version of the International Stratigraphic Chart have been thrashed out since then, much being accomplished in the late 19th and early 20th centuries. Curiously, the world body responsible for sharpening up the definition of this system of 'chrononymy', theInternational Commission on Stratigraphy (ICS), seems not to have seen fit to record the history of stratigraphy: a great mystery. Without it geologists would be unable to converse with one another and the world at large.
Yet now an increasing number of scientists are seriously proposing a new entry at the 4th level of division after Eon, Era and Period: a new Epoch that acknowledges the huge global impact of human activity on atmosphere, hydrosphere, biosphere and even lithosphere. They want it to be called theAnthropocene, and for some its eventual acceptance ought to relegate the current Holocene Epoch, in which humans invented agriculture, a form of economic intercourse and exchange known as capital and all the trappings of modern industry, to the 5th division or Stage. Earth-pages has been muttering about the Anthropocene for the past decade, as charted in a number of the links above, so if you want to know which way its author is leaning and how he came to find the proposal an unnecessary irritation, have a look at them. Last week things became sufficiently serious for another comment. Simon Lewis and Mark Maslin of the Department of Geography at University College London have summarised the scientific grounds alleged to justify an Anthropocene Epoch and its strict definition in a *Nature* Perspective (Lewis, S.J. & Maslin, M.A. 2015. Defining the Anthropocene. *Nature*, v. **519**, p. 171-180).-=, which is

interestingly discussed in the same Issue by Richard Monastersky.

Lewis and Maslin present two dates that their arguments and accepted stratigraphic protocols suggest as candidates for the start of the Anthropocene: 1610 and 1964 CE, both of which relate to features that are expressed by geological records that should last indefinitely. The first is a decline and eventual recovery in the atmospheric CO_2 level recorded in high-resolution Antarctic ice core records between 1570 and 1620 CE that can be ascribed to the decline in the population of the Americas' native peoples from an estimated 60 to 6 million. This result of the impact of European first colonisation – disease, slaughter, enslavement and famine – reduced agriculture and fire use and saw the regeneration of 5×10^7 hectares of forest, which drew down CO_2 globally. It also coincides with the coolest part of the Little Ice Age from 1594-1677 CE. They caution against the start of the Industrial Revolution as an alternative for a 'Golden Spike' since it was a diachronous event, beginning in Europe. Instead, they show that the second proposal for a start in 1964 has a good basis in the record of global anthropogenic effects on the Earth marked by the peak fallout of radioactive isotopes generated by atomic weapons tests during the Cold War, principally ^{14}C with a 5730 year half life, together with others more long-lived. The year 1964 is also roughly when growth in all aspects of human activity really took off, which some dub in a slightly Tolkienesque manner the 'Great Acceleration'. [There is a growing taste for this kind of hyperbole, e.g. the 'Great Oxygenation Event' around 2.4 Ga and the 'Great Dying' for the end-Permian mass extinction]. Yet they neglect to note that the geochronological origin point for times past has been defined as 1950 CE when nucleogenic ^{14}C contaminated later materials as regards radiocarbon dating, which had just become feasible.

Lewis and Maslin conclude their Perspective as follows:

To a large extent the future of the only place where life is known to exist is being determined by the actions of humans. Yet, the power that humans wield is unlike any other force of nature, because it is reflexive and therefore can be used, withdrawn or modified. More widespread recognition that human actions are driving far-reaching changes to the life-supporting infrastructure of Earth may well have increasing philosophical, social, economic and political implications over the coming decades.

So the Anthropocene adds the future to the stratigraphic column, which seems more than slightly odd. As Richard Monastersky notes, it is in fact a political entity: part of some kind of agenda or manifesto; a sort of environmental agitprop from the 'geos'. As if there were not dozens of rational reasons to change human impacts to haul society back from catastrophe, which many people outside the scientific community have good reason to see as hot air on which there is never any concrete action by 'the great and the good'. Monastersky also notes that the present Anthropocene record in naturally deposited geological materials accounts for less than a millimetre at the top of ocean-floor sediments. How long might the proposed Epoch last? If action to halt anthropogenic environmental change does eventually work, the Anthropocene will be very short in historic terms let alone those which form the currency of geology. If it doesn't, there will be nobody around able to document, let alone understand, the epochal events recorded in rocks. At its worst, for some alien, visiting planetary scientists, far in the future, an Anthropocene Epoch will almost certainly be far shorter than the 10^4 to 10^5 years represented by the hugely more important Palaeozoic-Mesozoic and Mesozoic-Cenozoic boundary sequences; but with no Wikipedia entry.

Not everybody gets a vote on these kinds of thing, such is the way that science is administered, but all is not lost. The final arbiter is the Executive Committee of the International Union of Geological Sciences (IUGS), but first the Anthropocene's status as a new Epoch has to be approved by 60% of the ICS Subcommission on Quaternary Stratigraphy, if put to a vote. Then such a 'supermajority' would be needed from the chairs of all 16 of the ICS subcommissions that study Earth's major time divisions. But first, the 37 members of the Subcommission on Quaternary Stratigraphy's 'Anthropocene' working group have to decide whether or not to submit a proposal: things may drag on at an appropriately stratigraphic pace. Yet the real point is that the effect of human activity on Earth-system processes has been documented and discussed at length. I'll give Marx the last word in this 'The philosophers have only *interpreted* the world, in various ways. The point, however, is to *change* it'. A new stratigraphic Epoch doesn't really seem to measure up to that…

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Genus Homo pushed back nearly half a million years

Posted on March 10, 2015 by Steve Drury | Leave a comment

Bill Deller, a friend whose Sunday is partly spent reading the Observer and Sunday Times from cover to cover, alerted me to a lengthy article by Britain's doyen of paleoanthropologists Chris Stringer of the Natural History Museum. (Stringer, C. 2015. First human? The jawbone that makes us question where we're from. *Observer*, 8 March 2015, p. 36). His piece sprang from two Reports published online in *Science* that describe about 1/3 of a hominin lower jaw unearthed – where else? – in the Afar Depression of Ethiopia. The discovery site of Ledi-Geraru is a mere 30 km from the most hominin-productive ground in Africa: Hadar and Dikika for *Australopithecus afarensis* ('Lucy' at 3.2 Ma and 'Selam' at 3.3 Ma, respectively); Gona for the earliest-known stone tools (2.6 Ma); and the previously earliest member of the genus *Homo*, also close to Hadar.

On some small objects mighty tales are hung, and the Ledi-Geraru jawbone and 6 teeth is one of them. It has features intermediate between *Australopithecus* and*Homo*, but more important is its age: Pliocene, around 2.8 to 2.75 Ma (Villmoare, B. And 8 others. Early *Homo* at 2.8 Ma from Ledi Geraru, Afar, Ethiopia. *Science Express* doi: 10.1126/science.aaa1343). The sediments from which Ethiopian geologist Chalachew Seyoum, studying at Arizona State University, extracted the jawbone formed in a river floodplain. Other fossils suggest open grassland rich with game, similar to that of the Serengeti in Tanzania, with tree-lined river courses. These were laid down at a time of climatic transition from humid to more arid conditions, that several authors have suggested to have provided the environmental stresses that drove evolutionary change, including that of hominins (DiMaggio, E.N. and 10 others 2015. Late Pliocene fossiliferous sedimentary record and the environmental context of early Homo from Afar, Ethiopia. *Science Express* doi: 10.1126/science.aaa1415).

Designating the jawbone as evidence for the earliest known member of our genus rests almost entirely on the teeth, and so is at best tentative awaiting further fossil material. The greatest complicating factor is that the earliest supposed fossils of *Homo* (i.e. *H. habilis, H rudolfensis* and others yet to be assigned a species identity) are a morphologically more mixed bunch than those younger than 2 Ma, such as *H. ergaster* and *H. erectus*. Indeed, every one of them has some significant peculiarity. That diversity even extends to the earliest humans to have left Africa, found in 1.8 Ma old sediments at Dmanisi in Georgia (*Homo georgicus)*, where each of the 5 well-preserved skulls is unique. The Dmanisi hominins have been likened to the type specimen of *H. habilis*, but such is the diversity of both that is probably a shot in the dark.

Replica of OH 7, the deformed type specimen of Homo habilis. (credit: Wikipedia)

Coinciding with the new Ethiopian hominin papers a study was published in*Nature* the same week that describes how the type specimen of *H. habilis* (found, in close association with crude stone tools and cut bones, by Mary and Lewis Leakey at Olduvai Gorge, Tanzania in 1960) has been digitally restored from its somewhat deformed state when found (Spoor, F. *et al*. 2015. Reconstructed*Homo habilis* type OH 7 suggests deep-rooted species diversity in early *Homo*.*Nature*, v. **519**, p. 83-86, doi:10.1038/nature14224). The restored lower jaw and teeth, and part of its cranium, deepened the mysterious diversity of the group of fossils for which it is the type specimen, but boosts its standing as regards probable brain size from one within the range of australopithecines to significantly larger –~750 ml compared with <600 ml – about half that of modern humans. The *habilis* diversity is largely to do with jaws and teeth: it is the estimated brain size as well as the type specimen's association with tools and their use that elevates them all to human status. Yet, the reconstruction is said by some to raise the issue of a mosaic of early human species. The alternative is an unusual degree of shape diversity (polymorphism) among a single emerging species, which is not much favoured these days. An issue to consider is: what constitutes a species? For living organisms morphological similarity has to be set against the ability for fertile interbreeding. Small, geographically isolated populations of a single species often diverge markedly in terms of what they look like yet continue to be interfertile, the opposite being convergence in form by organisms that are completely unrelated.

Palaeontologists tend to go largely with division on grounds of form, so that when a specimen falls outside some agreed morphological statistics, it crosses a species boundary. Set against that the incontrovertible evidence that at least 3 recent human species interbred successfully to leave the mark in all non-African living humans. What if the first humans emerging from, probably, a well-defined population of australopithecines continued to interbreed with them, right up to the point when they became extinct about 2 Ma ago?

On a more concrete note, the Ledi Geraru hominin is a good candidate for themaker of the first stone tools found 'just down the road' at Gona!

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Wet spells in Arabia and human migration

Posted on March 8, 2015 by Steve Drury | Leave a comment

In September 2014, Earth Pages reported how remote sensing had revealed clear signs of extensive fossil drainage systems and lakes at the heart of the Arabian Peninsula, now the hyper-arid Empty Quarter (Rub al Khali). Their association with human stone artifacts dated as far back as 211 ka, those with affinities to collections from East Africa clustering between 74-90 ka, supported the sub-continent possibly having been an early staging post for fully modern human migrants from Africa. Member of the same archaeological team based at Oxford University have now published late Pleistocene palaeoclimatic records from alluvial-fan sediments in the eastern United Arab Emirates that add detail to this hypothesis (Parton, A. *et al*. 2015. Alluvial fan records from southeast Arabia reveal multiple windows for human dispersal. *Geology*, advance online publication doi:10.1130/G36401.1).

The eastern part of the Empty Quarter is a vast bajada formed from coalesced alluvial fans deposited by floods rising in the Oman Mountains and flowing westwards to disappear in the great sand sea of dunes. Nowadays floods during the Arabian Sea monsoons are few and far between, and restricted to the west-facing mountain front. Yet, older alluvial fans extend far out into the Empty Quarter, some being worked for aggregate used in the frantic building boom in the UAE. In one of the quarries, about 100 km south of the Jebel Faya Upper Palaeolithic tool site , the alluvial deposit contains clear signs of cyclical deposition in the form of 13 repeated gradations from coarse to fine waterlain sediment, each capped by fossil soils and dune sands. The soils contain plant remains that suggest they formed when the area was colonized by extensive grasslands formed under humid conditions.

Dating the sequence reveals that 6 of the cycles formed over a 10 thousand-year period between 158 to 147 ka, which coincides with a peak in monsoon intensity roughly between 160 and 150 ka during the glacial period that preceded the last one. Three later cycles formed at times of monsoon maxima during the last interglacial and in the climatic decline leading to the last glacial maximum, at ~128 to 115 ka, 105 to 95 ka, 85 to 74 ka. So, contrary to the long-held notion that the Arabian Peninsula formed a hostile barrier to migration, from time to time it was a well watered area that probably had abundant game. Between times, though, it was a vast, inhospitably dry place.

Satellite view of the Arabian Peninsula. The Oman mountains sweep in a dark arc south eastwards from the Staits of Hormuz at the mouth of the Persian Gulf. The brownish grey area to the south of the arc is the bajada that borders the bright orange Empty Quarter (credit: NOAA)

The authors suggest that the climatic cyclicity was dominated by a 23 ka period. As regards the southern potential migration route out of Africa, via the Straits of Bab el Mandab, which has been highly favoured by palaeoanthropologists lately, opportunities for migration in the absence of boats would have depended on sea-level lows. They do not necessarily coincide with wet windows of opportunity for crossing the cyclically arid Arabian peninsula that would allow both survival and proceeding onwards to south and east Asia. So far as I can judge, the newly published work seems to favour a northward then eastward means of migration, independent of fluctuations in land-ice volume and sea level, whenever the driest areas received sufficient water to support vegetation and game. In fact most of NE Africa is subject to the Arabian Sea monsoons, and when they were at their least productive crossing much of Ethiopia’s Afar depression and the coastal areas of Eritrea, Sudan and Egypt would have been almost as difficult as the challenge of the Empty Quarter.

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Posted in Anthropology and Geoarchaeology, Climate change and palaeoclimatology

Tagged Alluvial fan, Arabian Peninsula, Arabian Sea monsoon, Empty Quarter, human migration

A tsunami and NW European Mesolithic settlements

Posted on March 3, 2015 by Steve Drury | Leave a comment

About 8.2 ka ago sediments on the steep continental edge of the North and Norwegian Seas slid onto the abyssal plain of the North Atlantic. This huge mass displacement triggered a tsunami whose effects manifest themselves in sand inundations at the heads of inlets and fjords along the Norwegian and eastern Scottish coasts that reach up to 10 m above current sea level. At that time actual sea level was probably 10 m lower than at present as active melting of the last glacial ice sheets was still underway: the waves may have reached 20-30 m above the 8.2 ka sea level. So powerful were the tsunami waves in the constricted North Sea that they may have separated the British Isles from the European mainland by inundating Doggerland, the low-lying riverine plain that joined them before global sea level rose above their elevation at around the same time. Fishing vessels plying the sandbanks of the southern North Sea often trawl-up well preserved remains of land mammals and even human tools: almost certainly Doggerland was prime hunting territory during the Mesolithic, as well as an easily traversed link to the then British Peninsula. Mesolithic settlements close by tsunami deposits are known from Inverness in Scotland and Dysvikja north of Bergen in Norway and individual Mesolithic dwellings occur on the Northumberland coast. The tsunami must have had some effect on Mesolithic hunter gatherers who had migrated into a game-rich habitat. The question is: How devastating was it.

Reconstruction of Mesolithic hut based on evidence from two archaeological sites in Northumberland, UK. (credit: Lisa Jarvis; see http://www.maelmin.org.uk/index.html)

Hunter gatherers move seasonally with favoured game species, often returning to semi-permanent settlements for the least fruitful late-autumn to early spring season. The dominant prey animals, red deer and reindeer also tend to migrate to the hills in summer, partly to escape blood-feeding insects, returning to warmer, lower elevations for the winter. If that movement pattern dominated Mesolithic populations then the effects of the tsunami would have been most destructive in late-autumn to early spring. During warmer seasons, people may not even have noticed its effects although coastal habitations and boats may have been destroyed.

Stair-step moss (credit: Wikipedia)

Norwegian scientists Knut Rydgren and Stein Bondevik from Sogn og Fjordane University College, Sognda devised a clever means of working out the tsunami's timing from mosses preserved in the sand inundations that added to near-shore marine sediments. (Rydgren, K. & Bondevik, S. 2015. Most growth patterns and timing of human exposure to a Mesolithic tsunami in the North Atlantic.*Geology*, v. **43**, p. 111-114). Well-preserved stems of stair-step moss*Hylocomium splendens* still containing green chlorophyll occur, along with ripped up fragments of peat and soil, near the top of the tsunami deposit which has been uplifted by post-glacial isostatic uplift to form a bog. This moss grows shoots annually, the main growth spurt being at the end of the summer-early autumn growing season. Nineteen preserved samples preserved such new shoots that were as long as or longer than the preceding year's shoots. This suggests that they were torn up by the tsunami while still alive towards the end of the growing season, around late-October. All around the North Sea Mesolithic people could have been returning from warm season hunting trips to sea-shore winter camps, only to have their dwellings, boats and food stores devastated, if indeed they survived such a terrifying event.

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Posted in Environmental geology and geohazards

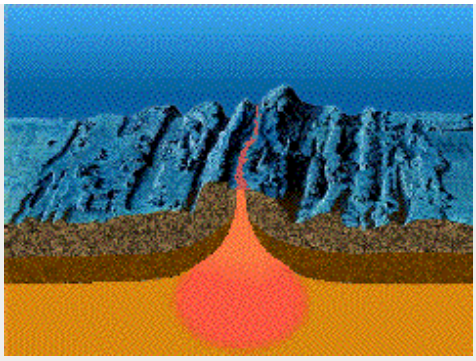
Tagged Doggerland, Mesolithic, North Sea, Storegga Slide,Tsunami

Glacial cycles and sea-floor spreading

Posted on February 17, 2015 by Steve Drury | Leave a comment

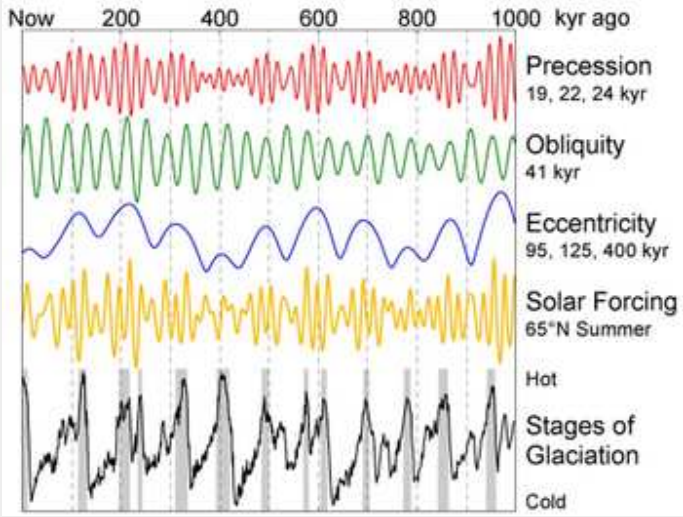
The *London Review of Books* recently published a lengthy review (Godfrey-Smith, P. 2015. The Ant and the Steam Engine. *London Review of Books*, v. **37**, 19 February 2015 issue, p. 18-20) of the latest contribution to Earth System Science by James Lovelock, the man who almost singlehandedly created that popular paradigm through his Gaia concept of a self-regulating Earth (Lovelock, J. *A Rough Ride to the Future*. Allen Lane: London; ISBN 978 0 241 00476 0). Coincidentally, on 5 February 2015 *Science* published online a startling account of the inner-outer-inner synergism of Earth processes and climate (Crowley, J.W. *et al*. 2015. Glacial cycles drive variations in the production of oceanic crust.*Science* doi:10.1126/science.1261508). In fact serendipity struck twice: the following day a similar online article appeared in a leading geophysics journal (Tolstoy, M. 2015. Mid-ocean ridge eruptions as a climate valve. *Geophysical Research Letters*, doi:10.1002/2014GL063015)

Both articles centred on the most common topographic features on the ocean floor, abyssal hills. These linear features trend parallel to seafloor spreading centres and the magnetic stripes, which chart the progressive additions to oceanic lithosphere at constructive margins. Abyssal hills are most common around intermediate- and fast-spreading ridges and have been widely regarded as fault-tilt blocks resulting from extensional forces where cooling of the lithosphere causes it to sag towards the abyssal plains. However, some have suggested a possible link with variations in magma production beneath ridge axes as pressure due to seawater depth varied with rising and falling sea level through repeated glacial cycles. Mantle melting beneath ridges results from depressurization of rising asthenosphere: so-called 'adiabatic' melting. Pressure changes equivalent to sea-level fluctuations of around 100-130 m should theoretically have an effect on magma productivity, falls resulting in additional volumes of lava erupted on the ocean floor and thus bathymetric highs.



Formation of mid-ocean ridge topography, including abyssal hills that parallel the ridge axis. (credit: Wikipedia)

A test of this hypothesis would be see how the elevation of the sea floor adjacent to spreading axes changes with the age of the underlying crust. John Crowley and colleagues from Oxford and Harvard Universities and the Korea Polar Research Institute analysed new bathymetry across the Australian-Antarctic Ridge, whereas Maya Tolstoy of Columbia University performed similar work across the Southern East Pacific Rise. In both studies frequency analysis of changes in bathymetry through time, as calibrated by local magnetic stripes, showed significant peaks at roughly 23, 41 and 100 ka in the first study and at 100 ka in the second. These correspond to the well known Milankovitch periods due to precession, changing axial tilt and orbital eccentricity: persuasive support for a glacial control over mid-ocean ridge magmatism.



Periodicities of astronomical forcing and global climate over the last million years (credit: Wikipedia)

An interesting corollary of the observations may be that pulses in sea-floor eruption rates emit additional carbon dioxide, which eventually percolates through the ocean to add to its atmospheric concentration, which would result in climatic warming. The maximum effect would correspond to glacial maxima when sea level reached its lowest, the reduction in pressure stimulating the greatest magmatism. One of the puzzling features of glacial cycles over the last million years, when the 100 ka eccentricity signal dominates, is the marked asymmetry of the sea-level record; slowly declining to a glacial maximum and then a rapid rise due to warming and melting as the Earth changed to interglacial conditions. Atmospheric CO_2 concentrations recorded by bubbles in polar ice cores show a close correlation with sea-level change indicated by oxygen isotope data from oceanic sediments. So it is possible that build-up of polar ice caps in a roundabout way eventually reverse cooling once they reach their greatest thickness and extents, by modulating ocean-ridge volcanism and thereby the greenhouse effect.

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January 2015 photo of the month

Posted on February 3, 2015 by Steve Drury | 1 comment

Angular unconformity at Telheiro Beach, Portugal (credit: Gabriela Bruno)

This image posted at Earth Science Picture of the Day would be hard to beat as the definitive angular unconformity. It shows Upper Carboniferous marine metagreywackes folded during the Variscan orogeny overlain by Triassicredbeds. Structurally it is uncannily similar to Hutton's famous unconformity atSiccar Point on the coast of SE Scotland, although the tight folding there is Caledonian in age and the unconformable redbeds are Devonian in age.

1 Comment

Posted in Sedimentology and stratigraphy, Tectonics

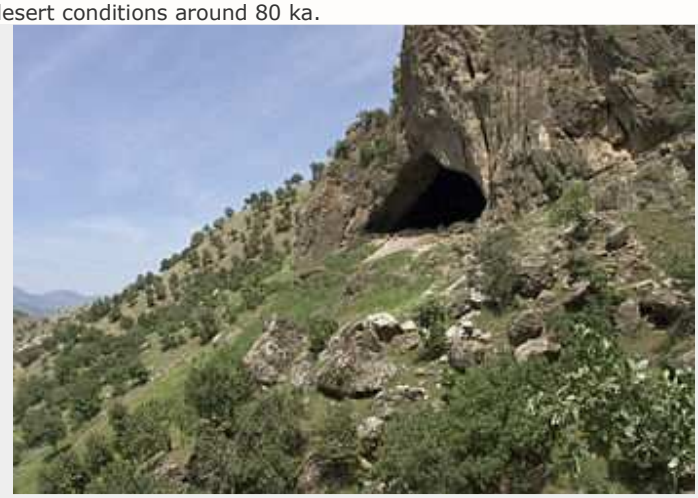
Tagged Angular unconformity, Folded strata, Orogeny, Redbeds

Human-Neanderthal cohabitation of the Levant

Posted on February 3, 2015 by Steve Drury | Leave a comment

The earliest known remains of anatomically modern humans outside of Africa were found unearthed from the Skhul and Qafzeh caves in what is now northern Israel. Their context was that of deliberate burial at a time when climate was cooling from the last interglacial, between 90 to 120 ka. The Levant was also the repository for a number of well-preserved Neanderthal skeletons, most dating to between 35-65 ka, including ten individuals at Shanidar in today's northern Iraq, some of whom were also deliberately buried including one whose grave reputedly contained evidence for a floral tribute. The 25 ka gap between the two populations has previous been regarded as evidence for lack of contact between them. However, the Tabun Cave in modern Israel has yielded tools attributed to Neanderthal Mousterian culture that may indicate their intermittent presence from 200 to 45 ka, and fossils of two individuals dated at

~122 and ~90 ka. The remains at Skhul and Qafzeh are significantly more rugged or robust than African contemporaries and have been considered possible candidates for Neanderthal-modern human hybrids. But whatever their parentage, it seems they became extinct as the climate of the Levant dried to desert conditions around 80 ka.



Entrance to the Shanidar Cave, northern Iraq, occupied by Neanderthals between 35-65 ka (credit: Wikipedia)

A more promising overlap between modern human and Neanderthal occupation comes with the discovery by a group of Israeli, US, Canadian, German and Austrian scientists of a much younger anatomically modern human cranium from the Manot Cave, also in northern Israel (Herschkovitz, I. and 23 others 2015. Levantine cranium from Manot Cave (Israel) foreshadows the first European modern humans. *Nature* (online) doi:10.1038/nature14134). The cranium has a U-Th radiometric age of ~55 ka, well within the time span of Neanderthal occupation. Moreover, Manot Cave is one of a cluster of occupied sites in northern Israel, with separations of only a few tens of kilometres: undoubtedly, this individual and companions more than likely met Neanderthals. The big question, of course, is did the neighbours interbreed? If so the Levant would be the confirmed as the probable source of hybridisation to which the DNA of non-African living humans points. There may be a insuperable difficulty in taking this further: it is thought that the high temperatures of the region, despite its dryness, may have destroyed any chance of reconstructing ancient genomes. Yet one of the first Neanderthal bones to yield useful genetic material was from Croatia, which is not a great deal cooler in summer.

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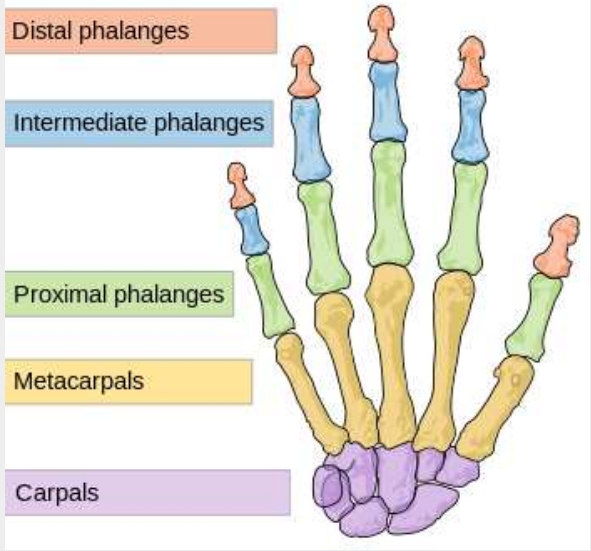
Convincing, indirect evidence for early toolmakers

Posted on February 2, 2015 by Steve Drury | Leave a comment

A surprising number of animals pick up items from their surroundings and use them, mainly to get at otherwise inaccessible foodstuffs. What sets humans apart from such tool users is that we make them and for a long time part of our repertoire has been tools used to

make other tools; so-called 'machine tools'. An example is a piece of antler used to pressure-flake flint to give a stone blade a better edge, a more recent one is the increasing use of robots on assembly lines. Making a tool is impossible for a bird with only its beak and ill-adapted feet, while even a chimpanzee lacks various forms of grip needed for precisely directed force and manipulation. It was Frederick Engels who first focussed on the importance of the hand being freed to evolve the capacity for manual labour by the permanent adoption of an upright posture and gait, in his essay *The Part Played by Labour in the Transition from Ape to Man* written in 1876.

The earliest tools known turned up in 2.6 Ma old sediments at Gona in NE Ethiopia, while evidence for tool use is well accepted from cracked and sliced bones found in sediments dated at 2.5 Ma from Bouri in the same region. In neither case can the finds be tied to fossil remains of the makers and users, the earliest direct link emerging from famous Olduvai Gorge in western Tanzania, where crude Oldowan tools and worked bones occur with incomplete remains of a hominin, dubbed *Homo habilis* ('handy man') because of this association. Somewhat more controversial are bones that show cuts and scrape marks plus signs of having been cracked open that were found in a 3.4 Ma context at Dikika, also in Ethiopia, within the same sedimentary horizon as the young *Australopithecus afarensis* known as Selam ('Hello'). The Dikika material is little different from 0.9 to 1.2 Ma younger bones at Bouri and Olduvai: the controversy seems to stem more from its much greater age and association with hominins deemed by some to have been incapable of creating tools.



Bone structure of the (right) human hand. (credit: Wikipedia)

An entirely novel approach to the issue of the first tools and their makers, which with little doubt would have tickled Engels no end, is a careful anatomical and physiological examination of fossil hominin hand bones in comparison with those of chimps and living humans (Skinner, M.M. *et al*. Human-like hand use in *Australopithecus africanus*. *Science*, v. **347**, p. 395-399). The bones being scrutinized are the five metacarpals that form the links in the palms from muscles of the forearm to finger and thumb movements and thus to various kinds of grip. In humans there are a host of ways of gripping objects from the precision of opposed thumb and finger pinching, especially that using the forefinger, to the squeezing power grip that wraps thumb and all fingers around an object and makes a fist. The best a chimp can do is grabbing a branch, to which its knuckle-walking hands are well adapted. The tips of the metacarpals are mechanically loaded according to the types of grip used repeatedly in life and that works to modify the physical density of the tips' spongy bone tissue in patterns that vary according to habitual usage of the hand and its digits. This new approach is reputedly far more diagnostic than the actual shape of metacarpal bones, and requires high-resolution CT scanning.

Known early human and Neanderthal tool-makers show very similar patterns: in fact they suggest far more heavy loading through various kinds of grip than the metacarpals of humans from the modern period. In 1.8 to 3.0 Ma old *A. africanus* and *Paranthropus robustus* (a gorilla-like but bipedal australopithecine) from South Africa metacarpals suggest that both were habitually using a tree-climbing grip, much as chimpanzees do, but more closely resembled modern human and Neanderthal committed tool users. Both were certainly capable of using forceful precision grips to make and use tools up to 0.5 Ma earlier than the date of the earliest known tools. So far the technique has not been applied to the palm bones of earlier hominins such as *A. afarensis* (2.9-3.9 Ma) and *Orrorin*

tugenensis (~6 Ma). Despite the suggestion of tool-makingcapability, agreeing that it did take place in non-*Homo* hominins must await finds of tools, as well as signs of their use, in close association with fossil remains of their makers. The Dikika association is simply not enough. Yet, some bipedal being must have made tools before the date of the earliest ones (~2.6 Ma) discovered at Gona. Look at it this way: it is a lucky archaeologist who discovers every piece of evidence for a fundamental social change at one site. The fact that, by definition, the vast bulk of Pliocene and Pleistocene sediments that may contain the key evidence is either buried by younger material or was a victim of erosion, means that the chance of resolving the origin of the fundamental feature of human behaviour is tiny. The chance that scientists will continue looking is astronomically higher.

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Reconstructing the structure of ancient vegetation canopies

Posted on January 25, 2015 by Steve Drury | Leave a comment

One of the central measures used to describe modern ecosystems is the ratio of foliage area to that of the ground surface – the leaf area index (LAI) – which expresses the openness of vegetation canopies. A high LAI helps to retain moisture in the soil, partly by shading and cooling the surface to reduce evaporation and partly by stopping surface soil from being battered to a concrete-like consistency by heavy rain, which reduces the amount of water that can infiltrate. It is possible to estimate LAI across today's entire land area using satellite image data but a proxy for palaeoecological LAI has remained hard to find.

Hemispherical photograph used to calculate modern canopy cover. (credit: Wikipedia; photo by S.B. Weiss)

The outer coating of leaves in well-shaded (high LAI) areas tends to have protective or pavement cells that are larger and have more complicated shapes than does that of leaves in more open canopies. The framework of leaf cells is silica-based and made up of

structures known as phytoliths whose morphologies vary in much the same way as the cells that they support. So theoretically it is possible to use fossil phytoliths in terrestrial sediments to estimate LAI variations through time in local canopies, but first the approach needs a means of calibration from living ecosystems. The vegetation of Central American Costa Rica varies through the entire range of possible LAI values, which leads to varying amounts of sunlight available to the leaves of cover plants. Measuring the area and the degree of shape-complexity of phytoliths in modern soils there shows that each is positively correlated with LAI.

A modern herbivorous mammal (lowland paca) from dense forest in Costa Rica. (Photo credit: Wikipedia)

Putting this approach to use in the Cenozoic terrestrial sediments of Patagonia, US and Argentinean palaeoecologists aimed to examine how the evolution of the teeth of herbivorous mammals – a major feature in their speciation – linked to changes in vegetation structure (Dunn, R.E. *et al*. 2015. Linked canopy, climate and faunal change in the Cenozoic of Patagonia. *Science*, v. **347**, p. 258-261). Using phytoliths they were able to show that in the Eocene the area was covered by dense, closed forest canopies that gradually became more open towards the end of the Eocene to be replaced by open forest and shrubland habitats in the Oligocene and Miocene, with a brief period of regreening. It was during the period of more open vegetation that tooth structure underwent the most change. Chances are that the vegetation shifts began in response to the onset of Antarctic glaciation at the beginning of the Oligocene Epoch and related climate change at the northern margin of the Southern Ocean. Changes in the herbivore teeth may have been in response to the increasing amount of dust adhering to leaves as canopies became more open and soil increasingly dried out.

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Posted in Climate change and palaeoclimatology, Geobiology, palaeontology, and evolution, Sedimentology and stratigraphy

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Bicentenary of the first national geological map

Posted on January 25, 2015 by Steve Drury | 3 comments

It's good to know that the geosciences have had revolutionising developments to match those of the rest of science. Forget the Battle of Waterloo in 1815, which of course was '*the nearest-run thing you ever saw in your life*' when the Brits were saved from defeat by the timely arrival of the Prussians: This year we can celebrate one that literally put geology on the map, kicked-off the systematic exploration for every kind of physical resource, thereby putting a great deal of money in the pockets of coal, petroleum and metal moguls and making geology a career rather than a pastime. In 1815 William Smith published *A Delineation of the Strata of England and Wales with part of Scotland*, which despite the title was a map showing the basic geology and structure of the whole of England and Wales: the first ever map showing accurately the distribution of rocks for an entire country. The original, at 2.6 by 1.8 m, dominates the main staircase at Burlington House, the home of the Geological Society of London.

William Smith's A Delineation of the Strata of England and Wales with part of Scotland (1815)

Tom Sharpe has nicely summarized the key facts surrounding Smith's masterpiece (Sharpe, T. 2015. The birth of the geological map. *Science*, v. **347**, p. 230-232). One feature that I certainly did not know was that the colour scheme for the different stratigraphic units was based on the dominant colour of the rocks themselves, such as purples for the abundant slates of the Lower Palaeozoic, brown and red for the Old- and New Red Sandstone, greys and blacks for the Coal Measures and green for the Greensand, which until quite recently remained widely used to signify Cambrian, Ordovician and Silurian; Devonian and Permian; Upper Carboniferous and Cretaceous.

Although celebrated today, Smith's map was panned by the gentlemen geologists of the Geol Soc, who attempted to do a better job, but failed ignominiously. William Smith was not a leisured chap of the Enlightenment, but worked for a living surveying coal mines, navigating canals and draining fens. Despite their antipathy, the Fellows of the Geological Society of London knew a good earner when they saw one and plagiarized Smith's work and undercut his regular price for his map. As a result he ended up in a London debtors' prison. Even on the day of his release in 1819, bailiffs seized his house and its contents. The Geol Soc eventually did honour Smith with its Wollaston Medal in 1831, its then presidentAdam Sedgwick dubbing him 'the Father of English Geology': by that time geology had become a profession…