

## Welcome

At Chemists for Peace one of our key goals is to help increase the community's awareness of some of the scientific aspects of public issues. While we understand that a certain amount of personal bias is unavoidable, it is our intention to strive to provide a balanced perspective on the issues we discuss - letting the scientific facts guide our arguments. Below we have assembled a few comments on some issues of particular interest: science and policy, global warming and innovation. We recognize that these remarks are clearly not a complete assessment of the issues, but are made to serve as an introduction aimed at sparking further discussion.

### The Complexity of Science

Martin Mulvihill

There always exists a tension in science between the elegance of data collection and the messy business of interpretation. The same set of data will often lend it self to multiple interpretations, and only by developing and testing multiple possibilities may scientist convince themselves and their peers of a particular interpretation. This exchange of ideas between scientists is the imperfect vehicle for the evaluation of new ideas. Many areas of research which have the potential for broad reaching effects on the society and environment are currently ensconced in these debates. Two of issues that affect us all are genetically modified crops and hydrogen as an alternative fuel.

The genetically modified organism debate has been covered by both the mainstream<sup>1</sup> and scientific press<sup>2</sup> and, even without concrete scientific conclusions, lawmakers have jumped into the mix passing laws concerning labeling and marketing of such products. To see the polarization that this debate can cause we need to look no further than the events surrounding Professor Ignacio Chapela, who was denied tenure earlier this year. Professors Chapela's research originally published in *Nature*<sup>3</sup> showed that Mexico's unmodified corn crop had been contaminated by modified species and was expressing genetically modified genes. Controversy surrounding this article, its eventual retraction, and Chapela's outspoken opposition to the UC Berkeley-Novartis partnership, seemed to come to a head when he was denied tenure. One of Chapela's supporters, Tyrone Hayes, an associate professor of integrative biology at UC Berkeley, is also no stranger to controversy. After being hired by Novartis to do some contract work on the herbicide Atrazine, a widely used chemical in U.S. agriculture, he found that minute levels lead to damage in frogs' reproductive systems<sup>4</sup>. The publication of these results, like Chapela's, was met with wide spread resistance. These two examples both highlight concerns associated with GM crops, and, for a wider view of the issues and research discussing the benefits and dangers of GM crops, see Wolfenbarger and Phifer's article<sup>2</sup>. Although somewhat dated, this article outlines the research to date and suggests the limitations of our current knowledge both pro and con.

Another issue, hydrogen fuel, is a prime example of the difference in coverage between the mainstream media and the scientific press. *Science* magazine recently devoted an issue to exploring the possibility of a transition to a hydrogen economy<sup>5</sup> and found that the challenges are many and significant. This stands in contrast to the message seen in the world's respected journalistic outlets<sup>6</sup>, which tout hydrogen fuel as the answer to a global reliance on fossil fuel. As scientists it is our responsibility to be informed and vocal about issues such as these to promote the advancement of the messy business of interpreting scientific data. Only through the active involvement of scientists will there be hope that policy makers and media outlets will accurately portray the current state of science.

<sup>1</sup> Carol Pogash, "California County Debates Use of Gene-Altered Foods" *New York Times*, March 2<sup>nd</sup> 2004.

<sup>2</sup> L. L. Wolfenbarger and P. R. Phifer, "The Ecological Risks and Benefits of Genetically Engineered Plants" *Science*, 2000, 290, 2088.

<sup>3</sup> David Quist and Ignacio Chapela, "Transgenic DNA introgressed into traditional maize landraces in Oaxaca, Mexico" *Nature*, 2001, 414, 541.

<sup>4</sup> Hayes, T. B. *et al.* "Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses" *Proceedings of the National Academy of Science, USA* **99**, 5476-5480 (2002)

<sup>5</sup> *Science* 13<sup>th</sup> August 2004, 305, 5686.

<sup>6</sup> <http://news.bbc.co.uk/1/hi/sci/tech/3676468.stm>

## The Bush Administration and (lack of) Scientific Integrity

Amber Wise

The United States has an impressive history of investing in the capabilities and respecting the independence of scientists. This includes recognizing and utilizing the scientific process of analyzing data in order to draw unbiased conclusions which are then used as a basis for public policy decisions. This legacy has brought us sustained economic progress, science-based public health policy, and unequaled scientific leadership within the global community.

However, actions by the Bush administration threaten to undermine this legacy, and as a result, policy decisions are being made that have serious consequences for our health, safety, and environment. The administration has been distorting and censoring scientific findings that run contrary to their agenda. This is not isolated to a single issue or incidence by any means. In fact, in 2004 a group of 20 Nobel Laureates warned “the scope and scale of the manipulation, suppression and misrepresentation of science by the Bush administration is unprecedented”. The array of issues includes, but is not limited to lead poisoning<sup>1</sup>, mercury levels in the atmosphere<sup>2</sup>, global warming<sup>3</sup>, prescription drug safety<sup>4</sup>, reproductive health issues and sex education<sup>5</sup>.

Unfortunately, distorting or manipulating data to align with predetermined agendas is not the only example of undermining the scientific process<sup>6</sup>. This administration has also appointed unqualified or biased people – including industry insiders- to sit on “independent” science advisory panels<sup>7</sup>. In some cases, they have done away with these advisory panels altogether. These practices are trickling down into our education system, where abstinence-only education has taken the place of honest information exchange<sup>5</sup> and even the teaching of evolution must be accompanied by “creationism” theories. This, in combination with large budget cuts to education<sup>7</sup> is not going to create a generation of informed thinkers who respect the scientific process.

These trends are very disturbing for numerous reasons. First, it undermines the scientific process as a respected, unbiased, peer-reviewed process of data analysis. Additionally the reputation of the scientists who study these subjects is damaged when their data is needlessly thrown out, distorted, or simply ignored. Finally, and most importantly, is that these actions result in policy that is not in the best interest of the public’s health and well-being.

We put our trust in governing bodies to be honest in their scientific handlings, but the current administration has abused this trust and put petroleum and other large industrial interests ahead of the environment and its constituents’ health.

1 “EPA protects public from mercury, but not lead” *Environmental Data Interactive*  
[http://www.edie.net/news/news\\_story.asp?id=9662&channel=0#](http://www.edie.net/news/news_story.asp?id=9662&channel=0#)

2 ["New EPA Mercury Rule Omits Conflicting Data"](#) (*The Washington Post*) March 22, 2005.

3 “Report by EPA Leaves Out Data on Climate Change” *New York Times*, July 19, 2003.

4 “Many FDA scientists had Drug Concerns, 2002 survey shows” *Washington Post*, Dec. 16, 2004.

5 “The Content of Federally Funded Abstinence-only Education Program” By Rep. Henry Waxman for the US House of Representatives Investigation Reform Committee.

<http://www.democrats.reform.house.gov/Documents/20041201102153-50247.pdf>

6 ["Business over Biology"](#) *Tuscon Weekly*, March 10, 2005.

7 ["Scientists Feel Stifled by Bush Administration"](#) (*Associated Press*), by Paul Recer.

Can be found in many news outlets, one of them the San Francisco Chronicle, Feb. 23, 2005.

**To find out more about some of these issues, see the following articles and references.**

A good summary of all of these issues is included in “*Scientific Integrity in Policymaking: An Investigation into the Bush Administration’s Misuse of Science*” by Union of Concerned Scientists, July 2004. [http://www.ucsusa.org/global\\_environment/rsi/page.cfm?pageID=1641](http://www.ucsusa.org/global_environment/rsi/page.cfm?pageID=1641)

-Scientific Integrity in the News: (recent relevant articles) [www.ucsusa.org/global\\_environment/rsi/page.cfm?pageID=1406](http://www.ucsusa.org/global_environment/rsi/page.cfm?pageID=1406)

-Specific examples of this administration’s abuse of science [www.ucsusa.org/global\\_environment/rsi/page.cfm?pageID=1398](http://www.ucsusa.org/global_environment/rsi/page.cfm?pageID=1398)

## Global Warming

James Hoefelmeyer

With increased human colonization of the earth, and technological advance, a global civilization has emerged. As a result, information is readily available enabling assessment of various activities for their global impact. Although global communication and cooperation is incomplete or severely strained, there is a consciousness that our actions have consequence for which we must be held accountable. Almost as strong as our desire for explicit rules governing accountability is our desire to quantify all assets in terms of economic impact. Since human activities include an infinity of things, such as painting, construction, experimentation, eating, etc., economic characterization and quantification is often challenging and incomplete. This becomes even more apparent when the systems of interest include less tractable assets such as emotional wellbeing or environment.

A topic of intense debate that has been underway in our global society relates to the idea of Global Climate Change<sup>7,8</sup> as a result of human activity. In the debate, some groups note that a series of observations seem to establish a trend of average surface temperature rise, and relate this to a rising atmospheric concentration of carbon dioxide. Further observations, such as retreat of glaciers<sup>9</sup> or the spread of pine-beetles to higher elevation forests<sup>10</sup>, are postulated as effects of the temperature rise. In order to launch such a view, however, one must first be able to show the normal behavior of earth's climate. This is a complex and difficult technological challenge, since climate events and cycles occur over long time scales. Accurate data has not been recorded on the earth's climate until only very recently, which amounts to the blink of an eye in a long timeline of climate history. As a result, there is healthy skepticism and inquiry about the normal behavior of the earth's climate, and what defines a climate change event induced by humans.

Some efforts have been made to try and establish the definitions of normal climate patterns on earth.<sup>11</sup> These include studies of ancient tree cross-sections<sup>12</sup> in order to establish seasons of dry and wet, or observations of Polar ice layers<sup>13</sup>, which similarly (are postulated) to indicate annual precipitation levels. In addition, several climate models<sup>14</sup> have been created to simulate earth's climate patterns. Although the climate models are our best attempts to use measurement to predict patterns over time, they may be incomplete.

It is important in this debate, as any, to rely on facts as much as possible, and to try to devise experiments and observation to collect more facts. An incomplete list of pertinent literature is provided below. It is through facts and analysis, not fear and ignorance, that our society will find progress and resolve this debate. Obviously, this debate is significant, as this is an issue with truly global impact.

### General Reading:

James G. Speth, *Red Sky at Morning: America and the Crisis of Global Warming* Yale University Press. 2004.

<sup>7</sup> Alley, R.B. *et al Science*, **2003**, 299(5615), 2005.

<sup>8</sup> Easterling, D.R. *et al Science*, **2000**, 289(5487), 2068.

<sup>9</sup> Hoelzle, M.; Haeberli, W.; Dischl, M.; Peschke, W. *Global and Planetary Change* **2003**, 36(4), 295.

<sup>10</sup> Logan, J.A.; Regniere, J.; Powell, J.A. *Frontiers in Ecology and the Environment* **2003**, 1(3), 130-137.

<sup>11</sup> Crowley, T.J. *Science*, **2000**, 289(5477), 270.

<sup>12</sup> Esper, J.; Cook, E.R.; Schweingruber, F.H. *Science*, **2002**, 295(5563), 2250.

<sup>13</sup> Hurrell, J.W. *Science*, **1995**, 269(5224), 676.

<sup>14</sup> Hansen, J. *et al J. Geophys. Res. – Atmos.* **2002**, 107(D18), No. 4347.

## **Innovation, the Environment, and the Community**

Katharine Geramita

As the world changes and becomes increasingly taxed by our demands, we are obliged to respond with new and improved solutions to the problems we face. Luckily, we as scientists and engineers are in a unique position to effect positive change and projects that focus on novel innovation that reach into every corner of the imagination. Due to efforts and innovations in alternative fuels, alternative building materials, innovative agriculture planning to novel office planning, it is often amazing how fast some things catch on and the impact of something that started out small may soon reach out beyond all expectations. Outlined below are just two examples of where the innovation and creativity of scientists and engineers have had a significant impact on their local communities and environment around them.

### ***Tire recycling and reuse:***

A close friend and journalist recently wrote “Face it: Biotech is sexy, used tires are not.”<sup>1</sup> But independent of the public appeal, used tires are everywhere and they are not easily recycled since they are, by design, resistant to almost everything we can think to throw at them. But this fact hasn’t stopped a number of different groups from trying to find new and innovative ways to tackle the problem of tire recycling and reuse. One such group, GreenMan Technologies Inc. based in Massachusetts, recycles more than 21 million tires a year to make alternative-fuel and civil engineering materials.<sup>1</sup> In Quebec, Canada, tire reuse and recycling became a provincial mandate after a huge tire fire led to a \$12 million (CAN) clean up bill.<sup>2</sup> Currently the province recycles or reuses 100% of its old tires and has even begun cleaning out the old disposal sites.<sup>2</sup> In both cases not only does the tire recycling remove the tires from a potentially hazardous landfill site – but the old tires have also proven to be a better raw material for the new application. Tires burnt for energy generate the same amount of energy as oil and 25% more energy than coal.<sup>1,2</sup> For turf applications, the “environmental benefits of the artificial fields go much beyond their recycled components as there are no pesticides or chemicals, no fumes from lawn mowers and huge savings on water”.<sup>2</sup>

### ***Green Architecture:***

No matter how much we try to deny it, most people spend a huge part of their life indoors. We also spend a huge amount of money and energy trying to precisely control this indoor environment to meet our specific climate desires. Given these two statements, it is not surprising that the field of Green Architecture, which aims to create buildings with a reduced environmental impact, has taken off. As outlined in an article by Marie Ung<sup>3</sup>, there are a number of building design features that can simultaneously reduce the cost of heating and cooling a building. Concepts as simple as placing small shades over the windows to block the direct sun in the summer or establishing a roof top garden, have been shown to reduce operating costs significantly<sup>4</sup>. Along with novel building construction, it has been found that improvements in ventilation and natural light have a drastic effect on resident/employee physical and mental well-being, which has led to ingenious new approaches to air circulation and illumination.

<sup>1</sup> “Local company’s tire drive puts the brakes on income loss” *Boston Business Journal*, Nov 5, 2002  
<http://www.hannahhoag.net/Images/Greenman%20Technologies.html>

<sup>2</sup> “From St. Amable fire to Concordia’s turf Quebec succeeds at tire recycling”  
<http://www.hannahhoag.net/Images/St.%20Amable%20tire%20fire.html>

<sup>3</sup> “Green Architecture” *California Engineer* **83**, 01, 2004

<sup>4</sup> “Beauty, Productivity, Energy Savings” *Business West*  
<http://www.coldhamarchitects.com/greenbuilding/beauty.htm>

<sup>5</sup> Green architecture technical details:  
<http://www.miarch.com/sustainable/resources.html>