THE SCIENCE CREATIVE QUARTERLY ISSUE TWO PART TWO OF SIX JULY 25TH 2005 BANG BANG!

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Our masthead, we think, will be forever evolving, although at present we have two Daves, a Bethany, a Caitlin, a Stephen, a Claire, a Russell, an Alex and a Justin.

Tom, Moebius and Richard continue to be happy to help.

Maybe Willow?

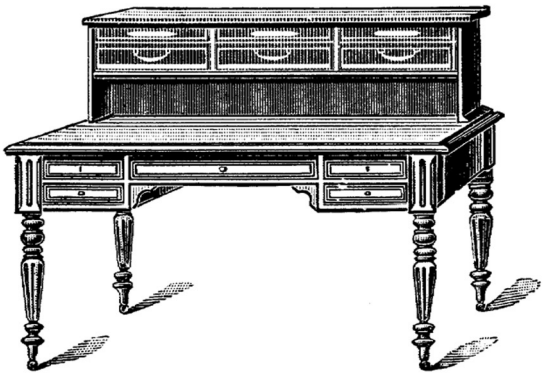
We did follow up on Chris and his friends, and for now, we know that Chris is on board.

Isn't Jen really good at drawing pictures?

Our exotic sounding Azar is sort of still with us, but involved with a different project that will likely have an affiliation with the SCQ later this summer.

Email us at **tscq@interchange.ubc.ca**

A FEW TIPS ON WRITING GOOD SCIENCE LITERATURE.



Go out on a limb. Don't be afraid to use the words, "Uranus", "friction" and/or "sperm" vicariously.

In your story, it is good to insert either the line "Now, at last, we can save the world!," or "Dear God. What have I done?" For extra conflict, insert both.

Be aware that the majority of the Elements in the Periodical Table end in "ium." This makes rhyming really easy.

Sex, drugs, blood and guts – really now, this is just an invitation to write about mate selection, pharmaceuticals, and anatomy.

When in doubt, chemists are the bad guys, physicists are the good guys, and biologists are generally the ones with the best cleavage.

Bacteria make good antagonists. Plus, they are literally everywhere - this only adds to their aura as an awesome force to be reckon with.

If you plan on using the "=" symbol, please be certain that the two sides are indeed equivalent. If they're not, mathematicians will be irked, which to be honest, means that nothing else will happen.

Try using Boolean logic in your plot lines. Bonus marks if you can also use the word Boolean in your plot line. Extra extra bonus marks if your plot line can be express as a y=mx+b equation.

And finally, for the love of all that is good, please no articles on Scientology.

<please submit your efforts to tscq@interchange.ubc.ca>

WEALTH AS A CANCER RISK

By David Secko

Wealth can bring a lot of things to a family and new research is suggesting such things are not always good.

One of these is childhood leukemia.

Although rare overall, leukemia is one of the most common potentially fatal illnesses that can befall a child, and a new study completed at the BC Cancer Agency in Vancouver is revealing that a high socioeconomic status can raise the risk of this disease by as much as 14% in Canada.

The reasons for the link between wealth and childhood leukemia are not yet clear, but knowing is important nonetheless, since it's a piece of the puzzle in the effort to understanding the true causes underlying this disease, which are not well understood.

"Money doesn't cause disease," says Marilyn Borugian, a researcher at BC Cancer Agency and lead author of the new study. "But there are so many things related to it."

Borugian and colleagues work is not the first to link childhood leukemia to high socioeconomic status. In fact, reports go back at least two decades.

But, in recent years, work on the effect of power lines on childhood cancer (by one of the authors of the current study, Mary McBride) appeared to find that the opposite was true, namely that childhood leukemia instead associates with lower, not higher, income.

"They [McBride and colleagues] found that the healthy children seemed to be of higher income," says Borugian, referring to the past studies. So, a question was afoot: has something changed? Or, was their an unseen bias in the power line studies?

About this time, Borugian got recruited to find the answer. She was just finishing her Ph.D., having come to study epidemiology after a 25 year career in computing for a stock brokerage. "We wanted to go about this new study through computer programming," says Borugian, "so that's how I got involved."

To re-examine the link between childhood leukemia and wealth, Borugian took Canadian postal codes and linked this to information from Statistic Canada on neighborhood incomes and 96% of all leukemia cases in children from 1985-2001. She found the lowest risk of childhood leukemia in the poorest neighborhood income and the highest risk in the richest.

"The original studies, with a higher risk in a higher income, are still supported," says Borugian. The results of the study appear in July issue of Epidemiology.

Apart from this result, Borugian's general technique is also raising interest. "It is already being used to look into other cancers," she says.

As for the risk of childhood leukemia, population studies like Borugian's don't reveal causes. People have hypothesized that early exposure to childhood infection in poorer neighborhoods might provide protection, says Borugian, but researchers need to zero in on individual cases to figure this out.

"In order to do something about this, there are still a couple pieces missing," says Boru-

gian, including individual studies to control for things such as diet and exercise.

"It may be as simple as increased physical activity in poorer families," she says. But, as yet, we don't know.

HOW LONG DOES IT TAKE TO DRESS YOUR MONKEY?

By Benjamin Cohen

Every year, upwards of tens of tens of assistant primatology researchers exchange cutting edge data retrieval techniques, field-based observation protocols, and daring new pants-and-jacket combos at their annual meeting. Usually a coastal locale, San Diego or Stamford, CT, the meetings are a veritable meat market for new blood. The cattle call of interviews is so famous it's infamous, aspiring primatology assistants stacking their cv's with just that many untraceable unpaid internship listings and five-letter acronyms. Primatological assistantship has, as a matter of course, become a lucrative and difficult-to-land job, not the least reason for which is the requisite grooming skills. As the tabloids have attested, most of our finest assistants have gone on to greater positions in the broader field, sometimes dressing people too. During a break-out session at last year's Airport La Quinta Inn meeting, we took a poll:

How Long Does It Take to Dress Your Monkey?

Molly, 31: Honestly, I'd say no more than 2 or 3 minutes. He's good about it. Sometimes he helps me pick out the tie. Hilfiger always goes well with his slacks.

Calvin, 27: Hmm, that's a toughy, cuz we usually tousle first, get him all fired up, then get the suit on. He likes it that way, so I can't say, really. Some days two minutes. Some days a half hour. Depends.

David and Anna, 34 and 32: We reject the question. No, seriously. We reject it. It's not about the outfit for us. Daryl is part of the family and we don't single him out. How long does it take you to get dressed? You don't know, do you? Nope, you don't time yourself, right? Exactly.

Melanie, 40: If vest, jacket, and a half-windsor knot, we're looking at six, seven minutes. We go the bow-tie and suspenders route, then a few minutes more. Ugh. It's always a pain with the suspenders. But I use a clip-on bow tie. I learned long ago with monkeys, always go clip-on, no matter how lame that may sound. Believe me.

DeAngelo, 24: Well…just a sec…hold on…there...up and around…hold on…just a sec...just a…into here…then under again…just…one…more...OK. There. What was that? Like maybe 45 seconds?

Lillian and Walter, 59 and 65: Oh, we do have a time with dressing. Verily. We'll make a game of it, and Roger will pick out the shirt, and I the pants. Then we'll switch, especially if we're going to dinner with the Jacobsons. Such a wonderful chimp, our Marvin. He is marvelous. We call him marvelous Marvin. Don't we, Marvin? You are marvelous, you are. Walter honey, be a dear and get me that Delft Saucer from the hutch, Elise asked that we bring it.

INTRODUCTION TO QUANTUM THERMO-EPISTEMOLOGY.

by T.J. Nelson

This manuscript describes some of our recent findings in the exciting new field of quantum thermo-epistemology, a branch of implausibility theory dealing with fundamental questions such as:

* *Why does toast always land butter-side down?*
* *Why do cars break down only when you need to go somewhere in an emergency?*
* *Why do banks only lend money to people who don't need it?*

We have found, surprisingly enough, that these vexing questions do in fact have a scientific answer, and have developed the beginnings of a theory, which is briefly described here.

Theorem (1).
Believing something to be true, or discovering a scientific fact, causes the universe to shift in such a way that the probability of this fact actually being true decreases. The amount of decrease is equal to the degree of certainty and incontrovertibility of the evidence for its truth.

Theorem (2).
The above assertion is unprovable, since proving it would render it entirely false.

Theorem (3).
Based on the principles of information theory (Shannon, 1948), in which information is analyzed as a form of entropy, it can be postulated that discovering a scientific fact, because of the large decrease in entropy this produces, would cause the discoverer to become cool to the touch. The degree of truth can then be simply and accurately measured with an appropriately calibrated thermometer.

From Theorem (1), it is easy to prove that: **The probability that something will happen is inversely proportional to one's desire for it to happen**. The other laws of *implausibility theory* can be readily derived from these three theorems (e.g., ``If something can go wrong, it will'' (Murphy, 1868)). A further proof of the correctness of these theorems lies in the fact that, since they are unprovable, it is impossible to be certain of their correctness; therefore, the universe cannot shift in such a way as to render them false.

(Another, even better, proof of this theorem used to exist; tragically, however, one of our rabbits ate the only copy of the proof.)

Another correlate of Theorem (1) is that the only way to prove something true is to wish for it to be false. It also explains why, the more one needs something, the harder it is to get.

One possible explanation for this is that the representation of an external fact in one's mind is in reality the creation of a small anti-universe, and thus by the law of conservation of truth, the external universe must change so as to make the sum total of truths equal to zero.

Here are some concrete examples of this phenomenon, which have been well documented elsewhere:

1. If you are in a car accident, the law changes in such a way as to make it your fault. Similar phenomena have been observed with tax laws and campaign finance regulations (Gingrich, 1997).

2. In conducting a scientific experiment, it is frequently observed that the closer one gets to the final result, the more difficult it becomes to reproduce the original observation. (This is also due in part to the well-documented Experimenter Entropy Effect).

3. The more potentially embarrassing your e-mail message, the greater the likelihood that it will be delivered to the wrong recipient (Allman, 1983).

4. Failure to perform backups of one's computer data produces a statistically-significant increase in the likelihood of a hard disk crash (The reference for this was accidentally erased).

5. Stepping out of the office causes the telephone to ring, as soon as the distance to the telephone becomes far enough to make it impossible to reach the phone before the caller hangs up. Only if you are working on something that requires sufficiently intense concentration that you can't answer the phone, will it ring while you are close enough to answer it. The quantum nature of this phenomenon becomes evident if one decides to never answer the telephone. In this case, the telephone will ring only when you are walking past it with nothing to do.

6. As one walks down the street, no matter which direction one walks in, the vast majority of people one meets are travelling in the opposite direction to oneself. This observation has been frequently attributed to quantum phenomena; however, it has recently been demonstrated (Walker et al., 1997), that this effect is largely due to a subtle sampling bias.

As an aside, it should be noted that several other phenomena once attributed to quantum effects have also been found to have other explanations. For example, the well-known observation that washing one's car can induce rain was actually found to be the result of tiny soap bubbles drifting into the upper atmosphere and acting as nuclei of condensation. Similarly, the observation by British researchers that carrying an umbrella usually prevents rain was found to actually be the result of trace chlorofluorocarbons (CFCs) emanating from the plastic elements of the umbrella, drifting into the stratosphere, and not due to quantum effects as originally believed. In a classic experiment, it was shown that in the stratosphere, the intense local heating caused by the the CFCs accumulated from thousands of opened umbrellas (mediated by CFC-catalyzed disruption of the ozone layer) not only prevented

atmospheric precipitation, but actually promoted nearly instantaneous reabsorption of clouds into the atmosphere, creating a sunny day.

The quantum epistemological effect of Theorem (1) has also been used by tornado researchers, who set up small trailers as "bait" in order to attract tornadoes for study, on the theory that the Universe would think the researchers did not want the trailers to be destroyed, and thus create a tornado (e.g., J. Swisher and B. Dervisham, J. Torn. Res. 7, 14332 (1999)). The ethics of this practice have been questioned by some researchers, while others have suggested that the fact that the researchers wish to observe a tornado actually serves to diminish the probability of their occurrence, even to the extent of counteracting the attractive effect of trailer parks (which are known to be a powerful tornado pheromone). In any event, although the affinity of tornadoes for trailer parks is readily demonstrated in the lab, the cycloattractant properties of trailers confounds any simple interpretation as to whether quantum effects truly plays any significant role.

It also underlines the difficulties of demonstrating these quantum effects in the laboratory, since any attempt to accumulate data on this effect will cause it to disappear, only to reappear again when the researcher concludes that the effect does not exist. Thus, these phenomena can only be studied by indirect or in cogito experiments.

Interestingly, the deconstructionists seem at some level to have grasped this concept, but as usual they have completely misunderstood its profoundly Heisenbergian epistemological implications.

(*Note*: We have recently shown that Theorem 1 is in fact a special case of general thermoepistemological theory, and is in fact a result of a generalized *curvature* of science. Quantum experimenter entropy effects may also play a role here as well.)

The theory developed thus far still needs more work to make it fit into the overall formal architecture of quantum mechanics. This is left as an exercise for the reader.

SYSTEMS BIOLOGY: AN OVERVIEW

By Mario Jardon, image by Jen Philpot

Milestones in DNA research

The discovery of DNA structure in 1953 was the starting point of a real scientific and cultural revolution, the ending of which is difficult to predict. The discovery and use of enzymes that copy, cut and join DNA molecules in cells was the next step in this revolutionary course. The development of two major techniques contributed further to this already vertiginous process: the manual DNA sequencing method, which appeared in 1975, and the discovery of the polymerase chain reaction (PCR) in 1985, which allows the million-fold amplification of DNA sequences.

A natural consequence of these two breakthroughs combined with increasing computerized system capabilities was the automation of DNA sequencing. A prototype sequencing machine, able to sequence as many as 250 bases per day, appeared in 1986. By 1989, a robust instrument had been developed that could be used routinely in the laboratory. Fully automated and integrated sample preparation and sequencing were available in 1998. The latest sequencing machines are able to process over 1.5 million bases per day.

Another element that has played a key role in this revolution is the Human Genome Project (HGP) which officially started in 1990, although discussions and feasibility studies began earlier. The objective of the HGP was to generate a finished sequence in 15 years. Two versions of the draft of the human genome sequence were published in 2001. The HGP had a central role in this revolution two ways: it provided the driving force behind the development of high-throughput technologies (such as large-scale DNA sequencing, mass spectrometry and DNA arrays) and it constituted the practical application of the idea that the elements of a genome can be defined and catalogued for use in global analyses.

The underlying principle of this view of the human genome (or of any genome) is that it has a digital nature: it contains specific, clear information; it is a code. This information allows scientists to approach the study of all biological systems (they all share the same code) within a defined, fully delineated framework. The challenge is therefore to decode this information. In the opinion of some authors, Biology could be redefined as an essentially informational science. [1,2]

Digital nature of DNA and properties of biological systems

Biological systems contain two main types of digital information: genes, which encode the proteins through the intermediary of RNA, and regulatory networks which specify how these genes are expressed in time and space.

It is indeed remarkable that genetic information operates across such different time spans: Mil-

lions to tens of years (evolution and conservation of species), tens of years to hours (life cycles) and weeks to milliseconds (physiology) [1]. Moreover, biological information operates on multiple levels of organization (molecular, cellular, organic, systemic, etc.) and is processed in complex networks, which happen to be considerably robust (single perturbations will rarely cause systemic failure).[2]

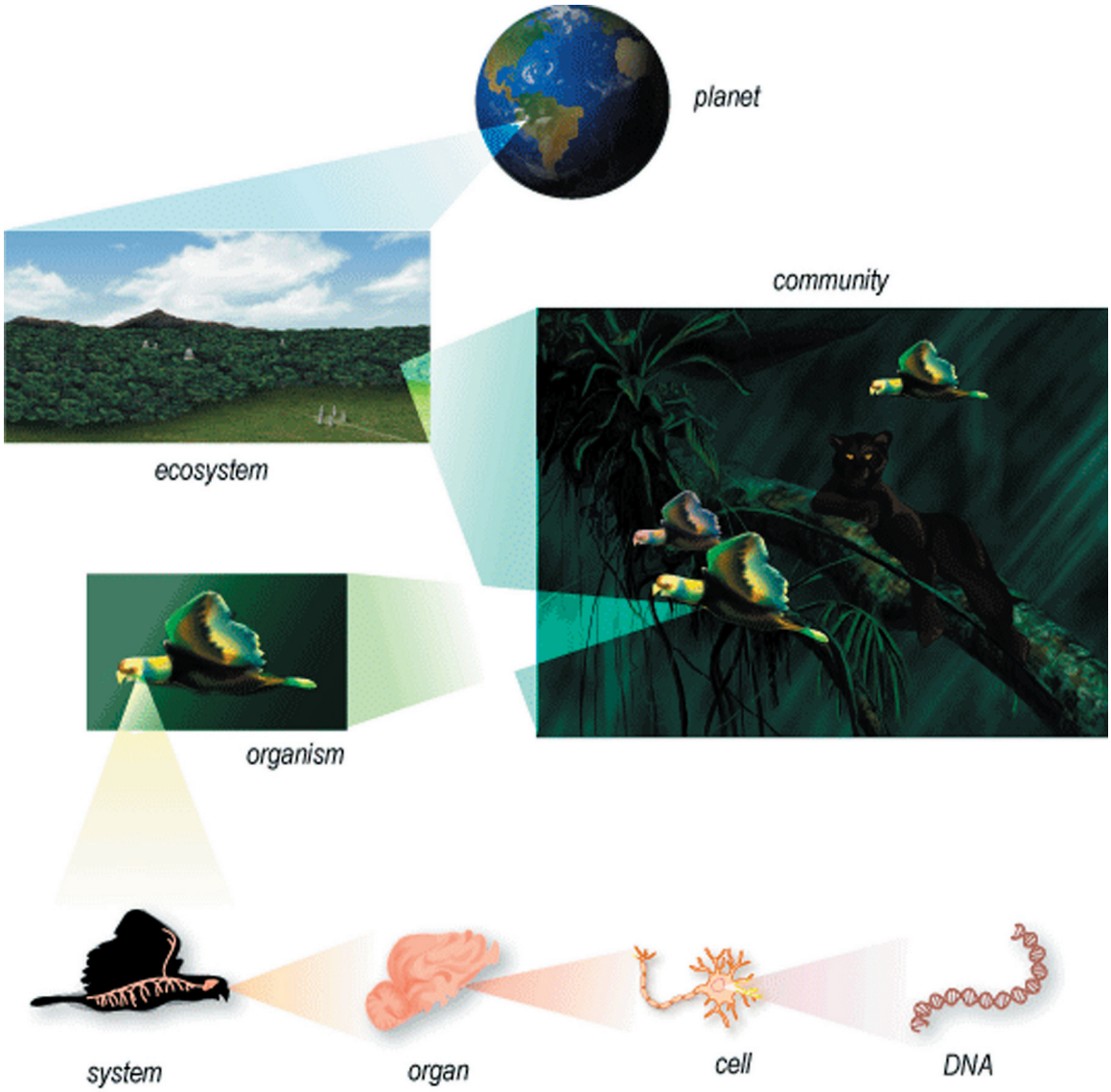


Figure 1. Systems Biology incorporates the study of the structure and dynamics of various systems in order to determine robustness.

The study of biological systems cannot be limited to simply listing its components (proteins, genes, cells, etc.); while an exhaustive list of all the parts of a car may give a vague impression, it does not necessarily help one to understand how the car functions. Similarly, a deeper understanding of biological systems can demonstrate how these parts are assembled together and how

they interact with each other and with the surrounding environment. In other words, a system-level understanding is required. This is the objective of Systems Biology.

The systems approach brings with it a sense of wholeness. In words of Ludwig von Bertalanffy, the author of General System Theory, contemporary science should recognize the importance of "wholeness". Wholeness is defined as "problems of organization, phenomena not resolvable into local events, dynamic interactions manifest in the difference of behavior of parts when isolated or in higher configuration, etc.; in short, 'systems' of various orders not understandable by investigation of their respective parts in isolation." [3]

Systems Biology

The Systems Biology approach starts with the definition of the structure of the system under study (the structure of the overall network, be it composed of genes, proteins, metabolites, etc.). Then the attention shifts to the system dynamics, in order to determine its functional properties. These two aspects (structure and dynamics) provide a baseline that can be used to analyze an essential property of biological systems: robustness.

Robustness of biological systems manifests in various ways. Firstly, biological systems constantly adapt to internal or external changes. Secondly, they show certain insensitivity, which enables them to deal with the noise generated by the stochastic signals to which they are exposed. Finally, they also exhibit what could be called a graceful degradation, which is a slow and gradual end as opposed to the catastrophic failure that occurs when functions are damaged. [4]

The overall Systems Biology methodology includes the formulation of a model once the components of the system have been defined, followed by the systematical perturbation (either genetically or environmentally) and monitoring of the system. The experimentally observed responses are then reconciled with those predicted by the model. Finally, new perturbation experiments are designed and performed to distinguish between multiple or competing model hypotheses. [5]

The task that Systems Biology attempts to undertake is the actual integration of genomics, proteomics and indeed all the emerging omic disciplines, with the ultimate aim of designing biological systems.[4]

The omic information

So what are these omic disciplines? As the aim of genomics is to gain an insight into the entire genome of an organism, the genome being its entire set of genes, genomics is the study of the whole set of genes of a biological system. Likewise, the object of the study of proteomics is the proteome, understood as the entire collection of proteins that are expressed in a system. In this way, the respective discipline arises from the study of the transcriptome (the set of RNA transcripts of a specific system) and the metabolome (the entire range of metabolites taking part in a biological process). Other omes (sets) that may also be of interest include: the interactome (com-

plete set of interactions between proteins or between these and other molecules), the localizome (localization of transcripts, proteins, etc.) or even the phenome (complete set of phenotypes) of a given organism. Systems biology strategies can thus be viewed as a combination of omic approaches, data integration, modeling and synthetic biology. [6,7]

Requirements for Systems Biology research

Evidently, the aims and approaches of systems biology are quite ambitious. It requires quantitative global High-Throughput (HT) biological tools such as DNA sequencing, DNA arrays, genotyping, proteomics, etc. Also needed are an extensive power of computational tools for databases and models and a very demanding integration of different levels of biological information, which requires the formation of cross-disciplinary scientists, not to mention the corresponding financial resources.

Conclusions

As previously mentioned, the discovery of the structure of DNA was a turning point in the history of science, culture and society. Its impact on medicine, agriculture, energy production, social issues, ethics, etc., continues to create interesting challenges in many areas of human activity. Scientists able to cross boundaries between many disciplines can make a valuable contribution to society. Awareness of the wholeness of this task as well as its implications, not only for science but for humanity, requires a sense of responsibility that is equally whole. [2]

References

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2. De Hoog C.L. and Mann M. Proteomics. Annu. Rev. Genomics Hum. Genet., 2004, 5: 267-293.

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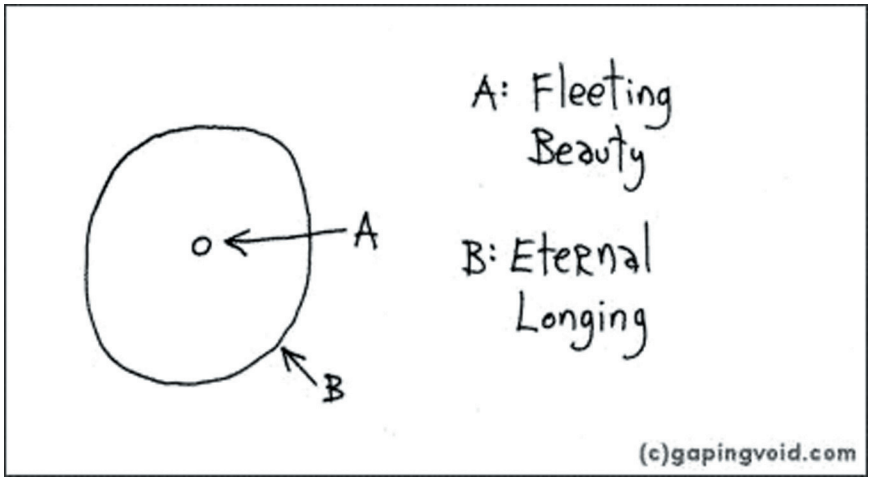
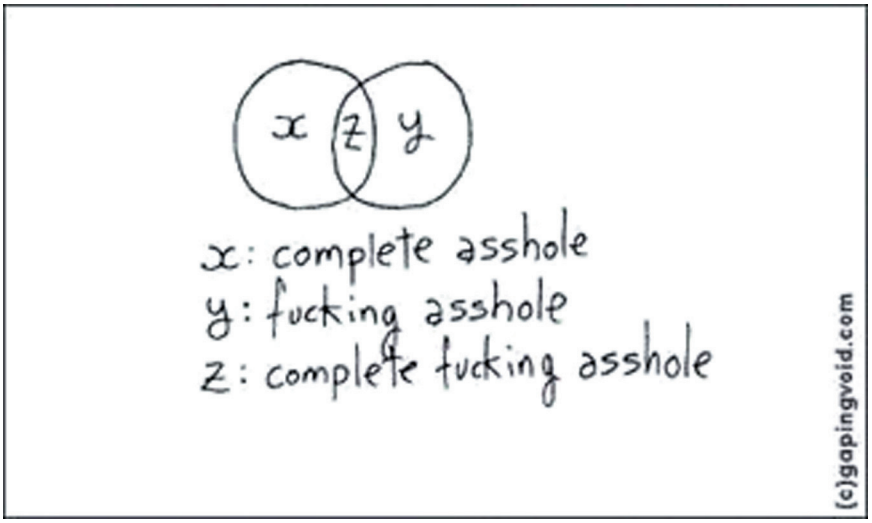
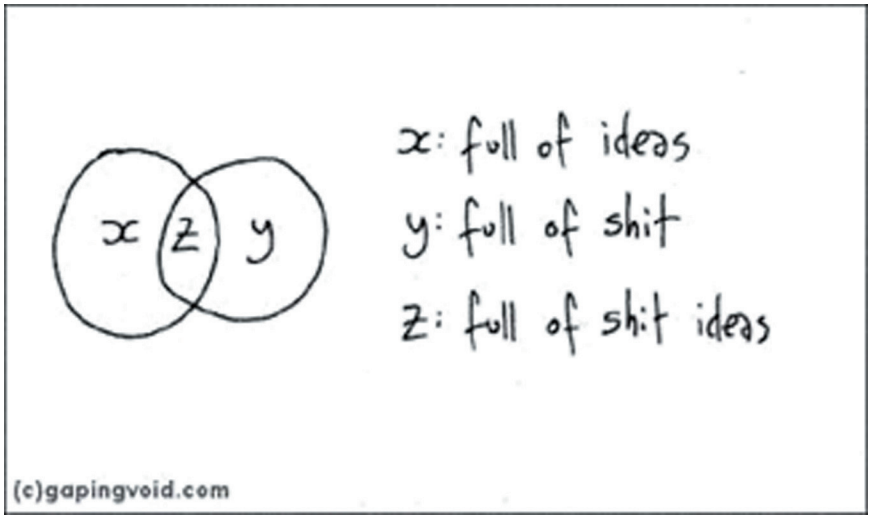
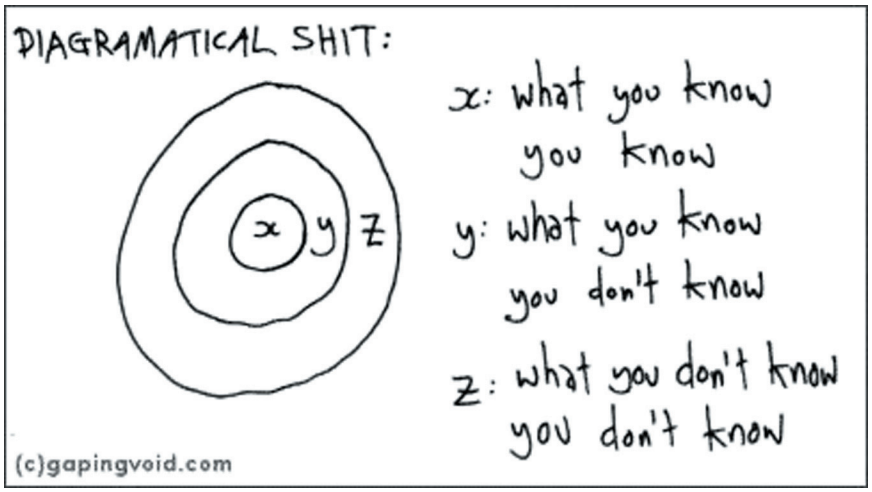
SOME VENN DIAGRAMS.

By Hugh MacLeod






x
z
y
x: full of ideas
y: full of shit
z: full of shit ideas
(c)gapingvoid.com


DIAGRAMATICAL SHIT:
x
y
z
x: what you know you know
y: what you know you don't know
z: what you don't know you don't know
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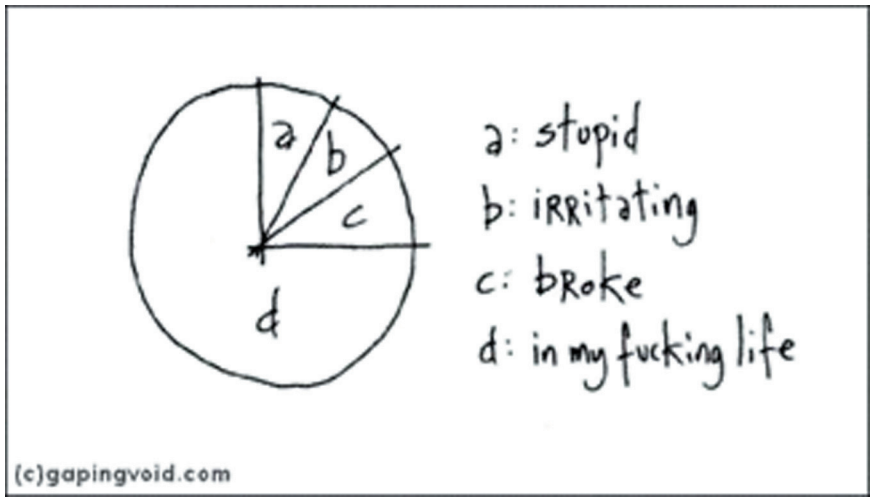
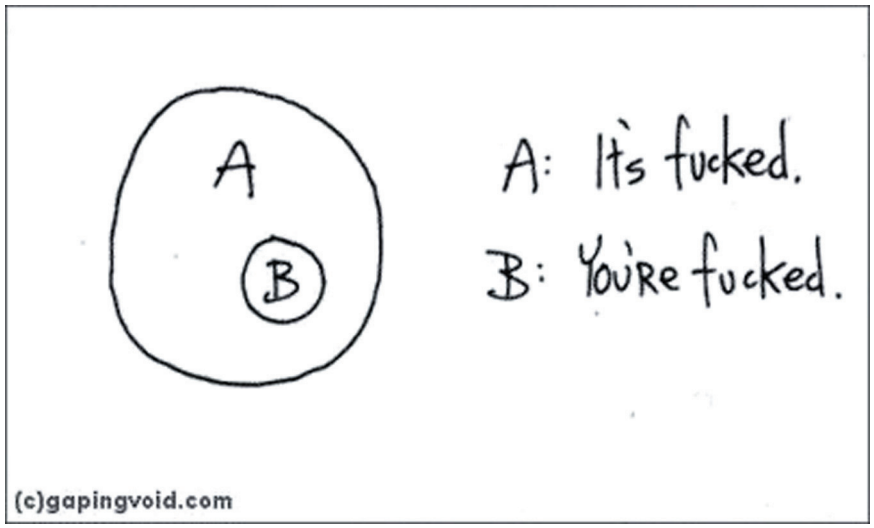
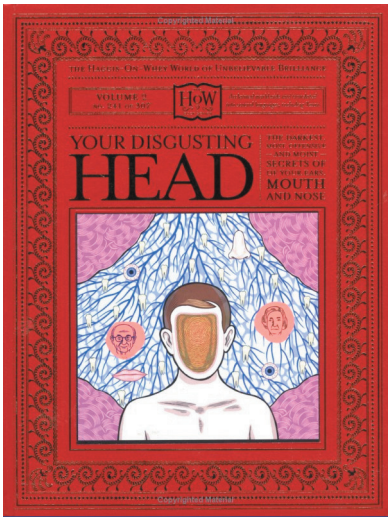

a
b
c
d
a: stupid
b: irritating
c: broke
d: in my fucking life
(c)gapingvoid.com


A
B
A: It's fucked.
B: You're fucked.
(c)gapingvoid.com

A REVIEW OF "YOUR DISGUSTING HEAD."

By David Ng

YOUR DISGUSTING HEAD: THE DARKEST, MOST OFFENSIVE - AND MOIST - SECRETS OF YOUR EARS, MOUTH AND NOSE.
By The Haggis-On-Whey World of Unbelievable Brilliance. 64pp. Simon and Schuster $24.50 (Hardcover)



In Norway, you say "buse."

As a geneticist, I am a lot more familiar with the concept of *snot* than one might suspect. And although this may appear to be a sort of an odd soundbite, it can be quickly explained by the simple fact that pure genomic DNA, isolated from any and all variety of nature's participants, will actually take on the appearance of the stuff you might see dripping out of an infant's nose. I even call it "boogery," which delights me to no end as an educator who is privilege enough to impart such wisdom to audiences ranging from scientific Heads of Departments to priests to politicians to graduate students to lawyers and (best of all) to unwary 11 year olds. In fact, I'll leave it to your imagination as to which particular group revels the most in this piece of information.

Anyway, given what tends to be the somewhat international flavor of these audiences, I appear to be an expert of sorts on all things *snot* – or at least in colloquial terms, having compiled an impressive list of foreign ways to say 'booger.'

Of course, the importance of language is steadfast in any discipline, even one as empirical as the sciences. Furthermore, I happen to know this first hand, having once made the mistake of teaching a group of graduate students to be especially "anal" when dealing with certain molecular procedures, a lecture that was met by sincere looks of disgust from my foreign students (asking,

why, of all things, do we have to be anal?).

In Ukraine, you say "smarkotch."
In Punjabi, you say "chewae."

In any event, anatomically speaking, *being anal* would be the exact opposite of all this nose business. As well, being anal has nothing to do with a really interesting book that is refreshingly titled "Your Disgusting Head, The Darkest, Most Offensive – And Moist – Secrets Of Your Ears, Mouth And Nose". Your nose (and, more specifically, the stuff inside it) on the other hand has a significant role in this book - which considering its wonderful use of language and my particular background, might even make this count as an academic review.

Anyway, this sort of book belies description. "Your Disgusting Head," attributed to Dr. and Mr. Doris Haggis-On-Whey and published by the fine folks at McSweeney's Publishing, is the second in the "HOW? BOOK SERIES" (The first being "Giraffes? Giraffes!). I can tell you that it is a very pretty book - think of the luscious retro look of those 60s and 70's children's science encyclopedias and you have an idea of what I'm talking about. But what makes this offering different is that instead of the stoic language of education, you have surreal and often very funny musings written in a tone that suggests scientific conjecture in a Radiohead, Teletubbies, Kurt Vonnegut kind of way (forgive me Radiohead and Mr. Vonnegut). In other words, I think it's marvelous, but I'm not so sure you will.

In Cantonese, you say "baytay."
In Flemish, you say "snot."

So perhaps the best way to gauge your level of interest, is to ask yourself whether the following titles make you grin:

WHERE YOUR MOUTH HAS BEEN
THE SICKENING FLUIDS THAT FILL YOUR SKULL
WHO IS THE LUNATIC WHO DESIGNED YOUR EARS?
MADAGASCAR
WHY YOUR BREATH SMELLS BAD?

And of course, my favourite,

WHERE DOES ALL THE SNOT COME FROM?

If so, then I think you too will enjoy this book immensely. In fact, I secretly believe that the underlying intent of this book is to read it to your children. Barring that, it might also work well as a reference in any scientific Ph.D. dissertation. More to the point, it's worth checking out, especially for those of us who are naturally scientifically curious.

Oh, and just in case you were wondering – my favourite way of saying snot is the very German, "schleim;" and apparently all the snot comes from Detroit.

SATIRE, SYRACUSE, AND SEA-LEVELS

Mike Rivers-Bowerman

I am an avid reader of *The Onion*. For those of you who don't know what I'm talking about please be rest assured that I'm not some sort of weirdo who looks for messages in tea leaves and the like. Perhaps the name of a vegetable is a rather unusual choice for a satirical periodical, although I would have to disagree with anyone who felt that any prior publications of this genre had set lasting precedents. The more absurd the name is the better, and as we all know, absurdity is inherent to human existence. To clarify this thought I will kindly refer you to Scientologist actors with the surname of Cruise and to pop stars who don't know when to call it a day with the plastic surgery. Thankfully, such selfless individuals provide us with an abundance of high quality entertainment. If we feel like having a good laugh at their expense, might as well do so while reading an oddly named, hilarious publication. *The Onion* it is.

Because I read *The Onion* so frequently and with such enthusiasm, I can quote many of the memorable phrases with some degree of accuracy...maybe not with the same familiarity the Republican Supreme Court Justices display with the Ten Commandments, but then again, that would be a difficult task indeed. My obsession with *The Onion* rather alarms my mother who wishes I paid similar attention to the Bible of her Mennonite heritage. Unfortunately, another lifelong love of mine, the *Simpsons*, has ruined any hope of me ever rising before noon on Sundays. Sorry Mom. You see, humour isn't necessarily appreciated in all church settings (recall that Mennonites don't drink or dance), and I happen to find Our Saviour's name humorous. Yes, blame it on Homer. Some of you may recall the episode where he is sent away by the Good Reverend Lovejoy to do missionary work (which he botches horribly I might add). As he flies away on a plane (to avoid the wrath of the fabulous PBS tag team of Big Bird and the Teletubbies) Homer repeatedly shouts out, "Save me Jebus!" Apparently he really was dreaming of dancing bears during the sermons. Anyways, enough about cartoons, religion, and my lame excuse for not going to church - let's get back to the story. Like any other newspaper, *The Onion* has headlines, feature articles, editorials, and yes, even horoscopes for those who require extra assistance. When I was asked to write a piece on climate change, I immediately thought, "Ha!" (not "Eureka!" as will be explained later). I'm sure you will be very surprised to hear that a headline from the May 30, 2002 *Onion* issue popped into my head. Atop of a photograph of a large floating sheet of ice was the headline, "Ross Ice Shelf Embarks on World Tour." The first time I read this I was confounded ('real confused like' for those Republicans). Rising global temperatures, melting glaciers, inanimate objects giving concerts...I didn't quite know how to feel. Should I be depressed or doubled-over?

Before deciding on an answer, I thought a little research might be in order. First off, I needed to determine what an ice shelf was. A little Google action quickly took care of that problem. According to our good friends at Wikipedia, an ice shelf is a "*thick floating platform of ice that forms where a glacier or ice sheet flows down to a coastline and onto an ocean's surface.*" The key message I took from this definition was that an ice shelf is a floater; even before parts of it begin to circumnavigate the globe. With this in mind, a number of seemingly legitimate questions came to mind. *Why are ice shelves breaking up? What are the consequences of melting ice shelves? Who will open for U2 if the Ross Ice Shelf melts?*

In response to the first of these queries, you will be relieved to know that ice shelves are continually undergoing calving, a process that causes them to release icebergs into the ocean [1]. Calving allows an ice shelf to achieve a sort of mass equilibrium that is necessitated by continual snow build-up and subsequent ice formation. I think we can be fairly certain that the headline in *The Onion* is referring to the fact that rising global temperatures are speeding up calving, and that the overall mass of the Ross Ice Shelf is slowing being degraded as a result. Thankfully, only a small fraction of the Ross Ice Shelf is on tour for the time being.

One of the major fears of the seers of drastic climate change is that melting glaciers will cause ocean levels to rise dramatically; up to 69 meters by some accounts [Houghton et al., 2001]. To tackle the second question posed in the previous paragraph, what we really need to do is determine the effect, if any, of a melting ice shelf on sea level. For a thorough analysis of this situation, let's do the logical thing and go back to ancient Greece.

In 275 BC, a military leader seized control of the independent city-state of Syracuse; no doubt inspiring future US foreign policy in Latin America. To commemorate his proclamation as king ten years later, Hiero II paid a prominent Syracusan craftsman to fashion an ornate crown out of a quantity of gold. Sometime after receiving the finished product, Hiero became suspicious of the craftsman's integrity. Fearing that he may have been tricked, Hiero asked a scholarly relative by the name of Archimedes to determine if the crown was indeed constructed entirely of gold. In his account some two hundred years later, the Roman architect (part-time historian?) Vitruvius noted that Archimedes figured out the problem while bathing himself in a tub one day. He observed that a greater volume of bath water was displaced when he submerged a larger fraction of his body. By this same logic, Archimedes reasoned that if identical masses of silver and gold were submerged in water, the silver would displace more water because it has a larger volume (i.e. lower density). By comparing the amount of water displaced by the crown and by an equivalent mass of gold, the king would be able to determine if the craftsman had replaced some of the gold with a cheaper metal! Vitruvius goes on to state that Archimedes jumped out of the tub excitedly shouting "Eureka!" and ran home naked. No word on whether he was arrested for public exposure.

So why have I included a Greek history lesson in an article that claims to deal with climate change? Well, Archimedes is the father of hydrostatics: an "interesting" scientific field that discusses floating objects, submerged objects, and buoyant forces. As hydrostatics can be used to explain the effects of melting icebergs on sea levels, it is rather relevant to our discussion of climate change. To start off with, let's state the obvious: frozen water floats in liquid water. If you don't believe me, refer to my all-time most hated movie: *Titanic*. The problem with icebergs is that unless you are a sea-dwelling creature or a submarine, you can't really see a whole lot of them. As has been repeatedly rediscovered over the years by lousy nautical pilots, floating ice is almost entirely submerged (89.5% to be exact).

Like any floating object, ice displaces a quantity of the liquid it is immersed in. To verify this idea of 'displacement' please perform the following experiment: put your Speedos on, place a dry towel by the edge of a full pool, and cannonball away! If everything goes according to plan you will have a

damp towel, indicating that you 'displaced' water from the pool onto the pool deck. The question of the day is: *How much?* From earlier discussion we know that a fully submerged object will cause an equal volume of water to be displaced. This is a seemingly trivial result. Where the object is located, the water cannot be. Thus, 500 cubic centimeters of sunken pirate treasure (or a Syracusan crown for that matter) will displace exactly 500 cubic centimeters of water. The same is not true for floating objects as they displace a weight of fluid equal to their own weight. To fully understand this statement, let's start with a few basics. Pretend you've just stepped onto a bathroom scale and the scale spits back some politically correct number in politically correct units (kilograms NOT pounds). One might be tempted to say, "Keep me away from that chocolate cake. I weigh too much." In reality, you do not 'weigh' 60 kilograms. You have a MASS of 60 kilograms. If you know any physics nerds, engineers will do, please mention this conundrum to them and they will be more than happy to explain (if you happen to meet one at a party, it can also be a good way to avoid any potential *Star Trek* conversation). As I happen to have studied some physics, I will briefly discuss weight and hydrostatics – and yes, I promise not to write it in Klingon. However, if you find yourself reading this next passage and saying, "Turn down the suck," please appreciate that while science can be very entertaining, *Fubar* (which you've probably seen far too many times by the way) has set the bar pretty high. Anyways, here we go...

Weight is a measurement of force. The strength of Earth's gravitational field is approximately $9.8 m/s^2$ at sea level. This means that a television thrown out of a 9th floor Gage tower window on the day of Arts County Fair will accelerate towards innocent bystanders in such a fashion that it's vertical velocity increases by 9.8m/s during each second it is in flight (ignoring air resistance of course). I'm thinking that a direct hit from a large meteor might be a slightly more dignified way to go...although neither a TV nor a chunk of alien-encrusted space rock is likely to result in the awarding of a prestigious (and posthumous) Darwin award. Anyways, with our newfound understanding of gravity we are now in a position to quantify *weight*. By referring back to our 60 kg person we can determine that they exert a gravitational force of 588 Newtons ($60 kg \times 9.8 m/s^2$) on the ground. Another way of stating this same information is to say that the person has a weight of 588 N. Thus, if this person were of a floatable body composition, they would displace exactly 588 N of water if lying in a pool (face up is always preferable). Believe it or not, this seemingly trivial piece of information will allow us to determine the effect on sea level if an iceberg or ice shelf melts.

Let's pretend we have a large tub of water, into which we drop a block of ice weighing 30 N. For simplicity, we will assume that the ice and the water are of the same elemental composition (pure H_2O with no chlorine, metal ions or other troublesome contaminants). For all of you budding thermodynamicists out there, understand that the ice will be liquefied as it has been placed into contact with heat reservoirs (i.e. air and water). Logic tells us that thermal energy will flow from the heat reservoirs to the ice, increasing both the temperature of the ice and the entropy of the universe in the process! Upon melting, the 30 N block of ice will become 30 N of water. As this water has the same volume as the water that was originally displaced, the level of the water in the tub will not change after the ice melts! In reality, the situation for ice shelves

is slightly more complicated. Coleridge's *The Rime of the Ancient Mariner* provides us with some valuable insight as to the composition of seawater: "Water, water, every where/ Nor any drop to drink." As you are well aware and have no doubt guessed, the glittery-eyed Mariner is alluding to the fact that seawater contains salt, which makes it bad for drinking but good for curing Albatross. The Ross Ice Shelf, on the other hand, is comprised of pure water with little to no salt content (ice crystals like to arrange themselves in regular formations - any salt crystals present are gradually pushed out). So unlike the example previously discussed, ice shelves and the water in which they float have different compositions. This will require us to perform some additional analysis to determine if a change in sea level occurs when the floating ice melts.

If a 30 N block of ice floats in a tub of seawater, 30 N of seawater will be displaced. When the block melts, 30 N of freshwater (just over 3 litres) will be mixed in with the seawater, displacing an equivalent volume. The freshwater is essentially 'replacing' the seawater that was displaced by the ice. To determine whether or not the water level in the tub will rise or fall, all we need to do is compare the volume of 30 N of seawater with the volume of 30 N of freshwater (note that any weight of 30 N at the Earth's surface corresponds to a mass of 3.06 kg). If the seawater has a larger volume, the water level in the tub will drop after the ice melts; the converse statement is also true. As seawater is denser than freshwater due to its salt content, 3.06 kg of seawater will occupy a smaller volume than 3.06 kg of freshwater. Thus, the water level in the tub will rise when the block of ice melts because the smaller volume of seawater is 'replaced' by a larger volume of freshwater! If we assume that the tub used in this example has a surface area of one square meter, the actual increase in the water level will only be a fraction of a millimeter. This leads us to the rather mundane conclusion that a floating block of ice such as an ice shelf or an iceberg won't exactly cause a flood of Biblical proportion when it melts.

Let's recap...I told you that there is enough water stored in all of the glaciers on Earth to raise the sea level by up to 69 meters if they were to melt. We then went on to prove that of this 69 meters, the maximum contribution of floating ice shelves and icebergs would be a few millimeters. With this in mind, a logical question might be, "*Then what is causing the estimated sea level rise to be so large?*" The answer is quite simple: land ice. Antarctica and Greenland are covered in massive ice sheets. If these glaciers were to melt, all of the runoff would directly increase the volume of water held in the world's oceans, accounting for over 99% of the predicted increase [Houghton et al., 2001]. As the volume of ice held in mountainous glaciers and ice caps is so much smaller than that held in the ice sheets, the predicted rise due to their melting would account for the remainder (about 0.5 meters) [Houghton et al., 2001].

So what is the take-home message?

Even if all of the icebergs and ice shelves in the world were to melt, the direct impact on sea level would be an increase of a few millimeters at most. There are even some who believe that we would see a drop in sea level if this were to occur. Water is densest at $4^{O}C$ and by liberating molecules of water from ice through the melting of floating glaciers, the total population of molecules at this temperature is bound to increase, leading to denser, more compact oceans. This might even be true, but by arguing about

whether the sea will rise or fall by 5 or 6 millimeters, we are really missing the point. The fact of the matter is that while the slow destruction of the Ross Ice Shelf isn't going to kill us, it is ultimately a sign of things to come. I ended up laughing at the 'World Tour' headline, but I probably shouldn't have; climate change is happening around us and there is really nothing all that humorous about it. Today we are dealing with melting icebergs and ice shelves that aren't causing significant changes in global ocean levels. *But what about tomorrow?* If we don't act now to develop a more sustainable approach to life, the land-bound ice sheets in Greenland and Antarctica will eventually melt due to rising global temperatures and the consequences will be severe; nations will be flooded, disease will be spread, and countless lives will be claimed. At this time, we cannot afford to apathetically hide in the shadows like T.S. Eliot's Hollow Men. We need action, and all of the global community would be wise to ratify and implement the Kyoto protocol immediately. Maybe it doesn't contain all of the answers, and maybe it doesn't go far enough, but it is a start that we can build on. Oh, and by the way, I still haven't heard from Bono; it appears as though he is rather annoyed with Canadians at the moment.

References:

1. http://en.wikipedia.org/wiki/Ice_shelf

2. Houghton, J.T. et al. Intergovernmental Panel on Climate Change Report. Climate Change 2001: The Scientific Basis. Cambridge University Press, 2001.

3. The story of Archimedes and the Golden Crown can be found at this website: https://www.cs.drexel.edu/~crorres/Archimedes/contents.html

ELSEWHERE AND OVERHEARD

By Caitlin Dowling

Overheard

"They rise vertically and backwards, so if you come from behind you have a much better chance."
Robin Wooton, an expert in insect biomechanics, on how to swat a fly effectively! (The Guardian)

"We found no association between levels of mental ability and reported happiness, which is quite surprising because intelligence is highly valued in our society,"
Alan Gow at Edinburgh University, whose research proves that intelligence is irrelevant to a happy old age. That's the text books in the river then… (New Scientist)

"Also, if a family already has several girls and members of the family would like to have a boy, our laboratory can offer one of many tools to help make the selection of the sex of the baby."
Hmmm… Yuri Melekhovets, who runs the Paragon Genetics lab in Toronto, where parents can find out the sex of their foetus as early as 10 weeks into pregnancy. (CBC)

"They only crush, put it in water, apply it on the tajine itself and they cook it at very low temperature."
That's all very well, Dr. Albert Nantel of the Quebec National Institute of Public Health, but it's still a lead glaze on Moroccan tagines – no 2nd helping for me…

Elsewhere

Einstein attended a séance?
(http://www.guardian.co.uk/life/feature/story/0,13026,1527621,00.html)

Codes for killers – knowledge of microbes could lead to cures of diseases
(http://www.sciencenews.org/articles/20050716/fob1.asp)

Why cocaine addicts are all about the fun…
(http://www.newscientist.com/article.ns?id=dn7698)

Beauty is in the nose of the beholder
(http://www.newscientist.com/article.ns?id=dn7668)

BOMBYX DISPAR

By Brian Willems

If you were to base a character
on the moth called *Bombyx dispar*
you could easily set your story
in Count Wodzicki's garden 1848

Your Bombyx could attach him or her
upsidedown on Wodzicki's trees
contained in a hairy envelope
just one egg among others

Then Wodzicki, I don't know if
he's good or bad, that's up to you
too numerous to remove all by hand
introduces 100 Titmice and Goldcrests

Birds! to gobble your Bombyx pre-emergence
since on average 1 bird eats 2 eggs a minute
in a 16-hour day 192,000 *Bombyx* gone
Bombyx sure among them

Or not, depending on what you'd want to do
that is, on whose side you're on: you would either have to
let the moths eat up all the trees, or watch insectivorous birds
eradicate bright swoops of bright ochre and gold

JOURNAL CLUB SELECTION.

Potential Effects of the Next 100 Billion Hamburgers Sold by McDonald's. (2005) American Journal of Preventive Medicine 28(4) :379-381
Well fed researchers, choose hamburger B.

(Found by Alex Lane, pdf of title page, available on line)

American Journal of Preventive Medicine. 2005, 28(4) :379-381

Potential Effects of the Next 100 Billion Hamburgers Sold by McDonald's

Elsa H. Spencer, PhD, Erica Frank, MD, MPH, Nichole F. McIntosh, MD, MPH

Background: McDonald's has sold >100 billion beef-based hamburgers worldwide with a potentially considerable health impact. This paper explores whether there would be any advantages if the next 100 billion burgers were instead plant-based burgers.

Methods: Nutrient composition of the beef hamburger patty and the McVeggie burger patty were obtained from the McDonald's website; sales data were obtained from the McDonald's customer service.

Results: Consuming 100 billion McDonald's beef burgers versus the same company's McVeggie burgers would provide, approximately, on average, an additional 550 million pounds of saturated fat and 1.2 billion total pounds of fat, as well as 1 billion fewer pounds of fiber, 660 million fewer pounds of protein, and no difference in calories.

Conclusions: These data suggest that the McDonald's new McVeggie burger represents a less harmful fast-food choice than the beef burger.

NEW (THIS TIME AROUND) CONTRIBUTORS

Benjamin Cohen lives in Virginia. He is an academic and a writer. Most names in this piece have been modified, where appropriate, to protect the privacy of those interviewed.

Over the last ten years Alex has taken a keen interest in current events and issues in science/technology. This enthusiasm has been fueled partly by contributions at Government , Academic and Biotech institutions. Hopefully these articles highlight his interest in the unusual, and point out that science is as easily defined as we would like.

Hugh MacLeod is a brand consultant, copywriter and cartoonist. Born in America but educated in the UK, he has spent most of his life shuttling between the two countries. He started out in straight TV advertising writing in the early 90s but with the advent of new media it evolved into new brand thinking and cultural transformation. His website, http://gapingvoid.com, is widely read in the blogosphere.

In addition to reading The Onion, recent UBC graduate and serf Mike Rivers-Bowerman finds time to ponder some of life's mysteries while riding a Translink peasant wagon to and from work every day. Some of his recent philosophical endeavours include trying to determine if Jim Beam is preferable to Wild Turkey and analyzing the aptness of Conan O'Brien's description of Michael Jackson as "a Franco-Prussian cavalry officer from outer space." Deep thoughts indeed.

Brian Willems is an American lecturing in British and Irish literature at the University of Split, Croatia. You can find some of his work in Pindeldyboz, 42opus, Milk Magazine, Yankee Pot Roast, Uber and others, or just visit his website (http://www.angelfire.com/cantina/brianwillems/01.html)

ABOUT SUBMISSIONS:

Anything will do, but if you like more direction, we are happy to look at:

Things with some link (however weak) to science.

Things in English.
Things in other languages that are more or less readable when translated with Google tools.

Things with many words.
Things with few words.
Things with pictures.

Things that are news worthy.
Things that are not terribly so.

Things that educate.
Things that entertain.
Things that both educate and entertain.

Things that are important to ones well being, or perhaps to the global community at large.
Things that (at the end of the day) are really only there for the sake of being there.

Things from famous people who think that this is a pretty neat thing going on here.
Things from infamous people - they're interesting too.
Things from everyone else.

Things that could win you an iPod of some shape and form.

And things whose copyright ultimately remain with the author, although it would be nice to be acknowledged as being involved in presenting it to others.

Submissions are preferred as attached word documents, or text pasted directly into the body of the email. Please send us your good work to **tscq@interchange.ubc.ca**