Doctors don't 'get' their patients

Physicians often guess wrong about their patients' beliefs about health

US physicians are often poor judges of their patients' health beliefs, according to a new study by Dr. Richard Street from Texas A&M University and Paul Haidet from The Pennsylvania State University College of Medicine, USA. However, physicians' understanding is better the more patients are involved by asking questions, expressing concerns, and stating their beliefs and preferences for care. Their analysis1 of how patients' health beliefs differ from their physicians' perception of these beliefs was just published online by Springer in the Journal of General Internal Medicine2.

207 physician-patient consultations were audio-recorded and, after the consultations, both physicians and patients completed a measure of beliefs about the cause, meaning, treatment, and control of the patient's health condition. Physicians additionally completed the measure on how they thought the patient responded.

Drs. Street and Haidet found that physicians generally did not have a good understanding of patient's health beliefs, but their understanding was significantly better when patients more actively participated in the consultation. However, in the majority of areas, doctors actually thought that their patients' beliefs were similar to theirs.

In addition, physicians were poorer judges of African-Americans' preferences to be a partner in their care, the meaning of the condition to Hispanic patients, and beliefs about control when the patient was of a different race to them. In some cases, understanding was better when physicians and patient were of the same race or ethnicity.

Dr. Street said, "If physicians had a better understanding of their patients' beliefs about health, they could address any misconceptions or differences of opinion they had with the patient regarding the nature, severity, and treatment of their illnesses as well as make treatment recommendations better suited to the patient's life circumstances. Encouraging the patient to be more involved in the consultation by expressing their beliefs and concerns is one way physicians can gain this understanding."

Dr. Haidet adds, "When doctors take time to listen to what the patient has to say, they can get a wealth of information about the lens through which patients make sense of their health. This can help them be better doctors."

References *1. Street RL & Haidet P (2010). How well do doctors know their patients? Factors affecting physician understanding of patients' health beliefs. Journal of General Internal Medicine DOI 10.1007/s11606-010-1453-3*

International formula milk marketing code mired in 3 decades of dispute

International code of marketing of breast milk substitutes -- 3 decades later time for hostilities to be replaced by effective national and international governance

An international marketing code for formula milk, intended to foster global cooperation among governments, industry, and aid agencies, has instead been mired in three decades of often bitter dispute, claims a child nutrition expert in the Archives of Disease in Childhood.

As long as hostilities continue, improvements in maternal, infant, and child nutrition will be less likely, says Professor Stewart Forsyth, formerly of NHS Tayside. Professor Forsyth has published widely on the benefits of breast feeding and collaborated with formula milk companies on research.

The Thirty Fourth World Health Assembly adopted the fourth draft of the International Code of Marketing of Breast Milk Substitutes in May 1981 as a minimum requirement to protect and promote appropriate feeding for infants and young children. Although voluntary, the implementation of the 11 articles of the code, which range from marketing and distribution, through quality standards, to national government responsibilities, is closely monitored by the World Health Organization.

At the time of its inception, it was envisaged that the code would provide a framework for governments, UN bodies, aid agencies, specialists, consumer groups and industry to cooperate fully, says Professor Forsyth.

But instead, he writes: "There has been an unrelenting series of disputes, predominantly relating to alleged violations of the code, which have provoked high profile acrimonious exchanges, boycotts, and legal proceedings." Crucially, there is a lack of official independent information on the validity or otherwise, of these claims and their outcomes, he adds.

The self regulatory national governance arrangements for the code have lacked transparency and clearly defined responsibilities, he contends. "It is probably not surprising that each of the components of this self regulatory structure continue to manifest aspects of self interest, and this is likely to continue in the absence of an 'ombudsman' or independent body with the authority to arbitrate," he writes.

Self appointed monitoring groups, which have stepped into the breach, have been hampered by insufficient access to all the relevant information and an approach that is unlikely to inspire the confidence of all the players involved, he suggests.

International accountability also potentially lacks transparency and consistency, he contends, especially for issues that cross national and continental boundaries.

"The controversy that has bedevilled the code for 30 years is almost entirely limited to matters of interpretation and compliance," he writes. "However, because these issues have been so protracted it has led to an atmosphere of mistrust that has now become embedded between key agencies."

It is time to "replace current hostilities with effective national and international governance," he says.

Plentiful maternal affection in early infancy boosts adult coping skills

Mother's affection at 8 months predicts emotional distress in adulthood

Mums who shower their infants with affection equip them to cope well with life stressors as adults, indicates research published online in the Journal of Epidemiology and Community Health. Despite growing interest in the role of early life experiences in adult health, most studies have relied on recall; few have tracked participants from childhood to adult life, say the authors. They base their findings on 482 people, who were part of the US Providence Rhode Island birth cohort of the National Collaborative Perinatal Project.

The quality of their interactions with their mothers at the age of 8 months was objectively rated by a psychologist during routine developmental assessment.

At the end of each session, the psychologist completed an assessment of how well the mother had coped with her child's developmental tests and how she had responded to the child's performance.

The amount of affection and attention she gave to her child was also categorised, with descriptors ranging from "negative" to "extravagant."

Mental health was subsequently assessed in adulthood at the average age of 34, using a validated symptom checklist, which captures both specific elements - such as anxiety and hostility - and general levels of distress.

At the 8 month assessment, one in 10 interactions (46) were characterised by a low level of maternal affection towards the infant. Most (85%; 409) were characterised by normal levels of affection.

The remaining 6% (27) were characterised by very high levels of maternal affection.

When the specific elements of the checklist were analysed, those whose mothers had been observed to be the most affectionate at the 8 month assessment had the lowest levels of anxiety, hostility, and general distress.

There was more than a 7 point difference in anxiety scores between those whose mothers had displayed low/normal levels of affection and those whose mothers had displayed high levels. And there was more than a 3 point discrepancy in hostility scores and a 5 point difference in overall general distress scores.

This pattern was seen across all the various elements of the symptom checklist: the higher the mother's warmth, the lower the adult's distress.

The authors conclude that their findings back up the assertion that even very early life experiences can influence adult health. High levels of maternal affection are likely to facilitate secure attachments and bonding, say the authors. This not only lowers distress, but may also enable a child to develop effective life, social, and coping skills, which will stand them in good stead as adults.

Scientists explain the neurological process for the recognition of letters and numbers

The study can be found in 'Neuropsychologia'

"We analyzed the influence of the context given by a word when linking the physical traits of its components to the abstract representations of letters," explains to SINC Nicola Molinaro, main author of the study and researcher of the Basque Research Center on Cognition, Brain and Language (BCBL).

The results, published in Neuropsychologia journal, show that the linguistic context given by a word impacts the way in which single abstract representations of the letters that make it up are accessed, and that such access is partially independent from the physical properties of the stimuli.

"Otherwise, it would not be possible to think that a number can activate the representation of a letter when it is inserted among a string of letters that make up a word (M4T3R14L)," says Molinaro.

"We used numbers that visually resemble letters (1-I, 5-S, 7-T), and we replaced them," states the expert. The words were presented to participants during tenths of milliseconds (imperceptible to consciousness). Then, the correct words where shown so that participants could read them (for example, M4T3R14L - MATERIAL). Control strings including numbers explicitly different to letters (M9T6R26L- MATERIAL) and word identity (MATERIAL- MATERIAL) were also included.

The brain responds in three different ways

While participants read the words in silence, scientists recorded brain potentials associated to events (ERPs), which showed three main effects. The first one is that, over the 150 ms window, identical strings and strings including visually similar numbers, compared to control strings, caused a reduction in positivity, that is, in the ease of recognition.

"This effect shows that in the case of strings with letter-like numbers, the link between the visual physical representations of numbers and the abstract representations of correct letters is made automatically, given the visual overlapping among characters," points out the neuroscientist.

A second effect confirmed, at the 200 ms window, greater negativity for number conditions (M4T3R14L and M9T6R26L). "The brain recognizes that the elements that make up the strings presented unconsciously are in fact numbers, not letters, showing some specificity in the processing despite the initial visual overlapping found in the above component," he assures.

Lastly, 250 ms after the display of strings, the conditions of identity and visually letter-like numbers showed a very similar positive effect, clearly different from the effect caused by the strings with numbers that were visually different from letters (control).

"The global processing of words is very similar for strings that include letters that are properly written and for those including numbers that are visually similar to letters", concludes Molinaro.

Boat made from plastic bottles completes Pacific voyage

A boat made from thousands of plastic bottles has sailed into Sydney Harbour, completing a four-month voyage that began in San Francisco. The boat, called the Plastiki, was built using 12,500 plastic bottles.

Its 9,000 mile (15,000 km) voyage aimed to raise awareness of the dangers posed to the environment by plastic waste. Hundreds of people turned out in Sydney to welcome the Plastiki and its crew of six.

"It has been an extraordinary adventure," said expedition leader and environmentalist David de Rothschild.

Sea of waste

The Plastiki left the US city of San Francisco in March, crossing the Pacific and then travelling via Western Samoa and New Caledonia before arriving in Australia. It sailed via the Great Pacific Garbage Patch - a sea of waste about five times the size of the UK that sits just below the surface between California and Hawaii.

The vessel is a catamaran, with the thousands of plastic bottles attached with organic glue to two pontoons.

Other parts of the boat such as the sails and the mast are made from recycled materials.

Mr de Rothschild said he and his crew had wanted to raise awareness of the damage caused to the ocean by the disposal of plastic waste. "We have this addiction to single-use, throwaway plastic, which is choking up the ecosystem," he said earlier this week.

He said that a UN report warning of the dangers posed by plastic waste to the world's oceans was the inspiration for his trip. The Plastiki will now go on display in Sydney's Maritime Museum.

It was named after the Kon-Tiki, the raft sailed across the Pacific by Norwegian anthropologist Thor Heyerdahl in 1947. His grandson, Olav, was a member of Plastiki's crew.

Alcohol reduces the severity of rheumatoid arthritis

26 July 2010 Oxford University Press (OUP) * Under embargo until 27 July 2010 23:05 GMT

Drinking alcohol may reduce the severity of rheumatoid arthritis according to new research published today. It is the first time that this effect has been shown in humans. The study also finds that alcohol consumption reduces the risk of developing the disease, confirming the results of previous studies.

The study which is published online today in the journal Rheumatology (Wednesday 28 July), looked at 873 patients with rheumatoid arthritis and compared them with 1004 people without RA (the control group). The researchers, led by Gerry Wilson, Professor of Rheumatology at the University of Sheffield (Sheffield, UK), asked the two groups how frequently they had drunk alcohol in the month preceding their inclusion in the study. The study participants completed a detailed questionnaire, had x-rays and blood tests, and an experienced research nurse examined their joints.

The first author of the study, Dr James Maxwell, a consultant rheumatologist at the Rotherham Foundation NHS Trust and an honorary senior clinical lecturer in the Academic Rheumatology Group at the University of Sheffield, said: “We found that patients who had drunk alcohol most frequently had symptoms that were less severe than those who had never drunk alcohol or only drunk it infrequently. X-rays showed there was less damage to joints, blood tests showed lower levels of inflammation, and there was less joint pain, swelling and disability. This is the first time that a dose dependent inverse association between frequency of alcohol consumption and severity of RA has been shown in humans.”

Dr Maxwell and his colleagues also found that non-drinkers were four times more likely to develop RA than people who drank alcohol on more than ten days a month. The risk of developing RA decreased according to the frequency of alcohol consumption. “This finding agrees with the results from previous studies that have shown a decreased susceptibility to developing RA among alcohol drinkers,” said Dr Maxwell.

The researchers found that their findings applied regardless of gender and in both the anti cyclic citrullinated peptide (CCP) positive and negative forms of RA. “Anti-CCP antibodies are not present in most ‘normal’ people without arthritis,” explained Dr Maxwell. “We know that these antibodies develop prior to the onset of

RA, and are probably directly linked to the process which causes RA. Some patients have RA without having anti-CCP antibodies, but we know that the disease is much more severe in patients who do."

It is not fully understood why drinking alcohol should reduce the severity of RA and people's susceptibility to developing it. "There is some evidence to show that alcohol suppresses the activity of the immune system, and that this may influence the pathways by which RA develops. We do know that the changes in the immune system that lead to RA happen months and maybe even years before the arthritis actually develops," said Dr Maxwell. "Once someone has developed RA, it's possible that the anti-inflammatory and analgesic effects of alcohol may play a role in reducing the severity of symptoms.

"Further research is needed to confirm the results of our study and to investigate the mechanisms by which alcohol influences people's susceptibility to RA and the severity of symptoms. It is also possible that different types of alcoholic drinks may have different effects on RA."

The authors point out that there are some limitations to their study. These include the fact that they only recorded the frequency rather than the amount of alcohol consumption in the month before people joined the study; there might be bias due to people recalling inaccurately how often they drank alcohol and also the information represents a snapshot of drinking behaviour at one point in time, rather than giving information about fluctuating alcohol consumption over a longer period; and, finally, there were marked differences in age and gender between the RA and the control groups, although the researchers did adjust their results for these factors.

Writing in their paper, the study authors conclude: "While there are a number of limitations to the methodology of this study, the results do suggest that the consumption of alcohol may modify RA, influencing both risk and severity."

[1] "Alcohol consumption is inversely associated with risk and severity of rheumatoid arthritis". Rheumatology. Published online under advance access. doi:10.1093/rheumatology/keq202.

'Spontaneous generation' of prions observed

Metal wires 'catalyse' appearance of rogue proteins from healthy brain tissue.

By Daniel Cressey

After an epic series of experiments, a group of researchers has observed and reproduced what could be the spontaneous generation of prions--rogue misfolded proteins that have been implicated in the destruction of the central nervous system. These misfolded proteins, the culprits in Creutzfeldt-Jakob disease and scrapie, are highly infectious. Although famously transmitted by the ingestion of infected meats, prions are also thought to arise spontaneously in a tiny fraction of humans and other animals. Such de novo prion generation has previously been achieved with animal cells using a method called "protein misfolding cyclic amplification" (PMCA), which involves repeated rounds of ultrasound and incubation.

Now, a London-based team reports observing prions appearing from healthy mouse brain tissue (the results were detailed online July 26 in Proceedings of the National Academy of Sciences). (Human samples have traditionally proved less amenable to PMCA, and the misfolding of prion proteins is believed to occur at a much lower rate in humans than in mice.)

"What we were doing was trying to develop a very sensitive assay for prion detection on a metal surface, so we could use that in prion decontamination," says co-author John Collinge, who heads up the Department of Neurodegenerative Disease at University College London. "It took a while before we could convince ourselves this was a real phenomenon."

Sticky steel

Prions readily bind to steel wires, which can thus be used to detect the presence of prions, as well as to infect brains in laboratory studies. Collinge suggests that the metal surface in the team's experiments somehow catalyzed the formation of prions.

While working on a mouse version of scrapie in Collinge's lab, the researchers found that some wires coated with uninfected mouse brain, intended to serve as controls, tested positive. Eventually, they concluded that this was not an error or a result of contamination.

In a typical experiment, they report, wires were placed with brain homogenate from either uninfected mouse brains or brains infected with scrapie prions. Out of 16 experiments, nine had controls that were positive for prions. In total, 40 of 2,268 wells on test plates were positive.

The authors even went to the precaution of repeating the study in another laboratory that had never been used for prion work. They purchased new equipment and had it shipped directly to the site to avoid any risk of contamination. Despite this, healthy, uninfected brain cells still tested positive for prions at low rates.

"We can reproduce in a system in a lab what people believe is happening in animals and humans," says co-author Charles Weissmann, who is currently studying prion biology at Scripps Florida in Jupiter.

"In the beginning it was pretty hard to believe. We spent years repeating the experiment under more and more strenuous circumstances."

Crucially, when transferred to mice, the new prions caused disease with different characteristics from that produced by the scrapie prions normally used in the laboratory.

"Indeed, the histopathology associated with 'spontaneous prions' was unlike any seen previously in our laboratory," the paper notes. "The distinctive histopathological pattern elicited by the spontaneous prions excludes contamination with RML [Rocky Mountain Laboratory] or other mouse-adapted scrapie strains used by us as a cause for these mouse transmissions."

What's the alternative?

There is an alternative explanation to that of spontaneous generation.

Prions are believed to be a polymer of misfolded proteins. Collinge says that nascent "seeds" of prions might be forming and being destroyed in brains all the time. The metal wire could have the effect of concentrating seeds, thus increasing the rate at which prions form.

"What will be important now will be distinguishing whether this low abundance does exist, or whether the process induces the spontaneous generation of prions," says Claudio Soto, an expert in neurodegenerative disorders at the University of Texas Medical Branch in Galveston who was not involved in the work.

Soto's team pioneered the PMCA method--initially as a way of detecting prions, but later as a potential way of generating them. "It seems to me the possibility normal tissues have a low abundance of prions is quite feasible," Soto says.

Distinguishing between these two possibilities is the crucial next step. If pre-existing prions are being concentrated on the steel wires, the rate at which this happens should be directly proportional to the concentration of the brain material. More brain equals more seed prions. Conversely, genuine spontaneous generation would be a higher-order function of concentration, the authors note.

In the 'neck' of time: Scientists unravel another key evolutionary trait

ITHACA, N.Y. — By deciphering the genetics in humans and fish, scientists now believe that the neck – that little body part between your head and shoulders – gave humans so much freedom of movement that it played a surprising and major role in the evolution of the human brain, according to New York University and Cornell University neuroscientists in the online journal Nature Communications (July 27, 2010.)

Scientists had assumed the pectoral fins in fish and the forelimbs (arms and hands) in humans are innervated – or receive nerves - from the exact same neurons. After all, the fins on fish and the arms on humans seem to be in the same place on the body. Not so.

During our early ancestors' transition from fish to land-dwellers that gave rise to upright mammals, the source for neurons that directly control the forelimbs moved from the brain into the spinal cord, as the torso moved away from the head and was given a neck. In other words human arms, like the wings of bats and birds, became separate from the head and placed on the torso below the neck.

"A neck allowed for improved movement and dexterity in terrestrial and aerial environments," says Andrew Bass, Cornell professor of neurobiology and behavior, and an author on the paper. "This innovation in biomechanics evolved hand-in-hand with changes in how the nervous system controls our limbs."

Bass explained that this unexpected level of evolutionary plasticity likely accounts for the incredible range of forelimb abilities – from their use in flight by birds to swimming by whales and dolphins, and playing piano for humans.

The research, "Ancestry of motor innervation to pectoral fin and forelimb," was authored by Leung-Hang Ma (first author) and Robert Baker (corresponding author), both of Department of Physiology and Neuroscience, New York University Langone Medical Center; Edward Gilland, Department of Anatomy, Howard University; and Bass. All four researchers are affiliated with the Marine Biological Laboratory, Woods Hole, Mass.

Latest 'green' packing material? Mushrooms

Packing foam now entering the marketplace is engineered from mushrooms and agricultural waste

A new packing material that grows itself is now appearing in shipped products across the country.

The composite of inedible agricultural waste and mushroom roots is called Mycobond™, and its manufacture requires just one eighth the energy and one tenth the carbon dioxide of traditional foam packing material. And unlike most foam substitutes, when no longer useful, it makes great compost in the garden.

The technology was the brainchild of two former Rensselaer Polytechnic Institute undergraduates, Gavin McIntyre and Eben Bayer, who founded Ecovative Design of Green Island, N.Y., to bring their idea into production.

"We don't manufacture materials, we grow them," says McIntyre. "We're converting agricultural byproducts into a higher-value product."

Because the feedstock is based on renewable resources, he adds, the material has an economic benefit as well: it is not prone to the price fluctuations common to synthetic materials derived from such sources as petroleum. "All of our raw materials are inherently renewable and they are literally waste streams," says McIntyre. "It's an open system based on biological materials."

EcoCradle packaging material is composed of agricultural byproducts (cotton gin trash) bound together by fungal mycelium. With an appearance and functionality of polymer foams, EcoCradle can be manufactured with just one eighth the energy and one tenth the carbon dioxide of traditional foam packing material. dward **Browka, Ecovative Design**

With support from NSF, McIntyre and Bayer are developing a new, less energy-intensive method to sterilize their agricultural-waste starter material--a necessary step for enabling the mushroom fibers, called mycelia, to grow. McIntyre and Bayer are replacing a steam-heat process with a treatment made from cinnamon-bark oil, thyme oil, oregano oil and lemongrass oil.

The sterilization process, which kills any spores that could compete with Ecovative's mushrooms, is almost as effective as the autoclaving process used to disinfect medical instruments and will allow the Mycobond™ products to grow in the open air, instead of their current clean-room environment.

"The biological disinfection process simply emulates nature," says McIntyre, "in that it uses compounds that plants have evolved over centuries to inhibit microbial growth. The unintended result is that our production floor smells like a pizza shop."

Much of the manufacturing process is nearly energy-free, with the mycelia growing around and digesting agricultural starter material--such as cotton seed or wood fiber--in an environment that is both room-temperature and dark. Because the growth occurs within a molded plastic structure (which the producers customize for each application), no energy is required for shaping the products.

Once fully formed, each piece is heat-treated to stop the growth process and delivered to the customer -though with the new, easier, disinfection treatment, Bayer and McIntyre are hoping the entire process can be packaged as a kit, allowing shipping facilities, and even homeowners, to grow their own Mycobond™ materials.

Based on a preliminary assessment McIntyre and Bayer conducted under their Phase I NSF SBIR award, the improvements to the sterilization phase will reduce the energy of the entire manufacturing process to one fortieth of that required to create polymer foam.

"This project is compelling because it uses innovative technology to further improve Ecovative's value, while also providing the environmental benefits that NSF is looking for," said Ben Schrag, the NSF program officer who oversees Ecovative's Small Business Innovation Research (SBIR) award. "The traction that they have gotten with their early customers demonstrates how companies can build strong businesses around products whose primary competitive advantage lies in their sustainability."

In addition to the packaging product, called EcoCradle™, Ecovative has developed a home insulation product dubbed greensulate™. Comparable in effectiveness to foam insulation, it has the added benefit of being flame retardant.

Ecovative is already producing custom protective packaging products for several Fortune 500 companies, though they are leveraging the new disinfection process to produce turnkey systems that they plan to deploy to off-site customers and do-it-yourself homeowners by 2013.

In addition to NSF, Evocative has received support from the USDA Agricultural Research Service, the Environmental Protection Agency, and the New York State Energy Research and Development Authority.

Relationships improve your odds of survival by 50 percent

Stayin' alive: That's what friends are for

A new Brigham Young University study adds our social relationships to the "short list" of factors that predict a person's odds of living or dying.

In the journal PLoS Medicine, BYU professors Julianne Holt-Lunstad and Timothy Smith report that social connections – friends, family, neighbors or colleagues – improve our odds of survival by 50 percent. Here is how low social interaction compares to more well-known risk factors:

**** Equivalent to smoking 15 cigarettes a day***
**** Equivalent to being an alcoholic***
**** More harmful than not exercising***
**** Twice as harmful as obesity***

"The idea that a lack of social relationships is a risk factor for death is still not widely recognized by health organizations and the public," write the PLoS Medicine editors in a summary of the BYU study and why it was done.

The researchers analyzed data from 148 previously published longitudinal studies that measured frequency of human interaction and tracked health outcomes for a period of seven and a half years on average. Because information on relationship quality was unavailable, the 50 percent increased odds of survival may underestimate the benefit of healthy relationships.

"The data simply show whether they were integrated in a social network," Holt-Lunstad said. "That means the effects of negative relationships are lumped in there with the positive ones. They are all averaged together."

Holt-Lunstad said there are many pathways through which friends and family influence health for the better, ranging from a calming touch to finding meaning in life.

"When someone is connected to a group and feels responsibility for other people, that sense of purpose and meaning translates to taking better care of themselves and taking fewer risks," Holt-Lunstad said.

In examining the data, Smith took a careful look at whether the results were driven primarily by people helping each other prolong their golden years. This effect is not isolated to older adults," Smith said. "Relationships provide a level of protection across all ages."

Smith said that modern conveniences and technology can lead some people to think that social networks aren't necessary. "We take relationships for granted as humans – we're like fish that don't notice the water," Smith said. "That constant interaction is not only beneficial psychologically but directly to our physical health."

Brad Layton worked on the study as an undergrad at BYU and appears as a co-author on the new study. Layton's involvement in this project helped him secure a spot as a Ph.D. candidate in the highly ranked epidemiology program at the University of North Carolina at Chapel Hill.

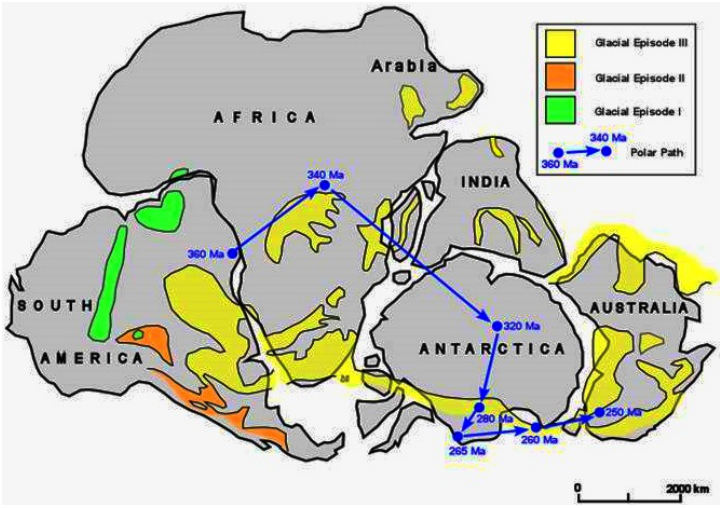
Super Glaciers Leave Their Mark on the Gondwanan Supercontinent

Late Paleozoic Glacial Events and Postglacial Transgressions in Gondwana

Oscar López-Gamundí and Luis A. Buatois

This new Special Paper from The Geological Society of America comprises a wide range of topics related to one of the most extreme paleoclimatic episodes in Earth's history, the Late Paleozoic Ice Age (LPIA). With over 100 illustrations, chapters paint a broad swath across Gondwana while focusing on specific topics related to the effects of LPIA glaciation and deglaciation-triggered sea-level rise on the supercontinent.

The book's objective, say editors Oscar R. López-Gamundí of Hess Corporation and Luis A. Buatois of the University of Saskatchewan, is "not to give a state-of-the-art review of the Late Paleozoic Ice Age," which has been done with competency elsewhere, but, rather, to turn the reader's attention toward facets of the LPIA that require further study.



Proposed cover illustration, provided by the editors, for GSA Special Paper 468, Late Paleozoic Glacial Events and Postglacial Transgressions in Gondwana. The collection covers state-of-the-art critical topics related to the Late Paleozoic Glaciation and deglaciation-triggered sea-level rise that affected Gondwana.

Topics include the sedimentologic, paleoenvironmental, and paleoclimatic aspects of the glacial event; the influence of postglacial transgressions on the salinity of coastlines; the nature of glacial and glacially influenced ecosystems, with a look at the faunas (including the Levipustula Fauna) and floras of the time; analysis and illustration of trace fossil assemblies; and discussion of relatively less well-known glacial deposits in some Gondwanan regions. One chapter even challenges the popular interpretation that there was a single massive ice sheet over much of Gondwana during the late Paleozoic glaciation. *http://www.geosociety.org/pubs/*

Segmentation Is the Secret Behind the Extraordinary Diversification of Animals

ScienceDaily (July 27, 2010) — Segmentation, the repetition of identical anatomical units, seems to be the secret behind the diversity and longevity of the largest and most common animal groups on Earth. Researchers from CNRS and Université Paris Diderot have shown that this characteristic was inherited from a common segmented ancestor thought to have lived 600 million years ago and whose presence "changed the face of the world." This discovery is published in Science on 16 July 2010.

What do centipedes, earthworms and humans have in common? They all feature the repetition of anatomically identical units along the axis running from the front to the rear of their bodies. This characteristic, which researchers call segmentation, is shared by three large groups of animals. It may not be obvious at first glance though, as the repeated segments can be hidden by a shell or be partially fused. The segments are nevertheless present, laid out along the bilateral axis in the trunk, abdomen or thorax.

The first of these animal groups is the arthropods, which include centipedes but also insects, spiders, scorpions and crustaceans, representing by far the largest group of animals on the planet. With the highest number of species and individuals, it makes up nearly 40% of animal biomass. Apart from centipedes, whose segmentation is impossible to miss, arthropods also include grasshoppers, crickets and shrimps. Vertebrates, another highly diverse group, come next. They comprise most familiar animals, including humans, and they represent an evolutionary success. In this group, segmentation is found in the vertebrae of the backbone and, at a finer anatomical scale, in the muscles and nerves that spread from the spinal cord. The final group is the annelid worms, whose body is almost entirely formed of identical segments, such as sea and earthworms. They are also very numerous in terms of species, though much less conspicuous.

These three groups are not closely related to one another. So, where does their segmentation come from? Is it possible that they all inherited this feature from a very distant common ancestor that lived 600 million years ago, before the Cambrian explosion, which produced most of the large animal groups that exist today? Or has segmentation occurred several times during the history of evolution? This is the question addressed by the researchers of CNRS and Université Paris Diderot at the Institut Jacques Monod, because segments seem to offer a significant advantage to the groups that have them, in terms of diversity, longevity and overall evolutionary success.

The researchers found that the genes controlling segment formation during embryo development are almost the same in drosophila (an arthropod) and in annelid marine worms, on which they concentrated their studies. These similarities led them to conclude that the genes had been inherited from a common ancestor, which was itself segmented. It also appears that vertebrates inherited this characteristic from an ancestor they share with the arthopods and the annelids. This is what the researchers are now seeking to confirm.

This work supports the idea that segmentation only appeared once in the history of evolution and that it led to the broad diversity of animal groups possessing it. This old and controversial idea among zoologists, had never been proved until now. But why should segmentation be so advantageous? Over millions of years, and exposure to changing environmental constraints, it is easier for an animal to specialize a segment into a specific tool in response to a need, than to create a whole new organ from scratch. By chance, evolution may have played a winning card with segmentation, which profoundly marked the history of life on Earth. If one day we could play God and create artificial animals or even biomimetic robots, perhaps we too should think about it. But this is still within the realm of science fiction.

Translating Stories of Life Forms Etched in Stone

By SEAN B. CARROLL

In 1909, Charles Walcott, a paleontologist and secretary of the Smithsonian Institution, discovered one of the greatest and most famous fossil troves high in the Canadian Rockies on Burgess Pass in British Columbia. The slabs of Burgess Shale that Walcott excavated contained the earliest known examples at the time of many major animal groups in the fossil record, in rocks that were about 505 million years old.

Walcott's discovery was further evidence of the so-called Cambrian Explosion - the apparently abrupt appearance of complex animals in the fossil record within the Cambrian Period, from about 542 to 490 million years ago. Although not seen before on the scale documented in the Burgess Shale, the emergence of trilobites and other animals in the Cambrian was familiar to paleontologists, and had troubled Charles Darwin a great deal.

The difficulty posed by the Cambrian Explosion was that in Darwin's day (and for many years after), no fossils were known in the enormous, older rock formations below those of the Cambrian. This was an extremely unsettling fact for his theory of evolution because complex animals should have been preceded in the fossil record by simpler forms.

In "On the Origin of Species," Darwin posited that "during these vast, yet quite unknown, periods of time, the world swarmed with living creatures." But he admitted candidly, "To the question why we do not find records of these vast primordial periods, I can give no satisfactory answer."

It took a very long time, and the searching of some of the most remote places on the planet - in the Australian Outback, the Namibian desert, the shores of Newfoundland and far northern Russia - but we now have fossil records from the time immediately preceding the Cambrian. The rocks reveal a world whose oceans were teeming with a variety of life forms, including primitive animals, which is certainly good news for Darwin.

Now, this once-worrisome gap in the fossil record is a period of intense interest to geologists as well as paleontologists. The former have even given it its own division in the geological timescale. The Ediacaran Period, from 635 to 542 million years ago, is the first new geological period to be named in more than a century. Moreover, geologists have developed some intriguing theories about how dramatic changes in the Earth's climate and chemistry during the Ediacaran may have allowed for the evolution of animals.

The first major advance towards finding the earliest animal life occurred in 1946 when Reginald Sprigg, a geologist for the South Australia government, was checking out some old mines in the Ediacaran Hills of the Flinders Range several hundred miles north of Adelaide. Sprigg noticed some striking disc-shaped impressions up to four inches in diameter on the exposed surfaces of rocks nearby.

Sprigg interpreted the patterns as the fossil remains of soft-bodied creatures like jellyfish or their relatives. But when Sprigg first showed the imprints to leading authorities, they dismissed them as artifacts made by the weathering of the rocks. However, later that year, when Sprigg found the frond-like forms he called Dickinsonia , he was certain that such geometrical impressions could have been made only by living creatures.

Sprigg was excited by both the unusual appearance of the fossils and by their age, which he believed to be the beginning of the Cambrian, and made them the oldest animal forms yet seen. But despite their potential importance, Sprigg's discoveries were ignored at an international geology meeting and his paper describing the fossils was rejected by the leading journal, . Sprigg moved on to other, more rewarding pursuits in the oil, gas, and mining industries.

Scientific attention to these strange forms was not revived until a decade later when more soft-bodied forms were found in the Ediacaran Hills and in England, and their age was firmly established as actually predating the Cambrian. Deposits of similar aged forms have been discovered at Mistaken Point on the Avalon Peninsula of Newfoundland, in southern Namibia, the White Sea of Russia, and more than 30 other locations on five continents. The global distribution of these disc-, frond-, tube-, branch-, or spindle-shaped forms demonstrate that life was complex and diverse in the Ediacaran.

But finding these fossils has posed many new mysteries. Many of the creatures are so unlike modern forms that deciphering what they are and how they lived continues to challenge paleontologists. Prof. Andrew Knoll of Harvard University has likened the Ediacaran forms to a paleontological "Rorschach" test because different scientists often interpret the same fossil very differently.

Dickinsonia, for example, has been interpreted as being a relative of jellyfish, a marine worm, a lichen, or even as a member of a completely extinct kingdom. The challenge to classifying most Ediacarans is that they lack some features that are characteristic of modern animals, a mouth or an anus in the case of Dickinsonia, or the shells and hard parts typical of many Cambrian groups. But, in fact, such simple bodies are exactly what should be expected of primitive forerunners of later animals. On the other hand, scientists have had to explain how such creatures functioned. Some of the very flat-bodied Ediacarans, for instance, lived on sediments and appear to have fed by directly absorbing nutrients by osmosis.

The kinds of animals that paleontologists have been especially eager to identify in the Ediacaran are those with bilateral body symmetry, the feature characteristic of the majority of modern animal groups, including ourselves. Bilateral animals flourished in the Cambrian so tracing their origins is crucial to understanding the pace of animal evolution. Several bilateral Ediacaran animals have been discovered, including Kimberella, a possible mollusc. Hundreds of Kimberella specimens are known that date to about 555 million years ago, 50 million years before the animals of the Burgess Shale.

The Ediacaran fossil record thus stretches the origins of animals to well before the Cambrian Explosion. But it also raises the question of why, after more than 2.5 billion years during which microscopic life dominated the planet, larger, more complex, forms emerged at that time?

A key requirement for larger creatures is oxygen, and the dramatic history of oxygen levels is also etched in Ediacaran rocks. Geologists now understand that the earliest Ediacaran organisms were deep water creatures that emerged 575 to 565 million years ago, shortly after a major ice age ended about 580 million years ago.

Recent chemical analyses of Ediacaran sediments reveal that the deep ocean lacked oxygen before and during that ice age, then became much richer in oxygen and stayed that way after the glaciers melted . That sharp rise in oxygen may have been the catalyst to the evolution of animals, including our ancestors.

Several weeks after the publication of "On the Origin of Species" and amid a torrent of criticism, Darwin added a mischievous postscript to a letter to his friend, the geologist Charles Lyell: "Our ancestor was an animal which breathed water, had a swim-bladder, a great swimming tail, an imperfect skull & undoubtedly was an hermaphrodite! Here is a pleasant genealogy for mankind." The Ediacaran fossils tell us that Darwin was being too generous. Our earliest animal ancestor probably had no head, tail, or sexual organs, and lay immobile on the sea floor like a door mat.