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## Redaksioneel

Skaars het die jaar begin (was dit dan nie net gister gewees nie?) en ons staar alweer die middel van die jaar en die kouer winter seisoen in die gesig!!

Dit is met groot leedwese wat ons vroeg in hierdie jaar verneem het van die dood van 'n groot genetikus in ons midde: Dr. Bill Louw. In hierdie uitgawe is daar 'n kort huldeblyk aan hom gelewer. Indien enige iemand enige brokkies inligting oor hom het kan julle dit gerus vir my aanstuur en kan ons dalk in 'n toekomstige uitgawe iets meer volledig oor sy betrokkenheid by die vereniging berig.

Recently Wynand van der Walt (FoodNCropBio) sent me on a summary of the ISAAA (International Service for the Acquisition of Agri-Biotech Applications) global report. In this issue I include a short excerpt

from this summary. More info on South Africa in general can be obtained from [info@isaaa.org](mailto:info@isaaa.org).

Ek sluit ook 'n interessante stukkie in die nuusbrieff in, waarop ek afgekomm het in die Internasionale Genetiese Vereniging se nuusbrieff. Dit gaan oor die titels van wetenskaplike artikels en gee bietjie insig in watter afleidings kan gemaak word deur slegs na die titel van 'n artikel te kyk. Dit laat mens besef hoe belangrik dit is om hierdie kort beskywende deel van jou artikel korrek te bewoord.

A reminder of the next **International Congress of Genetics**, to be held in Berlin, Germany, July 12-17, 2008. The abstract and early registration deadline for this is 15 January 2008. The following plenary speakers have been confirmed so far: Prof. Rudolf Jaenisch, Cambridge, USA; Prof. Eric Lander, Cambridge, USA and Prof. Svante Pääbo,

Leipzig, Germany.

Remember to visit our homepage [sagene.co.za](http://sagene.co.za). Not only are the newsletters published here but you can feel free to use this as advertising space for positions and bursaries or workshops etc. If you know of any interesting conferences which you might be involved with in the organization of or will be attending, please also notify us.

Mag die res van hierdie kwartaal vir jou goeie navorsingsresultate en blink idees inhou!!!!

Navorsingsgroete  
ROUVAY ROODT-WILDING



The characteristic of scientific progress is our knowing  
that we did not know.  
Gaston Bachelard

## GLOBAL STATUS OF BIOTECH/GM CROPS IN 2006

- Biotech crops achieved several milestones in 2006: annual hectarage of biotech crops exceeded 100 million hectares (250 million acres); for the first time, the number of farmers growing biotech crops (10.3 million) exceeded 10 million; the accumulated hectarage from 1996 to 2006 exceeded half a billion hectares at 577 million hectares (1.4 million acres), with an unprecedented 60-fold increase between 1996 and 2006, making it the fastest adopted crop technology in recent history.
- It is notable that the year-to-year increase of 12 million hectares in 2006 is the second highest in the last 5 years in absolute area, despite the fact that the adoption rates in the US, the principal grower of biotech crops, are already over 80% for soybean and cotton. It is also noteworthy that in 2006, India, the largest cotton growing country in the world, registered the highest proportional increase with an impressive gain that almost tripled its Bt cotton area to 3.8 million hectares.
- In 2006, the number of countries planting biotech crops increased from 21 to 22 with the EU country Slovakia, planting Bt maize for the first time and bringing the total number of countries planting biotech crops in the EU to six out of 25. Spain continued to be the lead country in Europe planting 60,000 hectares in 2006. Importantly, the collective Bt maize hectarage in the other five countries (France, Czech Republic, Portugal, Germany, and Slovakia) increased over 5-fold from approximately 1,500 hectares in 2005 to approximately 8,500 hectares, albeit on small hectarages, and growth in these five countries is expected to continue in 2007.
- 10.3 million farmers from 22 countries planted biotech crops in 2006, up from 8.5 million farmers in 2005. Of the 10.3 million, 90% or 9.3 million (up significantly from 7.7 million in 2005) were small, resource-poor farmers from developing countries whose increased income from biotech crops contributed to their poverty alleviation. Of the 9.3 million small farmers, most of whom were Bt cotton farmers, 6.8 million were in China, 2.3 million in India, 100,000 in the Philippines, several thousand in South Africa, with the balance in the other seven developing countries which grew biotech crops in 2006. This initial modest contribution of biotech crops to the Millennium Development Goal of reducing poverty by 50% by 2015 is an important development, which has enormous potential in the second decade of commercialization from 2006 to 2015.
- A new biotech crop, herbicide tolerant alfalfa, was commercialized for the first time in the US in 2006. RR® alfalfa has the distinction of being the first perennial biotech crop to be commercialized and was seeded on 80,000 hectares, or 5% of the 1.3 million hectares of alfalfa probably seeded in the US in 2006. RR® Flex herbicide tolerant cotton was launched in 2006 occupying a substantial area of over 800,000 hectares in its first year and was planted as a single trait and as a stacked product with Bt, with the latter occupying the majority of the hectarage. The plantings were principally in the US with a smaller hectarage in Australia. Notably in China, a locally developed virus resistant papaya, a fruit/food crop, was recommended for commercialization in late 2006.
- In 2006, the 22 countries growing biotech crops comprised 11 developing countries and 11 industrial countries; they were, in order of hectarage, USA, Argentina, Brazil, Canada, India, China, Paraguay, South Africa, Uruguay, Philippines, Australia, Romania, Mexico, Spain, Colombia, France, Iran, Honduras, Czech Republic, Portugal, Germany, and Slovakia. Notably, the first eight of these countries grew more than 1 million hectares each - this provides a broad and stable foundation for future global growth of biotech crops.
- For the first time, India grew more Bt cotton (3.8 million hectares) than China (3.5 million hectares) and moved up the world ranking by two places to number 5 in the world, overtaking both China and Paraguay.
- It is noteworthy that more than half (55% or 3.6 billion people) of the global population of 6.5 billion live in the 22 countries where biotech crops were grown in 2006 and generated significant and multiple benefits. Also, more than half (52% or 776 million hectares) of the 1.5 billion hectares of cropland in the world is in the 22 countries where approved biotech crops were grown in 2006.

**Clive James**  
Chair, ISAAA Board of Directors

Copies of this entire document is available from the newsletter editor. More info on SA GM crops is available from [info@isaaa.org](mailto:info@isaaa.org)

## WRITING TITLES FOR SCIENTIFIC ARTICLES

Titles are what readers see first, and constitute the author's main - sometimes only - opportunity to grab the reader's attention. I know that for many articles I see via email Table of Contents alerts, the title is the only part I read. Of the titles I read, only a minority entice me to click on to the abstract (where as often as not I discover that the enthusiasm created by the title has been misplaced!). My experience as a reviewer suggests that there is wide variation in the care taken in composing titles for scientific articles. Some authors produce titles that are so bland, clumsy or uninformative that I could easily believe that the title was typed quickly into the relevant box on the journal's web site, without any prior consideration. Other titles are beautifully crafted and too often artfully distorted, with the deliberate intent of cynically slipping ideas into the title that may not be genuinely represented in the main text.

Many common styles and tricks of title-writing are evident from published papers. There is an increasing use of the "title that says it all" - once you have read the long, detailed, conclusion-rich title (which gives almost as much

information as the abstract), you have all the facts of the case, and (coupled with confirmation that the subject is not very interesting) there is no need to read any further. A common trick to inflate the importance of a study (or, in grant applications, proposed study) is the "over-generalised" title. Thus "The evolution of developmental plasticity" might actually relate to a study that could equally fairly be entitled "Comparing electron micrographs of the mouthparts of different species of earwig".

These self-important titles, exaggerating the significance of the work for human understanding of the universe, overlap substantially with the "bipartite" title. Among bipartite titles, the "primary research" variant is in the form "cosmic significance-colonactual contents", as in "The evolution of developmental plasticity: mandibular variation within the genus *Forficula*". The "review" variant uses a colon to separate a jokey catchphrase, introducing contrived informality, from a more serious, detailed description of the subject-matter, as in "Knees up, mother Brown: assessment of joint replacement surgery in the elderly".

For many authors, the title's role in informing readers about the contents seems to be at least matched by its role in self-promotion. There is an increasing use of adjectives in titles to describe the importance of the work reported. Sometimes, it is a self-effacing description, as when a title advertises a "pilot study". More often it is a blatant attempt to make the paper seem more important or exciting, first to the editor and reviewers, and subsequently to the reader. In Kurt Vonnegut's novel *Galápagos*, New York publicity agent Bobby King achieves his masterpiece of the advertiser's art in persuading top celebrities to sign up for the maiden voyage of the good ship *Bahía de Darwin* to the Galápagos Islands. How is this miracle worked? By steadfastly never calling it anything other than "The Nature Cruise of the Century". Similarly, advertising campaigns unilaterally declaring a product to be "probably the best lager in the world" or "the best a man can get" presumably persist because after hearing it often enough, some people come to believe it. In single-handed retaliation for these ploys I am therefore entitling this article "The Most Brilliant Scien-

tific Opinion-Piece of the Century". After all, it must be true. It says so in the title.

If such an adjective gets through the review process, it sticks, and the description of the paper as reporting "extraordinary" or "astonishing" findings can do its shady undercover work of inflating the paper's importance in the reader's mind. This effect is also at work in seemingly innocuous adjectives like "remarkable" and "surprising"; how surprising or remarkable the findings are is a matter of opinion, and the authors are the last people we should turn to for an honest evaluation. Judging from some of the examples I found in the literature, there are clearly some authors who are very easily surprised. Among adjectives of self-promotion, apart from the relatively mild "surprising", the commonest appearing in titles are "remarkable" and "extraordinary", with only rarer appearances for "astonishing" or "spectacular". It is difficult to evaluate "dazzling" and "stunning": these do not necessarily constitute hyperbole, because they have perfectly reasonable technical uses in studies of vision (1, 2) and injuries (especially

## WRITING TITLES FOR SCIENTIFIC ARTICLES

those used in killing animals (3)). I could find only one instance of “gobsmacking” (in the British Dental Journal (4), so very probably a rare example of literal use of the term!), no examples of “stonking” and only three of “stupendous”, including one proudly describing the achievement of the Great Proletarian Cultural Revolution (5).

What do authors do for a title if the findings of their studies turn out to be not especially interesting or exciting? One long-established stratagem is to construct the title of the paper in the form of a question. When you see a title in the form of a question (“Is betadefensin copy number a modifier locus for cystic fibrosis?”), without even reading the abstract you know that the answer to the question will be “no”; if the answer had been “yes”, they wouldn’t have given the title in the form of a question! There are more recent variants of this attempt to make the results seem more interesting than they really are, including the use of “and” (“Beta-defensin copy number and modifier genes for cystic fibrosis”). When you read the abstract you discover that the two concepts have been evaluated together, and the conclu-

sion was that there is no connection between the two.

Most deceitful of all is the variant using “as” (“Betadefensin copy number as a modifier locus for cystic fibrosis”). If you take that to mean that beta defensin copy number was *identified* as a modifier locus for cystic fibrosis, that’s your mistake. What the title actually indicates is that beta-defensin copy number was *evaluated* as a modifier locus – and when you read the abstract you will discover that it turned out not to have the necessary properties. To my mind, the only defensible title in these circumstances is the honest use of the word “not”. We now even have the admirable *Journal of Negative Results in Biomedicine* to encourage researchers to report their disappointingly negative results honestly (6).

Putting aside the subtleties, how is the truthfulness of titles to be policed? The problem is that where imprecision shades into exaggeration, and exaggeration into deception, authors and editors have ultimately convergent interests in overselling their shared product. As ever, the burden of defending the literature against charlatans and self-publicists falls on the

shoulders of the reviewers, whose role in science might be characterized as unpaid, unregulated and unrecognized – and also on occasion unreliable (7). Just as a referee has to assess whether the conclusions arrived at in a paper are justified by the evidence presented, the most public and influential parts of paper, the abstract and title, should be subject to the most intense scrutiny of all. That doesn’t always happen!

*All titles for which references are not given have been invented for the purposes of illustration, and if there is any chance resemblance to the work of any scientist, living or dead, it is entirely fortuitous. There is no intention to belittle the efforts of those working in any branch of science quoted here, including beta-defensin copy number measurement, the morphology of earwig mouthparts, or joint replacement surgery in the elderly.*

1. Boos, S. (1980) Sensitivity to Dazzling Light of Diabetics During Driving in Darkness. *Acta Ophthalmologica*, 58, 306-306.

2. Gomezulla, F., Louro, O. and Mosquera, M. (1986) Macular Dazzling Test on Normal Subjects. *British Journal of Ophthalmology*, 70, 209-

213.

3. Lines, J. and Kestin, S. (2005) Electric stunning of trout: power reduction using a two-stage stun. *Aquacultural Engineering*, 32, 483-491.

4. Palmer, J.D. and Page, J.A. (1991) Gobsmacking Grins. *British Dental Journal*, 171, 28-29.

5. Anonymous (1976) Stupendous Achievement of Great Proletarian Cultural Revolution: How China Manufactured 4000hp Diesel Locomotives, Caught up with and Surpassed Advanced World Levels. *Scientia Sinica*, 19, 436-444.

6. Hollox, E.J., Davies, J., Griesenbach, U., Burgess, J., Alton, E.W.F.W. and Armour, J.A.L. (2005) Betadefensin genomic copy number is not a modifier locus for cystic fibrosis. *J. Negative Results in BioMed.*, 4, 9.

7. Armour, J. (2004) Oi! Referee! *Genetics Society News*, 51, 73-75.

**John Armour.** University of Nottingham

[Genetics Society Newsletter, June 2006, Issue 55](#)  
[www.genetics.org.uk](http://www.genetics.org.uk)

## Better choice of model organisms

**Research in evolutionary developmental biology, known as 'evo-devo', is being held back because the dominant model organisms used by scientists are unable to illustrate key questions about evolution, argue biologists in the latest issue of Nature Reviews Genetics.**

The subject of evo-devo, which became established almost a decade ago, is particularly dependent on the six main model organisms that have been inherited from developmental biology (fruit fly, nematode worm, frog, zebrafish, chick and mouse).

To help understand how developmental change underpins evolution, evo-devo researchers have, over recent years, selected dozens of new model organisms, ranging from sea anemones to dung beetles, to study.

One of the selection criteria deemed most crucial is the phylogenetic position of prospective model organisms, which reflects their evolutionary relationships.

Phylogenetic position is employed in two common, but problematic, ways, either as a guide to plug holes in unexplored regions of the phylogenetic tree, or as a pointer to species with presumed primitive (ancestral) characteristics.

Drs Ronald Jenner and Matthew Wills from the Department of Biology & Biochemistry at the University of Bath (UK), call for a more judicious approach to selecting organisms, based on the evo-devo themes

that the organism can shed light on.

"It is fair to say that, since its inception, some workers feel that evo-devo hasn't quite lived up to its early expectations," said Dr Jenner.

"Partly this is because too much was expected too soon, but we suspect that in terms of its future promise the current choice of new model organisms has not yet been optimised.

Dr Wills said: "Many models to date, in particular the big six, have been chosen because they are easy to keep in the laboratory, select and breed.

"Whilst this is generally fine in the context of development research, the benefits to evo-devo as a subject are limited.

"There are upwards of 35 phyla of animals, and four of our six best models come from just one phylum.

"However, that doesn't mean that simply choosing new models to plug holes in the phylogenetic tree is the best option for further progress in evo-devo."

Dr Jenner added: "The popular advice of choosing new model organisms to maximise phylogenetic spread is nice to show diversity, but it doesn't necessarily lead to new general insights about evolution.

"Choosing new models in this way leaves it entirely a matter of chance whether a new model will illuminate a particular evo-devo theme.

"Instead, we urge workers to select new models

specifically to illuminate hitherto neglected general themes within evo-devo."

In other cases, new model organisms are chosen on the basis of how well they are thought to represent a particular ancestral organism. In connection to this practice, the researchers point to 'basal bias' as another way that scientists may get it wrong when choosing new model organisms.

This occurs when scientists choose an organism because it was the first to branch off from its ancestor, rather than because it has known genetic or developmental similarities to it.

"We caution against this widely used rule of thumb, and advise the use of additional criteria, such as molecular branch lengths, to choose species as best representatives of ancestral body plans," said Dr Jenner.

"Just because an organism has sprung from the base of the evolutionary tree does not make it more primitive and representative.

"Equally, those that became separate species further down the evolutionary line are not necessarily increasingly different from that common ancestor.

"Among living species that descended from a particular common ancestor, those designated as 'basal' are those that are separated from this ancestor by the smallest number of speciation events.

"Sometimes evolution speeds up in association

with speciation – an organism can change a lot in this time.

"However, substantial evolutionary change may also occur in the absence of speciation, so basal species are not necessarily, or even likely a more conserved model of the ancestor.

"We need to make better use of the techniques that allow us to calculate how much an organism's genome has changed over time, when making assessments about how much an animal resembles its ancestor, because this information can be helpful in estimating how much an organism's phenotype has changed."

Dr Wills added: "Establishing criteria for choosing model organisms is important in this field, especially given the pressure on available funding sources.

"We encourage evo-devo workers to communicate with funding agents so that the limited resources available will not be disproportionately channelled to the 'big six', which, while important, cannot illuminate all evo-devo's central themes.

"If we want to understand how insects evolved wings or how legs developed from fins, we need to judiciously choose several models from specific parts of the phylogenetic tree.

"There is little point in blindly increasing the diversity of model systems, without some specific goals in mind."

**Source: University of Bath, Press release—29/03/07**

## Hofmeyr van Schaik medal

Op 8 Februarie 2006 is die Hofmeyr van Schaik medalje aan Darrell Lizamore oorhandig. Darrell het in 2006 sy Honneurs graad aan die departement Genetika, Universiteit van Stellenbosch voltooi en met 'n gemiddeld van 76% is hy 'n waardige ontvanger van hierdie jaar se medalje.

Die Hofmeyr van Schaik medalje word jaarliks deur SAGV toegeken aan die mees

uitnemende vierde jaar student in Genetika (B.Sc. Honneurs of B.Sc. Agric). Om te kwalifiseer vir die toekenning, moet die student 'n finale punt van ten minste 75% behaal.

Die medalje is ter nagedagtenis aan die Suid Afrikaanse Genetiese Vereniging se eerste president (Dr. J.D.J. Hofmeyr) en sekretaris (Dr. T. van Schaik).

Darrell het vir eers sy

studies onderbreek en is huidiglik in Korea vir 'n jaar om Engels aan te bied. Ons glo dat hierdie kranige student eersdaags weer sy studies aan Stellenbosch sal voortsit.



A fact is a simple statement that everyone believes. It is innocent, unless found guilty.

A hypothesis is a novel suggestion that no one wants to believe. It is guilty, until found effective.

**Edward Teller**

## In Memorium

Dr Jan Hendrik (Bill) Louw (70) died on 4 January 2007 in Stellenbosch.

Dr. Louw obtained the senior certificate at Pretoria Boys High in 1953, B.Sc. Agric (Genetics and Mathematical Statistics) at the University of Stellenbosch (US) in 1959, M.Sc. Agric (Genetics), also at the US in 1961, and his Ph.D. (Genetics) at Edinburgh University as a British Council Scholar in 1966.

He was appointed as senior lecturer in the department of Genetics at the US in 1967. He married his wife, Elza (nee Marais) in 1968.

According to Dr. Jim

Allan, a previous colleague of Dr. Louw, he was quietly spoken, unassuming and a very private person with the ability to conduct research in his fields of

interest and to teach in the fields of plant and animal improvement.

“He kept up to date throughout his academic career with developments in biometrical

genetics, molecular genetics and appropriate computer usage.

“As a scientist he was a perfectionist. He wrestled with many difficult theoretical problems until, for each, he gained a thorough understanding of the concept and he was then able to present it simply and meaningfully. In this he earned the respect of his colleagues as well as from both under- and post-graduate students.” Dr Allan said.

Dr. Louw also served on the SAGS executive committee for many years as treasurer.

Dr. Louw leaves his wife, Elza, and his son Robert.



**Dr. Bill Louw en Dr. Jim Allan saam met Dr. Allan se vrou by 'n geselligheid**

## Can cats taste sweet?

Sugar and spice and everything nice hold no interest for a cat. Our feline friends are only interested in one thing: meat (except for saving up the energy to catch it by napping, or a round of restorative petting...) This is not just because inside every domestic tabby lurks a killer just waiting to catch a bird or torture a mouse, it is also because cats lack the ability to taste sweetness, unlike every other mammal examined to date.

The tongues of most mammals hold taste receptors—proteins on the cellular surface that bind to an incoming substance, activating the cell's internal workings that lead to a signal being sent to the brain. Humans enjoy five kinds of taste buds (possibly six): sour, bitter, salty, umami (or meatiness) and sweet (as well as possibly fat). The sweet receptor is actually made up of two coupled proteins generated by two separate genes: known as *Tas1r2* and *Tas1r3*.

When working properly, the two genes form the coupled protein and when something sweet enters the mouth the

news is rushed to the brain, primarily because sweetness is a sign of rich carbohydrates—an important food source for plant-eaters and the non-discriminating, like humans. But cats are from the noble lineage Carnivora and, unlike some of its lesser members, such as omnivorous bears or, even more appalling, herbivorous pandas, they exclusively eat meat.

Whether as a result of this dietary choice or the cause of it, all cats—lions, tigers and British longhairs—lack 247 base pairs of the amino acids that make up the DNA of the *Tas1r2* gene. As a result, it does not code for the proper protein, it does not merit the name gene (only pseudogene), and it does not permit cats to taste sweets. "They don't taste sweet the way we do," says Joe Brand, biochemist and associate director at the Monell Chemical Senses Center in Philadelphia. "They're lucky. Cats really have bad teeth as it is."

Brand and his colleague Xia Li first discovered the pseudogene after decades

of anecdotal evidence—such as cats showing no preference between sweetened and regular water, unlike other animals—testifying to their indifference to the sweet stuff. Of course, there are also plenty of anecdotal accounts pointing in the other direction: cats that eat ice cream, relish cotton candy, chase marshmallows. "Maybe some cats can use their [*Tas1r3* receptor] to taste high concentrations of sugar," Brand says. "It's a very rare thing but we don't know yet."

Scientists do know, however, that cats can taste things we cannot, such as adenosine triphosphate (ATP), the compound that supplies the energy in every living cell. "There isn't a lot hanging around in meat, but it's a signal for meat," Brand says. And plenty of other animals have a different array of receptors, Li says, from chickens that also lack the sweet gene to catfish that can detect amino acids in water at nanomolar concentrations. "Their receptor is more sensitive than the background concentration," Brand notes. "The cat-

fish that detects the rotting food first is the one that survives."

So far, cats are alone among mammals in lacking the sweet gene; even close relatives among the meat-eaters like hyenas and mon-gooses have it. And cats may lack other components of the ability to enjoy (and digest) sugars, such as glucokinase in their livers—a key enzyme that controls the metabolism of carbohydrates and prevents glucose from flooding the animal. Despite this, most major pet food manufacturers use corn or other grains in their meals. "This may be why cats are getting diabetes," Brand offers. "Cat food today has around 20 percent carbohydrates. The cats are not used to that, they can't handle it." What these fearsome predators of suburbia cannot taste may be hurting them. But it also means that most cat lovers don't have to worry about Simon snatching their unattended dessert.

**Taken from: David Biello  
Scientific American, March  
8, 2007.**

## Sensitive stem cells

Our choice of careers as adults isn't determined by whether we slept on a cot or a feather mattress as a child. But then, we're not stem cells (at least, not any more). A pair of recent reports shows that when scientists grow stem cells in the laboratory, the physical properties of the cells' culture-dish homes influence when they will adopt a distinct path in life and what that path will be.

At the 2006 annual meeting of the American Society for Cell Biology in San Diego last December, Christopher J. Murphy of the University of Wisconsin-Madison presented data showing that embryonic stem cells are more likely to keep their *pluripotency*—their ability to become any type of cell—when they are grown on a surface stamped with a pattern of tiny ridges. The effect was independent of the scale of the ridges, which ranged from nanometers to micrometers in width. Traditionally, cultured cells are grown on smooth glass or plastic surfaces.

This finding challenges the ingrained culture of cell culture, which has long assumed that the molecules dissolved in the liquid medium that bathes cells, including growth factors and other chemical signals, had the last word in determining cell physiology. Murphy disagrees, citing work in his laboratory that shows physical properties of the surface to be "as fundamental an element [in de-

termining cell behavior] as having growth factors in the media."

So what exactly does the physical topography do to the cell? "What doesn't it do?" asks Murphy. "It changes everything—adhesion, migration, proliferation, differentiation." From his systems-engineering perspective, the research offers potential benefits for the large-scale production of embryonic stem cells, which have the theoretical ability to divide indefinitely but often lose pluripotency for reasons that are poorly understood.

The Wisconsin team's findings echo previous work by scientists at the University of Pennsylvania. In the August 25, 2006, issue of the journal *Cell*, the Penn group showed that the fate of mesenchymal stem cells could be directed by the stiffness of the substrate on which they were grown. Mesenchymal stem cells come from adult bone marrow.

A research team led by Dennis E. Discher found that stem cells grown on the stiffest matrix became bone precursors. Those grown on the softest surface became nerve cells, and those grown on a medium-stiff substrate assumed the characteristics of muscle cells. The shapes of the cells and the suite of active genes contained within confirmed their new identities. Previous studies had shown that chemical

cues could effect this kind of differentiation, but Discher's paper was the first to demonstrate that cell lineage could be controlled in the absence of soluble stimuli.

This property makes sense, Discher says, given the role of such cells in tissue regeneration and repair. "These [mesenchymal stem] cells leave the bone marrow and end up in different places—muscle, bone, fat." But to repair muscle, or become a neuron in the brain or cartilage at the end of a bone, the stem cell must become anchored and "physically engage the microenvironment" before becoming one of the gang.

Such differences in the relative stiffness of animal tissues are easy to appreciate, according to Discher. "You can feel it. You know brains, calf's brains, how soft they are? I take you to the supermarket, you can feel the difference between steak and bone, or between fat and calf's brains."

But groceries aside, how exactly does a cell "feel" the surface it grows on? "It starts with attachment and contraction," explains Discher. Cells create what are called *focal adhesions*—points of attachment on the substrate—that provide a foundation for the cytoskeleton. A type of motor protein known as nonmuscle myosin II applies tension to the actin filaments of the cytoskele-

ton. At the end of the line, a complex of proteins near the focal adhesion appears to act as a "mechanotransducer," translating physical forces into intracellular signals. In the *Cell* paper, Discher and his colleagues showed that inhibiting myosin prevented the substrate-based differentiation.

The strong effect of physical properties on cell behavior in these experiments doesn't mean that scientists were wrong before about soluble signals. On the contrary, the two types of stimuli seem to work together. But Discher states—using language similar to Murphy's—that "physical cues are just as influential [on cell fate] as chemical cues. It's a balance." In his mesenchymal stem cells, differentiation was more complete when chemical and physical cues pointed in the same direction.

The potential implications of this work for cell biologists are profound, given that everything scientists know about the way cells behave in culture comes from experiments on hard, smooth surfaces. For this reason, Discher cautions that biologists need to "take those data [from rigid substrates] with a grain of salt." Given the tens of thousands of research papers that include such methods, that's a lot of salt.

**Christopher R. Brodie**  
Taken from *American Scientist* 95 (2): March-April 2007

## Interesting websites

<http://www.seedquest.com>

<http://www.biowatch.org.za>

<http://www.bioscience.heacademy.ac.uk/imagebank/>

<http://www.genengnews.com>

**SAGV/ SAGS is on the web**  
<http://www.sagene.co.za>

## KONGRESSE

### AGRI OUTLOOK 2007

25 to 26 October 2007

Pretoria, Gauteng, South Africa

<http://www.agrimark.co.za>

### 2nd INTERNATIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY (ICSTIE'07/'08)

8 to 10 June 2008

Penang / Kedah, PENANG / KEDAH, MALAYSIA

<http://www.penang.uitm.edu.my>

## Frank and Ernest



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## Funny language

English may be a flexible, expressive language, but it doesn't have a single word that captures the sense of: "so angry one feels like throwing up." Japanese does: **mukamuka**.

Adam Jacot de Boinod trawled the world's dictionaries for other vivid examples. The following are some of the indispensable terms collected in his book *The Meaning of Tingó* (Penguin).

**Altjiranga mitjina** (Aranda, Australia): the timeless dimensions of dreams

**Areodjarekput** (Inuit): to exchange wives for a few days only

**Cigerci** (Turkish): a seller of

liver and lungs

**Cooperar** (Spanish, Central America): to go along willingly with someone else to one's own disadvantage

**Gagrom** (Boro, India): to search for a thing below water by trampling

**Giomlaireachd** (Scottish Gaelic): the habit of dropping in at mealtimes

**Gumusservi** (Turkish): moonlight shining on water

**Guree** (Somali): to make room for a person to sit on a loaded camel

**Ichigo-ichie** (Japan): the practice of treasuring each moment and trying to make it perfect

**Ilunga** (Tshiluba, Congo): someone who is ready to forgive any abuse for the first time, to tolerate

it a second time, but never a third time

**Jeruhuk** (Malay): the act of stumbling into a hole that is concealed by long grass

**Marilopotes** (Ancient Greek): a gulper of coal dust

**Nakhur** (Persian): a camel that won't give milk until her nostrils are tickled

**Pagezuar** (Albanian): the state of dying before enjoying the happiness that comes with being married or seeing one's children married

**Pana po'o** (Hawaiian): to scratch your head in order to remember something

**Pu'ukaula** (Hawaiian): to set up one's wife as a stake in gambling

**Razblyuto** (Russian): the feeling for someone once

but no longer loved

**Seigneur-terrasse** (French): a person who spends much time but little money in a cafe (literally: a terrace lord)

**Torschlusspanik** (German): the fear of diminishing opportunities as one gets older (literally: gateclosing panic; often applied to women worried about being too old to have children)

**Waterponie** (Afrikaans): jet ski

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