

4th World Conference of Science Journalists

Reporting the future: Journalism meets emerging science

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Opening Ceremony and Welcome Reception

Master of Ceremony: Charles Tisseyre

Conference Hosts: Véronique Morin, Gilles Provost, and Jean-Marc Fleury

Charles Tisseyre of Radio Canada welcomed participants, commenting that the spectacular opening dance act reminded him of the intricate balancing act that science writers deal with daily. Participants then viewed a short video of images from around the world that illustrated the broad range of topics explored by science journalists. Tisseyre then introduced the conference hosts and organizers: Véronique Morin, Gilles Provost, and Jean-Marc Fleury.

Véronique Morin, president of both the Canadian Science Writers' Association and the World Federation of Science Journalists remarked that if registration was any indication the conference would be a success. She also likened the complexity of conference organizing, with its possible miscommunications and misconceptions, to science writing. And, although science has progressed in quantum leaps, it is still mistrusted by some. She cited as an example the fact that some people believe Hurricane Jeanne was an expression of an angry god.

Gilles Provost, president of the Association des communicateurs scientifiques du Québec, pointed out that the role of the science journalist is irreplaceable and crucial when scientific language is not publicly accessible. Outside of school, how will people learn about scientific concepts? And yet, an informed and educated public is necessary if Canadians are to compete with other countries. Making science more accessible is the task of science journalists and communicators.

Jean-Marc Fleury, the Conference's executive director, hoped that the conference had been tailored to the needs of attendees. To that end, the organizers included sessions on the best in journalism, opportunities to pitch stories, and sessions with Canadian scientists. He thanked the conference's financial supporters and some of the key people involved, including Allan Bernstein of the Canadian Institutes of Health Research and Maureen O'Neill of the International Development Research Centre.

Arthur Carty, National Science Advisor to the Prime Minister of Canada

Arthur Carty invited the audience to explore Canada and its scientific innovations, noting that they would learn about Canada's research successes and latest developments in the upcoming days. As an example, Carty mentioned the Perimeter Institute of Theoretical Physics (PI), founded to attract the best minds of the world to unlock the mysteries of physics. He added that PI is an outstanding example of public-private partnership. The recent opening of a national synchrotron facility in Saskatoon and the sequencing of a hybrid poplar genome are other examples of Canada's investment in science and its scientific achievements.

According to Carty, Canadian federal government investment in research is the highest of the G8 countries. Enhanced funding of Canada's Centres of Excellence with matching funding from provincial governments have made Canada an attractive place for research and investment. "We compete with the best," Carty said, adding that Canada's research productivity ranks sixth and is

poised to grow. A new national effort at commercialization will only improve this. At the same time, there is room for improvement. Canada could, for instance, use its knowledge to build capacity elsewhere, for example in the North since we are a polar nation and, additionally, in the developing world.

As National Science Advisor, Carty intends to build a stronger science culture and to promote the value and fascination of science. “Balanced journalism is crucial in this regard.” He noted the importance of role models for the next generation of science writers and concluded by quoting Isaac Asimov. “There is a single light of science and to brighten it anywhere is to brighten it everywhere.”

Michel Audet, Minister for Regional Economic Development and Research, Québec

Michel Audet is responsible for ensuring that the public not only has access to science but also benefits from it. To understand and control their environment, the public needs basic scientific knowledge, knowledge popularized by science journalists. Audet elaborated on Québec’s investment in and development of strategies for science and technology, and highlighted ongoing federal–provincial cooperation. Québec has developed a critical mass of expertise in many areas including food biotechnology, food processing, and technology transfer. Québec’s Centres of Excellence have state of the art equipment that attracts the best scientists. Audet noted that Montréal has the greatest concentration of biotechnology and aerospace industries worldwide. In the natural resource sector, Québec is also a leader with its excellent reputation for electricity distribution and its preoccupation with environmental protection. Québec’s emphasis on the environment in research and development has resulted in expertise in such fields as water management, recycling, and waste management.

Québec is also a bright spot in information technology with research ranging from telecommunication to fibre optics, with no sector omitted. Nanotechnology and nanoscience are also in the forefront and will revolutionize industry. In all, Québec’s scientific production is comparable to other Organisation for Economic Co-operation and Development countries, a fact that is reflected in business growth. Because Québec strives to be a leader in science, it focuses on developing its venture capital and on training highly qualified personnel through yearly scholarships. The province is also looking at privatization, public–private partnerships, and commercialization of research. In revising its research and development strategies, Québec will consult researchers and research users in 2005, an event of interest to science journalists.

In conclusion, Audet said that he hopes to open the public mind to science, thus allowing the public to participate in debates on scientific issues. Scientists and journalists have their roles to play in this campaign; scientists in particular, will benefit from increased communication with the public through science journalists.

Maureen O’Neill, President, International Development Research Centre

Maureen O’Neill remarked that scientific news is important to everyone, but especially to those who want to address global challenges through the application of new knowledge. “The work of researchers as well as local knowledge needs to be made widely available to feed into policy making.” Here, science journalists can make a profound contribution to policy makers by providing the best knowledge and data. The Centre supports scientists in the developing world to ensure that their work provides a credible base for improving people’s lives. It is the IRDC’s goal to support research and development in those countries. It supports this conference because the work of science communicators promotes and aids research in the South.

“Science needs to be celebrated and discussed in order to put into effect new programs and policies for progress.” O’Neill cited mercury pollution in Brazil, which through science and good communication was traced not to mining but to agricultural erosion. Years after implementing simple solutions such as reducing fish consumption, mercury levels in the hair of local residents dropped by 40%. Another success story is the political approval of an Information and Communication Technologies policy in Mozambique that met with resistance before its benefits were effectively communicated.

For O’Neill a key benefit of science writing is its ability to tell both sides of the story, although, in reality, there are never enough opportunities to do so. The Centre is particularly interested in reporting on local research. It is here that the credibility of science journalists can have an impact on the quality of life in developing countries. How can we support this? One way is through the Science and Development Network. Another is through reinforcing science journalism in these countries through education. “We need you to tell us how to move ahead in developing countries.” Ms O’Neil also announced that the IDRC has decided to welcome applications for support for projects which will seek to strengthen science journalism in developing countries, particularly in the areas of training and course development. In closing, she thanked various involved officials and organizations, and invited participants to discuss how to work in partnerships.

Herzberg and Smith Commemorative Stamps

Charles Tisseyre introduced Lynn Palmer, Vice President, Human Resources, Canada Post who unveiled two new commemorative stamps dedicated to Michael Smith and Gerhard Herzberg for their contributions to science. Herzberg spent his life studying free radicals, winning the Nobel Prize in chemistry as the world’s foremost molecular spectroscopist. The Herzberg Institute of Astrophysics is named in his honour. Smith researched genes. He was not only a researcher but also a teacher and philanthropist whose passion for his work took him beyond the ivory tower. The University of British Columbia established the Michael Smith Laboratory in his honour.

Each stamp features a silhouette of the scientist with a montage of his work. These commemorative stamps do not just honour these scientists—they also recognize the value of science and the work of all scientists. Palmer invited Monica Herzberg, Tom Smith, and Jean-Marc Fleury to unveil the stamps.

Representing the Herzberg and Smith families, Tom Smith said that both families were proud of this honour and were impressed by the detail and design involved in the project. Smith sought the opinions from members of the audience about science communication by asking if they found it generally easy to talk to scientists. He agreed that while some scientists are exceptionally gifted in relaying information, most were not. Consequently, science writers play a critical role in communicating science and educating the public.

L'Oréal-UNESCO Awards for Women in Science

Tisseyre introduced the L'Oréal-UNESCO Awards for Women in Science, a continually growing program that each year awards prizes and fellowships to women on five continents. After showing a short video of previous laureates, Tisseyre introduced the president of L'Oréal, Pierre-Yves Arzel. Arzel remarked that his company is less known for its research efforts than for its beauty products. From L'Oreal's initial meeting with UNESCO, their goal was to honour women scientists and to encourage them to continue acquiring scientific knowledge. He pointed out a young woman in the audience, Ghinwa Naja from Lebanon, a recipient of one of the fellowships, who can now continue her physical science studies thanks to receiving one of the fellowships and who will soon publish her work. He then presented fellowship awards to two young scientists for the exemplary nature of their research projects and their communication of the results: Glenys Webster and Kirsten Burgomaster.

Glenys Webster addressed the audience noting that she had benefited from many role models including her mother and Rachel Carson. The latter led her to her current passion for environmental toxicology. "I am looking forward to sharing my love for science with other young girls and women," said Webster emphasizing her desire to learn about science communication.

Kirsten Burgomaster said that she was honoured to receive the prize and thanked the L'Oréal-UNESCO Awards for Women in Science and Canada's National Science and Engineering Research Council. "I also want to thank my family and the many women who have been models in my life," she said, adding that she wants to mentor women in science.

The opening ceremony ended with parting words from Morin and Provost followed by a final vocal performance.

Keynote Addresses: Bad News, Good News for Science Journalists

Moderator: Alex Bielak

Alex Bielak welcomed participants and directed their attention to a videotaped message from Arthur C. Clarke, an icon of science fiction writing. From his home in Sri Lanka, Clarke greeted participants, saying that he hoped that some of the discussion over the next few days would be devoted to issues and concerns of science in developing countries. Specifically, he encouraged

participants to find answers to these questions:

- ? Why is there so much superstition about science in developing countries?
- ? What more can be done to attract bright people to pursue science?
- ? How can technological developments best be transmitted to those parts of the world that need them?

“We can’t solve all the world’s problems, even though some of us like to try, but we can and do influence government and society in their reaction to new technological developments.” To illustrate that the North is not immune to superstition, Clarke pointed out that a significant percentage of the American public still believes that the Apollo mission to the moon was faked. As Albert Einstein once said, “I only know two infinite things—the universe and human stupidity.”

Frank Burnet: Science Gets Graphic and Personal

Frank Burnet, University of the West of England, Director of Graphic Science, said he would attempt to provoke the audience with his thesis, but asked the audience to remember that his examples would be very British-centric. He suggested that participants could draw upon the British experience to gauge progress in scientific communication in their respective countries. He then illustrated two communication models: the deficit model, which asserts that people simply can’t get enough of science, and an engagement model, which asserts that members of the public actively promote science among themselves.

The deficit model is not accurate said Burnet, noting that the BSE (Bovine Spongiform Encephalopathy) and GMO (Genetically Modified Organism) issues showed that the investment in a science-aware public was essentially lost. Informing people is not enough when there are big, sticky issues such as these. The engagement model on the other hand envisages the public “clustered in cafes chatting about science” with the notion that this will spread like wildfire around the country. This model, Burnet noted has problems as well.

He suggested that it is not the scientific information that is problematic, but rather the public perception of scientists. In a recent poll in the U.K., 66% of those questioned agreed that scientists would say one thing in public and do another behind closed doors. Clearly, scientists need to get into the public eye, so that the public realizes that “scientists too, have bad haircuts and kids that don’t want to go to school.” Furthermore, trust is necessary among all parties: the public, scientists, and science journalists. To illustrate, Burnet provided a summary of a survey that determined public trust in various professions. He noted that 45% of the public’s trust lies with scientists and only 14% with journalists. “If you were a scientist, would you communicate with journalists?” Burnet cautioned that that these statistics were different in other countries. He related another survey on trusted information sources. Which information sources do policy leaders trust on climate change, for example? According to the survey, only 3% trust television reports. Obviously “if you rely on the premise that TV is good,” Burnet said, “you are barking up the wrong tree.”

Burnet then compared the utility of using the media to communicate science to using public

events. Media coverage reaches a large and selected audience, but for the scientist there is a lack of control as well as a limited focus since the mass media rarely gives the big picture or the details of the scientist's work. By contrast, although the audience is smaller, "Meet the Scientist" public events give the scientist greater control. True of both scenarios, Burnet added, is that most scientists need some training in public speaking.

Given this information about Britain's current science communication scene, Burnet discussed the work of the Graphic Science Unit. He described the computer stations at the Bristol Science Centre, which probe public opinion on robots, cloning, and other controversial topics. After 50,000 users, Burnet analyzed the responses. For example, adults said yes to "Would you like to have a robot in your home?" Robocleaners were the most popular robot selected. Robolovers were favoured by about 45% of 65+ women. "Why did we do this?" The Graphic Science Unit wanted people to explore their tolerance of technology and it wanted to compare their views.

The Cheltenham Festival of Science is another venue for popularizing science. Well-known science figures such as Richard Dawkins, Simon Singh, and Lord Winston take part in discussions about human cloning, genetic modification, and the future of Britain's countryside. Surveys indicate that festivalgoers keep talking about science after the festival. Burnet's group has also taken the message to public transit where banners such as the "Chemical Brothers" in a play on pop music and science, are meant to provoke and to bring the relevance of science to daily life. Posters reading "more lives or better lives" grace buses to generate discussion. His group has also been active in other public events such as comedies (for example, the Mighty Gene Machine), which directly engage the public in discussions of science issues.

Kathy Reichs: From Forensic Anthropology to Fiction

Author Kathy Reichs does not classify herself specifically as a journalist, but rather as a science and fiction writer. Science is fashionable, with an unprecedented number of television science shows, some of which feature quirky forensic anthropologist characters. But what do forensic anthropologists actually do? They are involved in the recovery, identification, and analysis of trauma victims. Reichs briefly described the recovery stage in which remains are discovered, often accidentally or sometimes by formal exhumation, and brought into the lab. Once in the lab, some initial questions are answered.

- ? Are the remains human or animal?
- ? What was the sex, age, ancestry, and height of the victim? Sex, for instance, can be determined by pelvic bones or jawbones, while age can be deduced from bone growth or degeneration.
- ? What kind of trauma occurred? Gunshot wounds and blunt object strikes leave characteristic marks.

Reichs has worked with many different agencies including the Federal Bureau of Investigation, the U. S. Disaster Recovery Team, and the Laboratoire de sciences judiciaires et de médecine légale in Québec. They seek her expertise in murder cases and mass mortalities as well as human rights cases. She weaves her work contexts into her fiction. Both in her work and in her book research, Reichs associates closely with other scientists to learn all aspects of a case. *Déjà Dead*,

which profiles a serial killer in Montréal, is drawn from her real-life work on this case. She described how such details as cuts on victims' bones led to the conclusion that the killer was either a butcher or an orthopaedic surgeon. In *Death du Jour*, Reichs used her work on the victims of the Order of the Solar Temple for the plot line, while another book is based on the exhumation in Montréal of a saint-to-be. In the latter case, she used the science of entomology to determine the length of time the saint's bones had been buried.

In her third book, Reichs based her story on Québec's biker war after her work on a number of its victims. Typically, she said, victims' cars are set on fire leaving badly burned and difficult-to-identify remains. She has spent time with blood spatter specialists among others. "I learn about every step of the process to ensure that I get the science right." This is key since Reichs' goal is to educate the reader. Her fourth book was drawn from her work with disaster response teams in cases such as the Oklahoma City bombing, and the TWA and Lockerbie disasters. Shortly after this book on the forensics of mass mortality, she found herself at Ground Zero to do just what she had written about.

Her work is rife with story ideas; she related the case of a left foot found on a Montréal skating rink and the subsequent volatile fatty acid analysis that helped solve the mystery. *Grave Secrets* was inspired by human rights abuses in Guatemala's civil war and her role in delivering victims' remains to their families. There have also been unusual cases such as the one in which a woman's skeleton was found in a hotel's septic tank in Belize. In a departure from human murder mysteries, the plot of *Bare Bones* revolves around animal remains that are thought to be human. Such cases have allowed Reichs to work with the U.S. Fish and Wildlife Service.

In her most recent book, *Monday Mourning*, the owner of a pizza parlour discovers bones in his basement that are identified as human. What does one do with only one, very dry bone? Reichs went to a C¹⁴ laboratory, which used a carbon isotope and strontium to date the bone.

In conclusion, Reichs emphasized that while her books are murder mysteries, they communicate sound science. "The good news is that the truth is out there and scientists are there ready to answer questions in order to get the message out."

Questions and comments

One delegate said that Burnet's presentation was indeed provocative as it was based on "half-baked" arguments. He remarked that journalists are not simply the conduits of science. "We are here to communicate controversies, discoveries, and major changes in science." While facts need to be verified, science reporting isn't just about the facts. He said that if scientists had their way, they would advocate the safety of British beef, adding "our job is to be critical not just to get the facts straight." Burnet replied that one of the models he presented was a conduit model. "But this is not about propaganda; scientists don't manipulate journalists to get them to impart a particular message to the public." Burnet reiterated that his message was the free-flowing nature of information between the public and scientists.

Another participant wondered how to make the move from non-fiction to fiction. Reichs said she

followed no specific recipe for this transition aside from being a voracious reader herself and reading a book on how to write. As a full professor at a university, she felt that writing fiction would bring her science to a wider audience. “Writing fiction is an ongoing learning process for me.”

One delegate suggested that Burnet’s work created a false impression of science and that she was still reliant on mass media to reach and engage a mass audience, which is the job of science reporters. Burnet replied that it is important to get the science message out in as many ways as possible. This doesn’t need to happen in an entirely media savvy manner, although that can be very effective, she added.

How to Sell In-Depth Stories

Moderator: Tim Lougheed

Tim Lougheed, in introducing the speakers, noted that some stories are easier to sell than others. It is challenging to put science into context and there is a certain art to selling hard science stories.

Deborah Blum, Science Writer, Madison, United States

Deborah Blum began the discussion remarking that irrespective of the story her mandate is always the same. “How can I spend time writing what I want rather than what my editor wants.” She gave the following tips to writers who want to “trump the game”:

- ? Know the editor. If, for example, an editor is obsessed with their gallstones, a story on gallstones will fly; will get you into the game and buy you credit.
- ? Build and nurture relationships with editors—these relationships are key.
- ? Know the audience. To illustrate, Blum told of pitching a story on teaching kids resilience to one magazine that rejected it; later it was readily accepted at *Psychology Today*.
- ? Have a story selling strategy. Blum’s attempt to sell her editor a story on nuclear weapons failed initially, but when she repackaged it as designing tomorrow’s weapons for California, she was assigned to the story for one year.
- ? Tell a story that is fresh, different, and unique. Write from the perspective of your own backyard.
- ? Do the homework and invest in the story in ways that editors don’t see. The more story background, the more successful the pitch.
- ? Begin with ideas from every day life and always have fun with it.

Pallava Bagla, Correspondent, *Science*, New Delhi, India

Pavalla Bagla began by saying that he does not “sell” stories: “I just believe in the idea.” As a

journalist, he feels that it is his duty to take information to the masses. He follows only this sense of duty, his passion for writing, and the fundamental of accuracy. “As a wild card entry into this panel,” Bagla observed that he straddles two worlds by writing for both the Indian and Western media. He has also cultivated photojournalism, which provides editors with pictures for his stories. The issue is getting the attention of editors and getting space in the paper. Bagla reiterated Blum’s comments that knowing your media outlet and your audience are important. “Sitting duck stories have worked well for me,” said Bagla, relating his experience in the 1998 tensions between Pakistan and India.

Bagla also prepares his stories ahead of time and waits for the demand. For the upcoming anniversary of the Bhopal disaster, he has a story that explores the ongoing soil and water contamination and human suffering. Bagla is also there for unfolding stories like India’s planned mission to the moon. He concluded that the road of the science journalist is a lonely and tough one, but one that “you should follow if it’s in your heart.”

André Picard, Journalist, *The Globe and Mail*, Montréal, Canada

André Picard brought a different perspective to the session as a columnist for *The Globe and Mail*. Although he is salaried, he still has to have a good pitch as he competes with others for space in the paper. “When I pitch big stories, I have to convince the editor that the Atkins diet should be dissected and not the biker war.” He provided the following tips for selling science and health stories:

- ? If the editor isn’t big on health, the notion needs a tough sell first.
- ? Devise a strategy that strikes the balance between the big stories and the day-to-day stuff.
- ? Timing is important—serendipity and good luck can go a long way.

“One never expects a big story,” said Picard, giving an example of the haemophilia story, which started as a minor investigative report on the “blip” in blood products statistics attributed to haemophiliacs and blood transfusion patients.

Knowledge about an editor can provide a context for selling stories, remarked Picard. An editor with a prostrate problem, on an Atkins diet, or with homecare problems gives instant context.

“My attitude is to never give up on a story since editors come and go,” said Picard, adding that he simply resends memos. He observed that many stories are obvious stories waiting to be told. A weekend spent with the husband of an Alzheimer-afflicted woman becomes a story. Obesity has been covered in many ways, so for a different angle, Picard did an exposé of Canada’s fattest city. It turned into a multi-media project that resulted in the sale of 50,000 more papers a day. Picard also discussed his stories on trans fatty acids, which done in conjunction with CTV coverage proved very successful. He shared some final pointers with the audience suggesting that science writers should always look for hooks, be patient and then pounce, and when possible, work with other media partners.

Questions and comments

Tim Lougheed asked if any of the speakers had ever “hit the wall” with a story? Blum said she holds onto stories such as one on fragile X syndrome which she has not yet been able to pitch. “The heart of selling stories like this one is finding the universal key.” She added that failed pitches on the other hand are a great problem for writers every once in a while. Lougheed then asked the speakers about their success stories. Bagla referred to the nuclear bomb story in India. This was a matter of being in the right place at the right time. Blum indicated that one of her story highlights was her repeated coverage of animal behaviour. “Many readers bailed on science in school and is it my job to draw them back in by making science intriguing and fun,” she said, recounting her story on laying chickens.

The moderator was curious about the differences among the many editors that Bagla has had to deal with. Bagla replied that although there are many shades of editors, none will pass a good story. “If your pitch fails, it is due to competition with politics or to the fact that your pitch wasn’t good enough.”

“What would you like to have known that you know now?” asked Lougheed. Picard said he would have pitched bigger stories and written books earlier. Blum would have worked harder on how to tell stories compellingly. The comfort zone between this and getting the science right had evaded her earlier. Bagla would like to have spent more time taking pictures.

One delegate asked if other media have as significant an impact on selling stories in North America as in Germany. Blum indicated that pack journalism was alive and well in the U.S. and blamed this phenomenon on editors with no science background. Picard added that if the story is really poor, writers will fight back; if not, they will try to give it a different angle. “We have to pick our battles.”

Another participant asked how media relations can serve journalists. Picard suggested that they promote their information indiscriminately and would be better to pitch to the appropriate media. He added, “Tailor your message to us and teach your scientists simple language.” Blum noted that science writers know a lot about the culture of writing, but little about scientists. It is a different way of thinking that needs to be understood.

Lougheed remarked that the email inboxes of most freelancers are packed, attesting to an industry that wants science information to get out. Asked if this was the scenario in Asia, Bagla replied that it was, and added that the subject line, like the headline of an article, is the most important thing in an email if the sender wants it read.

One delegate asked if agents are useful for pitching articles. Blum noted that this could be useful for such magazines as *The New Yorker*. However, taking a potentially sympathetic editor to lunch can work as well. However, when pitching a book to large publishers, agents are a must. Lougheed added that freelancers must make a significant upfront investment in their work knowing that sometimes it won’t pay off.

Another audience member asked about column syndication. Blum noted that agents “troll”

magazines for columns to be syndicated. But this requires overhead investment in becoming visible. “Once your name is out there, syndicates will find you.”

Cutting Through the Spin on New Drugs

Moderator: Alan Cassels

Ray Moynihan, Freelance Journalist and Author

Ray Moynihan began the discussion by stating that a journalist covering a story on science or medicine must also cover the story on the marketing behind the science, drug, or medicine. Many press releases are designed to shape perceptions of human illnesses by increasing public awareness about medical disorders or syndromes with the risk of raising expectations that the condition can be treated with the use of a drug—perhaps one that hasn’t been properly tested. A second risk associated with publicizing artificially high numbers of afflicted people is that it undermines serious illness. The third risk of these elevated numbers is that it creates a perception of illness based “on matters of everyday life,” because the surveys that arrive at these figures are not fine-tuned.

Pauline Dakin, Health Journalist, CBC Radio, Halifax, Canada

Pauline Dakin suggested questions to ask when assessing whether a story is an actual story or merely hype. It is particularly important to be discerning when reporting health stories because they rate in the top three areas of audience interest and 58% of people will change their behaviour based on media reports. After asking if there really is a story, she asks these questions.

- ? Has this research been peer-reviewed? Where? Can I see a copy?
- ? Who paid for this study?
- ? Is this a human study, an animal study, or a test tube study?
- ? Was this a Phase I, Phase II, or Phase III trial? (Rarely are Phases I and II worth reporting to a general audience.)
- ? Is the drug approved for sale in the country in which the story will be published?
- ? How large was this study?
- ? What’s the context? (How dangerous is the disease to be treated, what are the chances of getting it or dying of it, how does this compare with real-life risks such as being hit by a bus?)
- ? What are the risks as well as benefits of treatment? What about inconvenience or accessibility of treatment or intervention, or the cost?
- ? How are the results applicable to the real world? Is this information useful for patients of doctors on the front lines?
- ? What’s the “number needed to treat”? If you’d have to put 5,000 people on drug X for five years to prevent one stroke, this is useful information.
- ? Why should people know about this?

A journalist should also watch for hyperbole in press releases, the source of the release, test result numbers released as percentage figures, offers of video or in-house expert interpretation services, and celebrity figures promoting the condition.

Don Husereau, Pharmacist and Researcher for the Canadian Coordinating Office for Health Technology Assessment

Don Husereau began his presentation by referring to his idol Sir Frances Bacon, particularly to Bacon's concept of gaining knowledge empirically. Husereau went on to say that health information is garnered by analysing data and producing information, but the information that is gathered needs to be pieced together within a systematic review of all the pertinent medical evidence for that instance. This type of review requires an awareness of an entire body of knowledge and is not easy to produce. He referred the audience to several reliable and independent sources that produce this type of complete picture and that are available to journalists.

- ? International Network of Agencies for Health Technology Assessment at www.inahta.org
- ? The Cochrane Collaboration at www.cochrane.org
- ? WHO Health Evidence Network (not yet operative, but hoping to deal with social issues of health questions)
- ? Other sources include the following:
 - ? www.ccohta.ca (Canadian)
 - ? www.ncchta.org (United Kingdom)
 - ? www.ahrq.gov/clinic/epc (United States)
 - ? www.ecri.org (privately run, United States)

Husereau also offered his email address at the Canadian Coordinating Office of Health Technology Assessment: donh@ccohta.ca

Questions and comments

A member of the audience asked if the World Federation of Science Journalists could devise a set of guidelines for a code of conduct. The panel members indicated that they would be willing to co-operate on such an initiative. According to both the panellists and members of the audience, it is quite common for pharmaceutical companies to solicit journalists to do stories on their behalf by proffering dinners, trips, and even awards of a financial nature. A journalist, from a newspaper with few resources, wondered if a story might be better covered if an on-site visit (paid for by the party running a trial) was made. The consensus of the panel was that even if the visit resulted in a better story and full disclosure was used, the journalist would most likely be seen as biased. Someone pointed out that the real story in instances of unsolicited "gifts" was the offer itself.

A comment was made that drug companies do pay for studies on their own products at the test

stage and that the (Canadian) public is probably pretty comfortable with that since tax dollars are already stretched. Husereau responded by stating that lack of full disclosure is costing society money and studies need to be done with increased rigor. Session moderator Alan Cassels added that taxpayers should thank their governments for funding large comparative studies such as head-to-head testing of two drugs for treating the same condition or the work of the Women's Health Initiative.

One journalist challenged those present to not go for the “easy” story, going on to say that information provided by drug companies can cloud perceptions about diseases and she felt that assignment editors need education about this. Moynihan granted that a much broader discussion was due here. He believes that drug companies attempt to transform normal human desire into a demand for drugs or for a chemical solution to normal human states. Dakin agreed that assignment editors often think that a story must be covered if a competitor is covering it. She suggested trying to broaden the story, if possible, by providing some context.

Someone asked how to find a truly independent researcher. Moynihan replied by citing Husereau's sources of information. Dakin also suggested that perhaps the best that could be done locally would be to find someone who hadn't worked on that particular drug for that particular company.

The panellists were asked to comment on why they thought relationships between researchers and drug companies were not disclosed. Dakin said that people in the right places are not willing to talk about it. Moynihan said that there have been lots of stories about these relationships; now it is time for action and disentangling. He cited as an example that a conference such as WCSJ should not accept funding from drug companies. Husereau reported that clinicians embrace the opportunity for groups such as his to produce guidelines; the clinicians accept offers from private groups because they want the studies done, thinking they can remain above the influence of the funding party.

A journalist asked about dealing with what she called the “popular legacy” of drugs and traditional medicine in the media. Moynihan and Dakin both answered that it wasn't covered because it has yet to be properly evaluated, even though more people are relying on these approaches in the Western world. Husereau stated that an increasing number of studies are moving into this area, examples being studies of nutritional supplements, chiropractic, and omega fatty acids.

Someone mentioned an example of research being rejected because it was done in a developing country. Husereau suggested that any valid scientific assessment with assembled information can be submitted to his website for dissemination. Moynihan's concern is that billions of dollars are spent on research and development for therapies with marginal benefits to the Western world, while virtually nothing is spent researching therapies that could have transformational effects in developing countries.

One journalist told of having launched an in-depth investigation after looking more deeply at studies that were done on an anti-depressant. He was forced to drop the story, as were his colleagues, by political and economic interests putting pressure on his organization. He thought

it would be helpful to have grants available to allow journalists to do this type of investigative reporting.

A member of the audience responsible for fund-raising for the conference addressed the issue of corporate support, saying that, in terms of the total budget, there was very little corporate drug money and that it had been offered with no strings attached other than displaying the company's name.

In the Eye of the Beholder

This visually delightful session began with two questions that have become increasingly familiar to science journalists: “What makes a good graphic?” and “How can science journalists effectively incorporate graphics into stories?” By session's end, three panellists had used a host of impressive visual examples to illustrate the potential power of graphic art in science journalism.

Nigel Holmes, Former Graphics Director, *Time*; Founder of Explanation Graphics; Author, Teacher and Lecturer, Westport, United States

Nigel Holmes outlined six ways of making science stories visually exciting while providing clear and concise explanations to readers.

- ? Think of the page as a whole. Design page layouts in ways that allow text and graphics to “collide and mesh.”
- ? Use metaphors **when appropriate**. Holmes used an example from his work at *Time*: a drawing of Paul Revere metaphorically representing the exchange of information between two cells in the human body.
- ? Keep colour simple. Holmes usually begins with black and white drawings and only adds colour—in small quantities—when absolutely necessary.
- ? Change the format if possible and if beneficial to the overall message. Holmes' example was an illustration of the colour spectrum remarkably produced on a long, narrow, foldout page.
- ? Use modular drawing. Sometimes less is more; don't use fancy graphics tools simply because they are available when a simple drawing will do the trick.
- ? Most importantly, combine words and images. Although writers may have difficulties giving up traditional ways of producing text, graphics serve important purposes in science stories and should be used when needed to convey complex information.

Holmes concluded with two examples of his work that illustrated effectively all six points and emphasized the power of using graphics to help explain complex scientific information.

Alejandro Tumas, Art Director, *Clarín*, Buenos Aires, Argentina

Alejandro Tumas claimed that his paper was unique because graphic styles and signatures are constantly changing and evolving. He contrasted this to the traditional way of designing layouts which favours “finding what works and sticking with it.” Tumas remarked that his graphics team has found photographs and medical imagery extremely helpful analysing complex scientific information. One example of the power of photography was a layout he did during the world soccer championships. He used a photograph of a player’s leg to illustrate what different parts of the leg were doing while playing soccer. Tumas contended that his readers learned a lot from the layout, because the photograph accurately illustrated the text. The story should be the primary focus, with graphics supporting it. He ended with a three-minute slide show illustrating the unique style his graphic team has developed.

Christopher Sloan, Art Director, *National Geographic Magazine*, Washington, United States

Christopher Sloan rounded out the presentations by noting the dramatic changes graphic art has undergone in the past several decades, focusing specifically on the switch from hand drawing to computer graphics, as demonstrated by the “switch in most graphic departments from drawing tables to computers.” Sloan used an illustrated history of his work at *National Geographic* to show the wide variety of computer graphic and scientific technologies that are available to journalists who want to add creative graphics to their stories. Displaying an ancient Egyptian scene that marked *National Geographic*’s first foray into computer graphics, Sloan informed the audience that computer graphics are used at the magazine primarily when they provide a better avenue for communicating something or when they communicate an issue more dramatically than, say, a drawing. The computer generated ancient Egyptian scene allowed *National Geographic* to portray information about the civilization in a visual language that readers found familiar and appealing.

One of the biggest benefits of computer graphics are that they can be used in other places (i.e. on t-shirts, websites, coffee cups, etc.), and that such “re-purposing” gives them high value. When his magazine begins a project, all possible “spin offs” are considered to maximize the utility of a given graphic.

From the evolution of dogs to the effects of fat on the human body, Sloan gave an array of examples of how scientific technology can be effectively used to garner high quality, interesting graphics. He admitted that getting involved in technology processes such as MR scans (used for a story on human body fat) can be daunting for journalists, but asserted that it can become an interesting, informative, and ultimately successful process if journalists partner with knowledgeable scientists who are willing to explain the technology. In closing, Sloan urged science journalists to delve into the ever increasingly accessible world of computerized graphics, stating that decreasing prices and increasing sophistication of computer software and hardware has made computerized graphics accessible to those willing to invest the time and energy into using them.

Questions and comments

Several session participants expressed their concern over visual graphics replacing text as the primary form of communication. They cited television, computers, and video games as prime forms of competition that they felt were slowly replacing written text as the preferred method of obtaining information for most people. All three panellists addressed these concerns by restating that graphics and text should be used together—not separately—to communicate scientific information. All three panellists championed a team approach; each panel member emphasizing that compromise on the part of writers, graphic artists, and editors is often needed. It was suggested that, in an environment where graphics are increasingly being used to explain information, writers need to be somewhat flexible in how their final text is preserved and displayed. Graphic artists, on the other hand, need to work with writers to best accommodate their text.

Finally, one session member raised concerns that computerized graphics allowed for the *creation* of reality rather than the *showing* of it, referring to the resultant realities as “docudramas of the printed world.” He questioned whether science journalists had enough education to take on the responsibility of creating reality. Panellists were somewhat divided on the issue. Holmes empathized with the concerns raised and stated that he preferred drawings to computer graphics for this reason, among others. He concluded by proposing that if a created reality was not 100% accurate, the consequences might be misleading, if not harmful. Contrary to Holmes, Sloan held that often in science (as well as in history, etc.) there are only *degrees* of knowledge and that 100% certainty cannot always be achieved. He pointed out that often when talking about history, there is no way one can say that something looked a certain way. Similarly, in science, scientists often publish results based on best guesses, and very rarely are there examples of scientific studies that prove or disprove something with 100% certainty. Sloan suggested that a “best guess” based on expert knowledge, can be an acceptable alternative to not printing anything until full knowledge is gained. He said that in some situations full knowledge will never be ensured, for example what ancient Egyptian civilization look like.

From Hypothesis to Hype: Crossing the Line

Moderator: Tim Lougheed

Robert Park, Professor of Physics, University of Maryland, Director of Communication for the American Society of Physical Sciences

Tim Lougheed welcomed participants and introduced the panel, which began with Robert Park recounting some of the latest “news” stories, such as shoe magnets to rebalance a person’s energy. “It’s not news, it’s entertainment!” he said, arguing that it is easy to present pseudoscience to a public which is not science savvy and which expects miracles. It is difficult for people with little exposure to scientific methods and ideas to identify hucksters. In fact, “there is no claim so preposterous that a Ph.D. can’t be found to vouch for it.” Park also suggested that both scientists and journalists should be gatekeepers of scientific knowledge.

To illustrate his point he referred to cell phone risks. This controversy started with a Larry King interview in which it was suggested that there is a link between cell phone use and brain cancer. The media has also repeatedly featured the comments of Louis Slesin founder of *Microwave News* and a supposed expert. Park pointed out that Slesin's doctorate is in urban planning. The debate started even earlier with Paul Brodeur's book, *The Zapping of America*, which suggests that there are links between microwaves and cataracts. Yet, Park said, study after study found no danger with microwaves. When this fear faded, Brodeur made the jump to power lines, and subsequently to cell phones in two other books. Park indicated that when scientists scoffed at Brodeur's ideas, he cited them as part of the conspiracy. These controversies always seem to have the same cast of characters and carry with them a whole industry that measures microwaves.

Edward Campion, Senior Deputy Editor, *New England Journal of Medicine*, Boston, United States

Edward Campion gave an overview of the weekly *New England Journal of Medicine*, which publishes original and review articles, perspectives and editorials, and other pieces. In describing the manuscript review process, Campion gave an example of a study on statins given to patients with acute myocardial infarctions. The large study size, randomization, the authors' intention to treat patients, and the long patient follow-up period gave this study priority. The journal receives over 3000 original articles annually of which only 8% are accepted after review by the editor-in-chief, associate journal editors, two to four outside reviewers, and a final editorial board of statistical and medical consultants. "We are looking for work that is important, informative, novel, and ethical."

The journal rejects submissions when the science is flawed, not novel, or too specialized. The editor can ask for revisions with follow-up documentation of toxicity and side effects. The review is one aspect of the journal's quality control. The journal also requires full disclosure of all financial ties. Published articles are also evaluated in review articles and letters to the editor. Finally, the test of subsequent research will verify (or not) the published work. With respect to the journal's communication policy, Campion added that there is an electronic table of contents and free access to articles in developing countries.

Edoardo Boncinelli, Director, International School for Advanced Studies, Trieste, Italy

Edoardo Boncinelli noted that Italy's main problems in science communication are exaggeration and panic. In addition, the church raises many ethical questions. As an author and former scientist, Boncinelli, has a different perspective. "Any scientific issue may have societal questions sooner or later." The controversy lies in different ethical positions, not in the science. If everyone agrees on an ethical issue, science must obey and there is no controversy. Citing the example of reproductive technology, Boncinelli suggested that as science finds more and more

solutions, controversial positions will increase. For the science writer, however, “it is important to explain the science and the different ethical positions involved without taking a position.”

Boncinelli explained that science books, which can popularize scientific concepts, can't replace the daily or weekly work of science journalists. He suggested that a three-fold definition for science writing be used. First science should be popularized, then communicated, and finally, diffused into the population. In any newspaper or magazine there should be something readable about what science really means. He made a call to scientists and science writers “to foster and promote scientific concepts to percolate into the popular culture.”

Pablo Alban, Journalist, Ecuador

Pablo Alban is interested in indigenous use of medicine and said, “we have to recognize that indigenous medicine is not a science and it doesn't seek to end up as scientific knowledge.” With this in mind, science writers can understand and report on practices such as cleansing rituals. Alban continued by noting that science is not an absolute truth, and that art and culture should have a legitimate place in science. In Peru, indigenous medicine and its place in Indian culture and life is accepted as fact. Since this interculturalization is a state policy, it is not up to the journalist to question it. For example, the community—not the journalist—decides the authenticity of yachaks (indigenous doctors). Alban suggested that journalists should not ask if indigenous medicine cures, but if the yachak is a legitimate practitioner of indigenous medicine. The answer is that yachaks are doctors for their people who have a holistic vision of the body and spirit. In white-Indian societies, the choice of medicine is a strictly private decision and not a matter of public interest.

Alban noted that illnesses prior to the arrival of Europeans were minor (e.g. the evil eye or the wrong air) and there were therapies such as smell therapy and the use of the natural elements. This was knowledge that was transmitted from parents to children. Is indigenous medicine efficient? While there are no statistics to endorse this idea, Alban feels that statistics are not necessary. He suggested that alternative medicine should be considered complementary. “Tolerance, respect, and valuation are needed to discover their historical transcendence and their contribution to human well-being.”

During the discussion period, one delegate asked what journalists should say about controversial topics like cell phones when dated research indicates dangers. What criteria should reporters apply? Park said that in the question of alternative medicine, the most important test is the randomized double-blind placebo effect. Boncinelli suggested that if something is not yet known it is unlikely to be completely different from what is known. Continuing on this topic, the moderator asked if there were any warning signs one should look for to distinguish good from bad papers. Campion commented that any study has to be evaluated in the context of other studies in its field. “We won't publish unless there is convincing body of evidence.”

Another delegate wondered if more relative approaches and liberal principles that allow for some mistakes in biomedical research are called for. Park said no matter how good the heart is, studies

still have to be well done. Campion added that in the pursuit of truth, a little modesty and respect is required. “Much of what we do today will be proven wrong or inadequate later.”

While journalists can weed out phony experts on a case-by-case basis, is there a structured approach to weeding out frauds? Park suggested that journalists should first check an expert’s credentials. Be wary if research is pitched first to the media rather than to colleagues and if there is talk of a conspiracy, he added. Campion observed that journalists should obtain a review by an independent expert with no axe to grind and who is willing to be quoted.

Science for Profit

Moderator: Véronique Morin

Please note: Full coverage of this session was prevented by unexpected technical difficulties encountered by the report writing team

Shannon Brownlee, Schwartz Senior Fellow, New America Foundation, Washington, DC

In a presentation that contrasted the treatment of conflict of interest issues in the United States and elsewhere, Shannon Brownlee suggested a need for greater diligence in the relationship between journalism and academic medicine.

As a reporter who went directly from basic science to her first journalism assignment, Brownlee remembered her surprise at the code of ethics she received on her first day on the job. It prohibited her from accepting lunch from a source, donating money to worthy causes, giving speeches for money, owning most stocks if she covered a business beat, or accepting certain journalism prizes that included a cash reward.

“If we attended a political rally, our editors had better not catch us there without a press pass and a notebook,” she said. “There was zero tolerance for accepting presents from any sources. No free tennis racquets for the sports writer. No free drugs for the medical writers. No free plane tickets or hotel rooms for the travel writers.

“I actually had an editor in chief tell me he wished he could prevent his writers from voting, but he figured that would be unconstitutional.”

Brownlee said the rules served two purposes. The first was to keep reporters “as unbiased as possible,” but the second was to ensure the *appearance of fairness*. “That’s kind of a subtle point, but it’s extremely important in our business,” she said. “When the public no longer perceives that we are trying to be fair, we lose all credibility.”

Medicine has the same problem, she said, “and it’s going to become a problem for us in the press if we don’t start thinking about the conflict of interest that is happening in medicine.”

Brownlee said Americans' trust in their country's medical research establishment is reflected in its growing budget—funding for the National Institutes of Health has increased from US\$8 billion in 1984 to US\$30 billion today, and now accounts for 23% of federal research and development.

“That's largely a function of how the public perceives biomedical science,” she said. “We see what medical researchers do as enormously beneficial,” and “the public has trusted academia, it has trusted the drug companies,” largely because reporters have been “very, very nice to medicine.”

Citing specific coverage of specific issues, she suggested U.S. media have been too favourable toward academic medicine. Journalists have failed to report on negative effects of different treatment options or expose hospitals' profits related to new procedures, and have sometimes played a central role in creating public demand for new forms of care.

“This pattern has been repeated time and time again. A new surgery, a new drug, a new device, a new test. First it gets touted by academic clinicians. The press picks it up. Patients start demanding it....I know because I used to write those stories.”

For too long, Brownlee said, journalists have been “dazzled by science” and too willing to trust doctors and scientists. But now, academic medicine and the pharmaceutical industry are in trouble. One company paid half a billion dollars in federal fines “for effectively bribing doctors to prescribe a drug,” and another firm has been charged with deliberately hiding negative drug test results. Polling shows that members of the public “trust the pharmaceutical industry about as much as they trust Big Tobacco.”

But while the focus has been on the industry, Brownlee said a share of the blame belongs with academic scientists who have touted the drugs, failed to report side effects, skewed statistics, and accepted pharmaceutical funding to travel the country promoting products to their fellow doctors—while the public relies on them to report on drug safety and effectiveness.

“These are the academic scientists who are making hundreds of thousands of dollars on consulting fees, sitting on drug company advisory boards, who have allowed money to skew their science,” she charged. “One prominent doctor who has promoted these drugs to the press and his colleagues is making on the order of \$1 million a year in side deals with pharma.”

From the companies' perspective, all of this activity comes under the heading of marketing, designed to build relationships with academics and physicians and create “buzz” for their products. “The companies and their PR consultants make no bones about the fact that they see (physicians) in academia as marketing tools,” she said. They even have a term for them—Key Opinion Leaders (KOLs).

But at a time when 75% of the articles appearing in major medical journals are underwritten by industry, Brownlee said pharmaceutical funding of medical research and researchers is a major problem for journalists.

“One day, the public is going to figure out how skewed medical science has become, and it is going to wonder where the press was while it was happening,” she said. “The public is going to figure out that the other culprit is the press.”

The solution is for reporters to begin asking tough questions about who funds a study, who controlled the data, who wrote the paper. “We need to be aware of what is going on and start asking some uncomfortable questions,” she said. As a starting point, she encouraged participants to:

- ? Google their sources with the words “conflict of interest statement”
- ? Consult the Center for Science in the Public Interest’s integrity in science project (www.cspinet.org)
- ? Ask institutions about their funding sources
- ? Ask sources directly about their own conflicts of interest.

“That last recommendation may not make your sources happy, and it’s a hard question for many of us in the medical press to ask,” Brownlee acknowledged. “We in the press have imagined for too long that the people in academic medicine are selfless, and that they could not possibly do anything that might undermine the integrity of their research.”

But the time has come “to start acting more like reporters and muckrakers and less like friends of science,” she said. “I believe the integrity of medical science depends in part on us doing our job.”

Sheldon Rampton, Editor, PR Watch

Sheldon Rampton, Editor of PR Watch in Madison, Wisconsin, is co-author of *Weapons of Mass Deception: The Uses of Propaganda in Bush’s War on Iraq*. In a recent web posting, PR Watch stated that:

“Good communication skills are essential for a functional civilization. We need to be able to warn each other of danger, share ideas on how to improve our lives, teach each other how to use new technologies. Being able to clearly and effectively communicate a message is a noble aspiration. Yet, we see time and time again how PR firms, marketers, and propagandists, cloaking themselves in righteous ambitions, are using their communications skills to manipulate and deceive target audiences for their own gains or those of their patrons or clients.”

Aline Richard, Editor in Chief, La Recherche

Aline Richard, Editor in Chief of Paris-based *La Recherche*, suggested that the media, science and money make for a bad combination in France. Neither research nor news outlets would be possible without money, leading Richard to raise questions about:

- ? Who finances scientific research in France, at a time when the role of public funding is shifting and private sector involvement is an emerging trend
- ? How funding affects the mindset of scientists, journalists, and the general public

- ? How science journalists approach issues of research funding and whether they truly bring an independent perspective
- ? Whether journalists have the knowledge to ask the right questions
- ? Whether media outlets are truly interested in seeing the right questions asked.

Supporting Science Communication in the Developing World— SciDev.Net

David Dickson, Director, SciDev.Net

David Dickson opened this double session by stating that his goals at this conference were to introduce the SciDev.Net website and generate discussion about how it operates and how it might operate to better serve its audience. After introducing the other members of the panel, including the surprise panellist, Christina Scott, he presented the history and background of SciDev.Net. SciDev.Net was developed to provide an effective way to communicate scientific advances to developing nations so that they can put scientific knowledge into practice. Communicating scientific advances is a constituent element of the development process, not an “add on.”

Launched in December of 2001, the website has continued to evolve as a free access site that also provides a forum for discussion. It is the most commonly consulted website of its type. The name was expanded to “The Science and Development Network” so that it could be translated into Chinese. To increase its accessibility, the home page has a classic style and is divided into feature articles, opinions, regions, and topics. Readers have free access to selected articles from *Nature* and *Science* magazine with Internet links to the authors’ sources. Discussions are taking place to establish a similar arrangement with reputable medical journals. Other Internet links are included to in-depth research on issues. Regional gateways help develop networks of individuals with common concerns in Sub-Saharan Africa and Latin America. Additional regional gateways have been proposed for South Asia, China, South-East Asia and the Middle East, and North Africa. The website has more than 12,500 registered users, almost 1200 journalists among them.

SciDev.Net also organizes capacity-building workshops. Two have been held with the joint sponsorship of UNESCO: in Kampala, Uganda and in Chennai, India. The topic was using information and communications technologies to report the science of HIV/AIDS. The existing regional gateways, or networks, have also provided opportunities for exchanging ideas and information by science journalists at regional conferences.

SciDev.Net would like to expand its current network of about 70 local journalists and other contributors. The staff is also developing an online training program for science journalists. It hopes to enhance this program with online mentorship contacts between journalists from developed countries and those from developing countries, if journalists from developed countries can be recruited.

Dickson invited questions from the audience. The first question was why English is the only language on the website. Dickson replied that the staff is very aware of this limitation and the effect it has on attempts to have a more equitable global distribution of information and input into discussions. There is movement within the organization to add another language and a French editor has recently been hired. This kind of development does take time. The language issue was raised several more times, which underlining its importance.

The question of addressing issues in Iraq was raised. Dickson said that several editorial columns had been done on it, but SciDev.Net focuses on issues of generic science importance with international appeal.

Dickson then responded to two other questions by stating firstly, that Canada, through the International Development Research Centre, was taking the lead in promoting scientific development in developing countries, and SciDev.Net is trying to address the politics of science and the development of policies. Secondly, as for journalistic coverage of women and science in Africa, he said this was indeed an area of current focus within SciDev.Net.

Mike Shanahan, News Editor, SciDev.Net

Mike Shanahan addressed the importance of getting quality science news into local media and described Sci.Dev.Net's article selection process. The questions asked are:

- ? Is it new?
- ? Is it significant?
- ? Is it science?
- ? Is it related to development?

He described the steps taken when articles are accepted from freelance journalists in developing countries. Often they rely on local networks (if they exist) to sort through local stories. The most important criterion is whether the story is about science or not. Since writing styles vary from place to place, the articles accepted are edited before they are posted. The challenges of accepting articles from writers in developing countries include:

- ? Raising the writer's local issue into a global one;
- ? Accommodating language differences;
- ? Being alert to plagiarism;
- ? Providing writers with access to local experts;
- ? Providing background for readers in different countries; and
- ? Trying to improve the writing style.

Shanahan tries to maintain a global balance in what is included and uses a great many resources to find appropriate material. He also works hard to ensure that the story could be used in local media worldwide, if necessary, directly from the site.

The first question directed to Shanahan was about the pay scale at SciDev.Net. Dickson answered that although legally SciDev.Net was an NGO, professionally it was not, and that the board had worked out a pay scale based on U.K. rates. This is admittedly quite high for some

developing countries, but hopefully not so high that it discourages journalists from writing for local media outlets.

A positive comment was made on SciDev.Net’s “newsfeeds,” which allow anyone to have SciDev.Net updates listed on their own website. Although pleased that it is a useful service, Shanahan said that not too many people were using it; promoting it is not a high priority at this time. He would like to develop regional-specific newsfeeds in the future.

A question about promoting collaborations was answered with a suggestion that a notice be posted on SciDev.Net in the appropriate place. SciDev.Net has not focused on business-based research because of its mandate to translate research findings into development policy.

Shanahan respond to a question about stories on technological advances by saying that they are generally well-covered on other websites. However, if a particular technology was science-based and of interest to an international audience, SciDev.Net would do an article on it.

Christina Scott, Science Journalist, South Africa

Christina Scott discussed her experiences in getting the local media to include science articles. Although there is quite a lot of significant science going on in Africa, she maintains that often editors are afraid to cover it. One of the key issues is trying to make the editors understand why they should care about promoting science—why it is important to their lives and their readers’ lives. Adding an introduction to make the story more obviously relevant to the local situation will increase its appeal. Local researchers can be interviewed. The use of available local visuals with a story of international interest is another approach. Often a science story can be submitted to several different departments of the same media outlet; this will generate a bit of internal interest and increase chances of it getting used. Humour is often an effective tool, particularly in headlines. As science stories are rarely time-sensitive, a writer may be able to link the story to local holidays or observances. As a resource, Scott finds SciDev.Net is good middle ground between tabloid journalism and peer review journals. She has used it as introductory material when interviewing local experts so that they have a better idea of what her focus on their research will be. Dickson commented that SciDev.Net is keen to have its material re-used and it does provide the assurance that it is reliable and trustworthy source of information, aware that it has a reputation to maintain.

When asked if she has requests to supply visuals to accompany her stories, Scott replied that editors usually have a ready source of pictures and that she has never had to supply them, but if she knows a media outlet well, she may recommend something she knows they have on hand.

A question was asked about the low level of interest in science stories originating from other developing countries and how Scott deals with this. She acknowledged she has seen this phenomenon. Often a very obvious paragraph establishing a local context—this is what’s being done here and how—will help raise the interest level. She suggested always explaining why scientific developments are important because it isn’t always obvious.

A discussion opened up on the use of work from sources outside the local media—SciDev.Net, wire services, etc. Are these sources undermining local writers? Dickson replied that the reason SciDev.Net virtually hands articles to local media outlets on a platter is that its funding agencies realise that the media in the developing world are under a financial strain that precludes doing any work to incorporate science stories. SciDev.Net chooses to focus on the benefit to the end-user instead of to the newspaper publishers or other media.

Scott was asked about raising the profile of science stories on the radio. Might SciDev.Net also contribute to this effort on its website? Dickson said that they are interested in this and it is being looked at. Scott added that often she would take a story off the website, interview a local expert on the air, allowing her to present a story with a local context, but that it would often not be accepted until it had run in the print media, which is considered by some to be a proof of authenticity.

Dickson addressed a question on the impact of science journalism. SciDev.Net recently did a user survey, with 1500 responses. The majority of respondents said that using the website had changed their attitudes toward specific issues, that they did pass on information found there to colleagues, and that, to a lesser extent, they did use the material in teaching. When compared with the breakdown of SciDev.Net registrants by profession, this does provide a picture of positive impact.

Luisa Massarani, Latin American Regional Co-ordinator, SciDev.Net

Luisa Massarani, SciDev.Net's Latin American regional co-ordinator, then presented the steps to be taken and issues to be dealt with in setting up a local network and organizing a regional conference. There already are several organizations in Latin America whose goals are to improve how science is communicated. These groups wanted to maximize their impact with joint regional initiatives and realized that through workshops they could share experiences as well as materials. So they decided to form an organizing committee. Taking advantage of technology, they formed a virtual committee, thus eliminating the expense of face-to-face planning sessions.

The organizing committee had to decide on the length of the workshop (out-of-town participants preferred a longer one), the size of the workshop (a smaller one would mean more in-depth discussion, a larger one would allow more networking), the format of the conference (either restricted to formal presentations of papers or open with referees moderating), what themes to use, and the budget. The budget had to consider the conference duration, the number of participants, meals, breaks, marketing strategy, and how to contact key individuals and organisations. Respected agencies will fund such events, but not readily. It is often easier to get many local sponsors, even those who are willing to contribute in kind. Teams need to be established to monitor the arrival of participants and presenters, and to prepare for unforeseen problems. The event will go more smoothly if problem sharing is maximized, jobs are clearly defined, and organizers are flexible and focus on success instead of problems. To increase the meeting's impact, Massarani suggested producing a record, such as a CD, or something that can be posted on the Internet. To promote ongoing contact, an electronic database should also be established.

Questions and comments

The first question addressed to her was about the budget required for such conferences. Massarani said a lot depended on the amount of local support. For the Latin American region, \$20,000 (U.S.) would be expensive. They have held meetings without funding. Dickson added that if SciDev.Net was holding a workshop, they would expect to spend \$50,000 (U.S.) for 20 participants, but that would be a totally funded gathering—hiring computer, funding transportation, hiring accommodation, etc.

The discussion came back to getting science stories published in local media outlets. An editor working in a developing country said she that she had received good stories in which the English was so bad she had to throw it out (her outlet's language was English). She also said that as a journalist, she sometimes had to sell stories to international publications to gain the credibility to have them published in her local media. Shanahan interjected that he had never had that particular problem with language, but does have an established team of regional journalists working with him. Dickson, on the other hand, said he had encountered this particular language problem and realized how difficult it was to be sure of what was being said in these cases, making it to trickier to judge the value of the story.

A question was asked about selecting funding partners for conferences. If multiple partners are involved, it could create a difficult situation of dealing with multiple interests. Massarani said that in Latin America the themes were determined before contacting potential partners. This decreases the possibility of being sidetracked. This being said, she also brought up the possibility of reflecting local needs; should the presenters be invited, or selected from papers or a target group? Dickson added that SciDev.Net had recently used an essay competition to select workshop participants, selecting those who exhibited self-motivation. In his experience, joint sponsors often nominate participants that are either over-qualified or under-interested.

This comment solicited a second discussion on language, starting with the need to increase workshop participants' input when they feel their (common) language skills are not good. Using small groups formed according to language skills or interests was recommended. Someone commented that the essay competition would require someone to write in the language of the judges, thus eliminating many candidates from the outset. Another audience member suggested that people need to free themselves from being inhibited by their language skills. Dickson brought up another possibility in which a workshop participant could organize a second workshop on the same topic, but in another language. He proposed a third model in which a reporter at a workshop could post proceedings on a website in a different language, after consulting the other participants about what should be posted.

A question about participants' freedom to express themselves and raise questions at a sponsored workshop was directed to Massarani. She was asked about what funding parties expect in return. She said the Latin America network had run workshops with support from many kinds of companies and from the government. The amount of publicity the sponsor expects in return is really mixed, but workshop participants have not been censored nor their discussions limited.

Massarani acknowledged that while Latin American governments often exert some control over the press, so far that has not been extended to science journalism.

SciDev.Net was asked about the amount of funding given to projects in Africa. Dickson answered that a lot of money is spent promoting African activities in England. SciDev.Net's total yearly budget is roughly £550,000. All donor agencies have agreed to have no control over editorial policies. This comment brought forth a question about donor influence. Dickson said that it is critical the group refrain from censorship, but at the same time it needs to remain mindful of the responsibilities of good journalism. He concluded stressing the importance of SciDev.Net's independence in making choices.

The final question was whether a journalist exchange program had ever been organized. Dickson replied that it has been done. A four-week experiment in which a journalist from Uganda had come to the SciDev.Net offices to learn how to use website articles most effectively had just ended. SciDev.Net hopes to repeat this type of exchange in the future.

Polar Science Blossoms in Canada

Moderator: Karen Kraft Sloan

Louis Fortier, Canadian Arctic Shelf Exchange Study (CASES)

Dr. Louis Fortier, Professor of Biology at Université Laval in Québec City, reviewed recent data on the build-up of atmospheric greenhouse gases, especially the carbon dioxide (CO₂) concentrations linked to climate change. Based on current consumption of fossil fuel reserves, and presuming that the world's oceans will sequester 50% of future emissions, he said atmospheric CO₂ could quadruple over the next 250 years.

Computer models indicate that global warming will be most pronounced in the Arctic region. By 2070, when CO₂ levels will have doubled compared to pre-industrial levels, the North Pole will be warmer by 5°C, the Arctic Basin by 4°, and the general area above the Arctic Circle by 3.25°.

The models suggest the Arctic should already be seeing the effects of climate change, and Fortier presented evidence that 2002/2003 was "a real inferno over the Arctic," to the extent that the ice film over the Arctic Ocean is beginning to shrink substantially. Projecting summer temperatures to 2050, he said, "You will have an almost ice-free Arctic Ocean, with all the geopolitical, environmental, and socio-economic consequences that you can think of."

Fortier listed a series of questions arising from northern climate change: Will an ice-free ocean be a carbon sink or a source? Is Arctic fauna threatened by ongoing reduction of ice habitat? Will biological productivity and fishery yields increase? Does the present rate of reduction have any precedent? Will the reduction of sea ice increase the cycling of contaminants into the Arctic ecosystem?

The Canadian Arctic Shelf Exchange Study (CASES) has dispatched a research vessel into the

Beaufort Sea in search of answers. Teams from Japan, the United States, Norway, Spain, Poland, and Canada have logged 29,000 person/days at sea, studying the links between ocean physics, biology, and biochemistry and determining how changes in ice cover will affect fluxes into the system. The project receives major funding from the International Arctic Research Network, the Canadian Fund for Innovation, and Canada's National Science and Engineering Research Council (NSERC).

Although research findings are still preliminary, Fortier shared some preliminary insights. Contrary to initial expectation, the researchers found clear evidence that CO₂ is drawn down from the atmosphere into the ice in winter, to the extent that 12 million square kilometres of sea ice absorbs as much carbon as the Kyoto Protocol would remove from the atmosphere. The team has also documented a “slump” at the edge of the Continental Shelf, suggesting a massive slide of underwater sediment at some point in the past. But he said one of the most important discoveries has been the realization that universities and federal government departments can form win-win partnerships to support world-class studies of a changing Arctic Ocean.

Martin Fortier, ArcticNet

Dr. Martin Fortier gave an overview of ArcticNet (www.arcticnet.ulaval.ca), the first network of centres of excellence ever set up for the Canadian Arctic. The methodology integrates natural, human health, and social concerns and ensures that Inuit communities play a major role in the research. Whereas CASES looks at how the Arctic is changing, ArcticNet, of which Fortier is executive director, seeks to understand the impacts on Arctic communities and society.

Fortier noted that much of the unique metafauna in the Arctic is very fragile, and highly dependent on sea ice. He said changes in migration routes due to climate change will have a serious impact on the culture and health of Inuit communities, while loss of sea ice will raise issues of Canadian sovereignty, militarization of the Arctic, and opening up of the Northwest Passage.

“Major globalization” is also affecting the northern environment, Fortier said, with satellite dishes on every roof, high-speed Internet in many homes, and Wal-Mart on the ground in Inuvik and Whitehorse.

ArcticNet's most significant infrastructure is the CCGS *Amundsen*, a ship that has been outfitted as a clinic and staffed with nurses and Inuit interpreters. The team has just completed a health study in the 14 communities of Nunavik, in northern Québec, involving more than 1,000 Inuit.

A key objective of ArcticNet is to fund existing research centres in the natural, health, and social sciences in a way that enables them to work more closely together on issues that cross scientific disciplines. The initiative has also been able to secure funding for a relatively long period of seven years, and hopes to renew its grant for another 14—a longevity that is unusual for government-funded research, but absolutely essential support the observatories, relationships, and networks required to understand global change.

ArcticNet serves as an umbrella for 150 researchers working on 24 projects, including 90 Canadians from 23 universities and five federal government departments. Key objectives are to build synergies among Canadian and international researchers, involve northern communities and Inuit organizations alongside industry and government scientists, help train the next generation of northern researchers—many of them northerners themselves—and generate practical policy insights that will support the process of adapting to climate change in the Arctic.

The program is focusing on four interlinked themes, each with five or six funded projects:

- ? Differences in climate change and warming along an east-west gradient
- ? Impacts on coastal ecology, tundra, communities, and water supply along a mostly north-south gradient
- ? Impacts on Hudson Bay
- ? Integrating knowledge and developing policy to support effective adaptation to climate change.

In the Inuit Health Survey, flying teams of nurses visited communities in advance of the *Amundsen*'s arrival, then invited local residents to visit the ship when it arrived. More than 1,000 Inuit took part in nutritional interviews, received mammograms that are unavailable anywhere else in Nunavik, and provided blood samples for a variety of tests. Fortier said the approach reflects ArcticNet's commitment to educating northerners and integrating them in the research process.

“Every opportunity we have, we visit all the communities we can,” he stressed. “It is very important for them to know what’s happening on this ship they’ve been seeing for years, and to explain to them the science and the ecosystem they live in.”

Sloan stressed the importance of long-term, stable funding. At a time when northern science research funding has been eroding, she said ArcticNet's expected longevity is “sending a very important signal to some of those younger researchers that maybe there will be funding around when they want to do their PhDs and maybe get a job in the field.” She also stressed the “human face” of any research that takes place in the north.

Ian Stirling, Canadian Wildlife Service

Dr. Ian Stirling of the Canadian Wildlife Service stressed the value of a long-term database in tracking the impact of climate change on polar bears and seals in Hudson Bay and the High Arctic. “We would not have been able to do this work if we hadn't been able to stay in the same place doing some of the same things for close to 30 years,” he said. “The long time frame for ArcticNet is terribly important.”

Based on that research, Stirling said climate change will have a particular impact on species at the top of the food chain that depend on the ice. “Influences multiply as they work their way up

the ecosystem,” from microbes to polar bears, and “looking at the bears and seals can tell us very important things that are going on in the system that we’re actually not able to measure over the short term.”

Dr. Stirling described two broad approaches to research with bears. The first is to conduct cross-sectional samples of the entire population to track changes over time. The second is to tag individual animals to monitor their health over time, and fit them with radio collars to track their movements and activities. Research shows that polar bears do almost all their hunting on the ice and count on a diet of ring seals for the fat they need to survive—over time, the populations have increased and declined in tandem. When the seal population went into decline in the 1970s, then again in the 1980s, due to unusually heavy ice, the survival of polar bear cubs dropped immediately.

Much of the Wildlife Service’s long-term work with bears has been concentrated in Hudson Bay, along the north shore of Manitoba and Ontario, where adult bears live off their fat for long periods. Monitoring has demonstrated a decline in the condition of adults, particularly females, accompanied by dependent cubs, a change that Stirling attributed to the following:

- ? Earlier break-up of the sea ice, due to spring temperature increases of 0.3 to 0.4°C per decade over the past 50 years, leaving the bears with less time to hunt and store fat;
- ? A serious decline in the ring seal population, concurrent with a doubling in harvest seal numbers over the past decade; and
- ? A rapid reduction in the proportion of cod among fish stocks, from 40% in the mid-1980s to 15% in the mid-1990s.

Warmer temperatures also bring warm weather and rain that can collapse dens that have been in use for 150 or 200 years, killing the female bears and their cubs. One year, at a time when the temperature should be been -30°C, an early April rainstorm wiped out all the seal lairs. And forest fires linked to warmer temperatures in Hudson Bay have burned critical bear habitat. Early ice break-up also leads to more problem bears in areas populated by humans, since they have less fat to make it through the fall.

Questions and comments

A participant asked whether climate change can be reversed or slowed down. Stirling replied that carbon dioxide emissions would have to be curbed by 60-80%—compared to the 10% envisioned by Kyoto—just to stabilize greenhouse gases at current levels. He said projects like ArcticNet and CASES help communities anticipate and adapt to future impacts, positive as well as negative.

An attendee asked whether there is any evidence that polar bears are moving toward the High Arctic, where ice lasts longer. Stirling said more northerly areas are already full of bears, but there may be some short-term improvements in bear and seal habitats and productivity in the northern reaches of the Arctic Basin. Over the next 100 years, he said some computer models suggest seasonal loss of sea ice, a scenario that would probably enable some of the larger Arctic mammals to survive. The outcome is less certain in models that call for the ice to disappear

altogether. “In general, there are not very many places for bears to go,” and the pace of climate change is so fast that bears will be unable to evolve.

A participant asked whether there is any disagreement among Arctic scientists on the source of atmospheric carbon dioxide. Louis Fortier said it’s easy to distinguish natural from anthropogenic sources of CO₂, and noted that the vast majority of scientists agree that greenhouse gas emissions are linked to global warming.

“The debate is between the skeptical and the concerned,” he explained. “The skeptical, who are often paid by the oil and gas industry or the auto industry, will claim there’s no obvious link.” He acknowledged that the most sophisticated computer models are still unable to capture the full complexity of global climate systems. Martin Fortier noted that Reykjavik would be hosting a conference (www.acia.uaf.edu/pages/symposium.html) in November to review results of the Arctic Climate Impact Assessment (ACIA), an initiative that involved 600 of the world’s top scientists.

Based on earlier discussion of climate-related changes in fish stocks, a participant asked whether the Arctic cod fishery could be commercialized. Louis Fortier said the fish is very small, no more than 27 to 38 centimetres in length, and very narrow. It is pleasant in sushi and can be exploited for fish oil or fishmeal, but has no other commercial value. The good news for fisheries, he said, is that the gradual retreat of sea ice could create a more hospitable environment for more lucrative Atlantic cod stocks. But in that event, “if you’re a seal, your life is on a thread.

Terry Prowse, National Water Research Institute, Environment Canada

Terry Prowse, Project Chief with the Aquatic Ecosystem Impacts Research Branch of Environment Canada’s National Water Research Institute (NWRI), gave a rapid-fire overview of 10 of the key findings of the ACIA. The 1,800-page report reached a number of conclusions:

- ? The Arctic climate is already warming rapidly, and much larger changes are projected. The largest increases, in the range of 4°C, will occur in winter. The trend will be uneven across the Arctic, but the rate of warming will be twice to three times the global average, five to 10 times in some parts of the region. There is already evidence that glaciers are melting (especially in Alaska), sea ice is decreasing by 3% per decade, and snow seasons in the northern hemisphere are 5-10% shorter.
- ? While land areas are expected to warm by 3-5°C by the end of the century, oceans will warm by 7°C. Projections for winter seasons call for a 4-7°C increase over land, 7-10°C over water, with the loss of sea ice leading to localized warming and hot spots around the circumpolar edge of the Arctic Ocean.
- ? Precipitation will increase by about 20%, 30% in autumn and winter, although there is less confidence in the precipitation estimates. Snow cover will decline 20%.
- ? Arctic warming will have worldwide consequences. Increased glacial melt will add more freshwater to the oceans, raise sea levels, and possibly slow ocean currents that carry heat from the Equator through the North Atlantic to the Arctic system. Western Europe relies on these currents for warmth, and for much of its precipitation.

- ? Shifts in Arctic vegetation zones will bring wide-ranging impacts. Tree lines will shift, forests will replace a significant fraction of the Arctic tundra, tundra vegetation will move into polar deserts, and while the additional vegetation will increase the region's capacity as a carbon sink, it will likely absorb enough additional solar radiation to offset any positive impact on carbon levels.
- ? The diversity, ranges, and distribution of animal species will change. Marine habitats for bears, seals, and some sea birds will shrink drastically, driving some species to extinction. Caribou migrations will be affected by changing precipitation, river, and snow pack conditions.
- ? Coastal communities and facilities will be more vulnerable to extreme weather and can expect increased erosion, higher waves, and more frequent storm surges, particularly in Alaska, northwest Canada, and Russia.
- ? The retreat of sea ice will likely increase marine transportation and make Arctic resources more accessible. The Northwest Passage is 45% shorter for shippers than the Suez route, and the navigation year in the Passage is expected to increase from 20-30 days today to 90-100 days by 2080—possibly by mid-century, according to one model.
- ? Thawing permafrost will disrupt Arctic transportation, buildings, and other infrastructure, including ice roads and mine tailing ponds.
- ? Indigenous communities will face major economic and cultural impacts due to changes in species range, perceived differences in travel safety, and other challenges to human health, food security, and cultural survival.
- ? Stratospheric impacts of climate change could lead to elevated ultraviolet radiation, with corresponding impacts on people and animals.
- ? Multiple influences in different regions will interact to affect Arctic people and ecosystems. A unique aspect of the ACIA is its focus on four Arctic sub regions, to determine the most important climate-related stresses and how they affect one another.

Derek Muir, National Water Research Institute, Environment Canada.

NWRI Research Scientist Dr. Derek Muir described some of the newer contaminants that are beginning to show up in Arctic ecosystems. The past five to 10 years have seen the adoption of an international protocol to ban the established Persistent Organic Pollutants (POPs), the so-called “Dirty Dozen,” but Muir said the more fundamental issue is the use of chemicals in industrial society and “the fact that global circulation will bring certain types of chemicals with certain properties to the Arctic.”

Muir focused his presentation on “two groups of chemicals which you’re wearing and sitting on,” brominated flame-retardants and fluorinated stain repellents. The chemicals evaporate from seat cushions, clothing, and carpets before moving north in gaseous form, and may also be carried in dust. Like polychlorinated biphenyls (PCBs) before them, the new contaminants enter the food chain through snow and melt water, and possibly through gas exchange when contaminated air passes over a colder body of water. Once they enter the food chain, the substances concentrate as they move up from Arctic cod to ring seals to bears to humans.

Historically, most contaminant modelling focused on PCBs, Muir said. Communities have

played a significant role, with Inuit hunters taking sampling kits out to test concentrations in seals and beluga whales. Recent tests have revealed high concentrations of a class of brominated compounds, PBDEs, in two Canadian locations—the Alert radar base, and the community of Tagish, near Whitehorse. While Muir attributed most of the increase to long-range transport, he said there is also serious concern over burning of waste in small, northern communities with no recycling programs. Elsewhere in the region, PBDEs have been found in Greenland, northern Norway, and three locations in Russia.

PBDE concentrations may be low, but Muir said the time trends are critical—an upward trend means concentrations will eventually raise concerns in the absence of regulatory action. In the past 20 years, PBDE levels have increased eight-fold in beluga whales in the Eastern Arctic, nine-fold in western ring seals, and three-fold in seabird eggs. In Nunavik, human concentrations have tripled in the past decade, although—contrary to the experience with PCBs—human PBDE exposure is a bigger problem in southern Canada than in the North.

A second new category of contaminants consists of a series of fluorinated alcohols that are used in stain repellent, shampoo, cosmetics, paint, batteries, and electronics. The actual product is used as a polymer, and is quite stable. But a proportion of that polymer material is highly volatile and can degrade, for example, when a carpet is cleaned. Muir said the U.S. Environmental Protection Agency is currently investigating the potential for atmospheric degradation and any resulting impacts, but the relevant byproducts have been found in high levels in polar bears in Hudson Bay and eastern Greenland. “Essentially, the bears are telling us something about sources, and also that they’re efficiently transferred through the food web,” he said.

Across the board, Muir said archival samples dating back to 1972 have made a huge contribution to present-day analysis. He stressed that the Arctic region is an important indicator for the persistence and bioaccumulation of POPs, and reminded participants of the many other contaminants that have simply not been measured yet.

Marianne Douglas, University of Toronto

Dr. Marianne Douglas, Professor of Geology at the University of Toronto, explained the role of paleoecology in tracing global change that occurred before humanity began gathering data about 50 years ago. “We want to know when it started, whether it was when people started telling us or whether it happened imperceptibly before that,” she said. As a micropaleontologist, she uses gradual changes in the size, shape, and ornamentation of microfossils as an indicator of environmental conditions when those fossils lived and died.

Concerns about Arctic warming are paralleled in the Antarctic region, Douglas said. A high degree of warming has already occurred, with the result that pieces of the ice shelf the size of Rhode Island or Prince Edward Island are breaking off and being carried away. The fossil record suggests that similar changes may have occurred in the past.

The fossil record and past chemical concentrations can also be used to draw inferences about human settlement patterns. Douglas described a shallow pond on Somerset Island with water

chemistry consistent with a successful Thule hunting settlement between about 1200 and 1600 AD. Researchers found the remains of 125 bowheads, and the unique nutrients associated with whale meat are still gradually leaching into the watershed.

Douglas noted that International Polar Year occurs about twice each century, and typically leads to major international collaboration. In 1961, IPY culminated in the drafting of the Antarctic Treaty (which Canada has signed but not yet ratified). With a focus on humans and their environment, she said the next International Polar Year in 2007/2008 will present an opportunity for Canada to renew and expand its commitment to southern areas, especially Antarctica.

Questions and comments

A participant asked about links between climate change and Arctic contaminants. Muir said higher temperatures and increased rainfall increase heavy metal concentrations. He also cited growing evidence that mercury concentrations are on the rise in key animal species, although the link to climate change has not been established. In reply to another question, he said organic pollutants do degrade, but the problem is what they degrade into: Until recently, manufacturers haven't recognized that those secondary substances are persistent and bioaccumulative, and are getting into the environment.

An attendee asked Muir for data on the actual toxicity of the substance he had discussed. Muir said the question fell outside his specialty but noted that the persistence of some substances, one of which had been referred to as “molecular rebar,” had been deemed sufficient to justify regulatory action. That process is being driven by chemists until the toxicology catches up, as was the case with PCBs.

Another audience member asked Muir whether he was suggesting that substances be banned before all the toxicology is in. Muir said there is already consensus within the Canadian government that the fluorinated products he'd described must be removed from the environment, based on persistence and bioaccumulation. “I don't say it's a black-and-white government policy, but it's an emerging consensus within the regulatory community in Canada that they will act if it's present. They're using the precautionary principle to say that if it has certain characteristics, we can't wait for all the scientific data to come in.”

A participant said she was “stunned” that Canada had not yet ratified the Antarctic Treaty and asked what writers can do to advocate for faster action. Douglas said the main issue is resources. As a signatory, a country must claim a sector of interest in Antarctica, establish a scientific research base, or lead a major sector expedition. Citing Bulgaria as a country that has done creative work in this area on a shoestring budget, she expressed concern about the level of circumpolar awareness among southern Canadians. “Many people aren't as aware of how Arctic we really are,” she said. “That's the first way to hit home that this is really Canada.”

Muir said the POPs Convention has brought a new focus to Arctic research, since one characteristic of a persistent pollutant is its presence in a remote area. “So in a way, the urgency is a little different. We've got a situation where we can use information if we can generate it

quickly enough to push regulatory decisions.” The government is placing greater emphasis on remote and especially northern data to drive the evaluation of the next generation of POPs, and the UN Environment Program (UNEP) is also looking at candidate POPs.

Kraft Sloan said Canada made a great contribution to the POPs process, as did indigenous peoples’ organizations. “It’s when you can provide a human face for some of these problems and talk about how it affects their daily lives.”

Transportation Research: Social Sciences in Real Life

Do people reduce risky behaviour when they perceive that the consequences of such behaviour will be worse than the benefits? Or do they strive to keep their risk level constant by compensating with safety measures designed to reduce the negative consequences of risky behaviour? These questions were hotly debated between two panellists, while a third discussed his research on adolescents and risky driving behaviour.

Gerald Wilde, Professor of Psychology, Queen’s University, Kingston, Canada

Gerald Wilde began by presenting his Risk Homeostasis Theory (RHT). Wilde, a risk researcher since 1968 and author of *Target Risk*, proposed that people do not try to minimize risk but, rather, to optimize it. Wilde’s RHT rests on the premise that the amount of risk one encounters depends on how much risk one is willing to take. Essentially, less perceived danger results in less cautious behaviour.

Wilde used seat belts as the first of several examples of how RHT operates. According to Wilde, when seat belt legislation was initiated in certain countries in the 1970s, those countries with seat belt laws had a smaller decline in accidents than countries that had no such laws. His explanation is that since people felt that seat belts provided safety when they drove, they were more comfortable driving more recklessly, which resulted in more accidents. The safety provided by the seat belts was effectively cancelled out by the fact that people drove more recklessly.

Wilde also cited was a Swedish study that showed that adolescents with driver training were more at risk for accidents than those without training. It was thought that this occurred because adolescents with training were given more freedom by their parents—who felt more comfortable with their driving abilities—and subsequently drove more frequently and perhaps in situations that increased their vulnerability to accidents, for example at night.

Wilde used these examples not only to explain RHT, but also to assert that legislation is not the best way to reduce risky behaviour. His alternative to imposed laws is safety incentives. According to a study conducted at a German automobile company, when supervisors promised bonuses to employees who were accident-free for six months, a benefit-cost ratio of 2:1 was observed. Furthermore, lost workdays decreased by 50% to 80%, company morale improved, and turnover rates decreased. According to Wilde, safety incentives are effective because people

are given a future that they look forward to. He contended that society could reduce risk, and benefit tremendously, if safety incentives were awarded for desirable behaviours.

Barry Pless, Director of Developmental and Epidemiologic Research, Montréal Children's Hospital, Canada

Wilde's self-identified adversary, Barry Pless, gave a passionate rebuttal to Wilde's proposed theory. Pless emphasized that RHT is an unproven theory. Injuries, most of which are preventable, are the leading cause of death in people 45 years and younger. Pless suggested that there are two primary dangers inherent in RHT. First, interest groups often used RHT to oppose safety legislation. (Pless admitted he was an advocate for tough safety legislation.) Second, RHT may inhibit injury research, which obviously could have a negative impact on reducing injuries and deaths due to accidents.

Pless asserted that much of the data in Wilde's book *Target Risk* was not peer reviewed and that RHT had yet to be scientifically tested. He is also dissatisfied with the insufficient interpretation of studies and with the unequal weight given to road safety injuries, which make up a small subset of total injuries.

After critiquing the fundamentals of Wilde's theory and book, Pless offered statistical data to disprove some of Wilde's assertions regarding injuries. In *Target Risk* Wilde said that, while deaths-per-kilometre driven had decreased in the past few decades, motor vehicle injuries per capita had actually risen. Pless countered with statistics showing that motor vehicle deaths per capita in the United States had decreased by approximately 8% since 1950. He attributed this drop to the implementation of seat belt laws in many places in the U.S. He added that there was a 47% decline in poison-related injuries among children under 19 over the past few decades. Like the decline in motor vehicle injuries, the decline in poisoning injuries was attributed to the implementation of safety laws—specifically to clearly labelled packaging for poisonous substances.

Pless asserted that a lack of legislated safety measures increases risk and negative consequences for society. He did allow for the possibility that there is a small subpopulation of RHT people, but concluded that he did not know how large a segment of the population would belong to this category. He urged Wilde to gather more evidence for his theory in scientifically conducted, peer reviewed studies, and to subject RHT to rigorous scientific testing to prove or disprove its existence.

Pierro Hirsch, PhD Candidate in Public Health, University of Montréal

Pierro Hirsch shifted the focus of the session somewhat by offering the audience his insights into adolescent risk taking. Hirsch's research focuses on adolescent drivers to determine if factors exist that can serve as indicators of risky driving and the potential for accidents. One such factor

seems to be failing a driving theory test. Two current solutions to reduce the number of accidents are to reduce distractions driving and to require longer driver training periods before awarding driving licenses. The first solution is typically applied by reducing exposure to alcohol, reducing exposure to distractions (such as cell phones and multiple passengers), or by reducing demanding conditions (such as night time driving). The major drawback to this solution is that it is difficult to determine whether to apply such restrictions to all drivers or not. The second solution has been supported by a Swedish study in which the minimum age for obtaining a driving permit was reduced from 17 to 16. This resulted in an extra year (and 120 hours) of driving practice before a license was awarded. Hirsch was quick to point out that 120 hours was determined to be a threshold level. An increase in training hours of fewer than 120 hours still resulted in an increase in accidents.

Hirsch proposed a third solution, which he calls the “3-flag screening procedure,” that is supported by statistics that demonstrate the chances of a 17-year old male having an injury-inducing accident are twice as high for those who fail their first driving theory test as those who don’t. Hirsch considers these “3 flags” (being 17 years old, male, and failing a first driving theory test) as so indicative of potential accidents that he supported refusing to license adolescents who had these three indicators. He advocates studying this small subgroup to refine our understanding of what makes this subgroup greater risk takers than other subgroups.

Questions and comments

Because of the lengthy debate between Wilde and Pless, the question and answer period was relatively short. One session participant stated that it seemed “common sense” for people to adjust their risky behaviour according to their perceived safety, and asked Pless to clarify his position on the matter. Pless responded by saying that risk perception and behaviour cancel each other out. The bigger issue he had intended to address was that major safety initiatives result in higher levels of safety. One audience member noted that Europe had both tougher driving tests and higher speed limits and wondered if the two cancelled each other out in terms of safety outcomes. Hirsch said it was hard to say country by country because there could be many confounding factors.

Good Science, Good Radio

Moderator: Pat Senson

Moderator Pat Senson explained that the four panellists would introduce themselves and that the session would continue as a round table discussion.

Bob McDonald, Host, Quirks and Quarks, CBC Radio, Toronto, Canada

Bob McDonald said that, compared to TV, he finds that radio has “more colourful pictures.” On his show, he’s been inside a black hole, and at both the beginning and the end of the universe.

Depicting these things on TV would be very expensive. *Quirks and Quarks* uses language that people can understand and humour to convey information.

Yanick Villedieu, Host, Les années-lumières, Radio-Canada, Montréal, Canada

Yanick Villedieu described *Les Années lumière*, which he's hosted for 20 years, as the French version of *Quirks and Quarks*. They see their work more as journalism than popularization. "That doesn't mean that we don't explain things. But we want to write news." They produce stories about visionaries in a variety of formats—reports, interviews, and reactions. "We all think as journalists, and science journalists aren't the only ones doing these stories. Everyone can talk about stories that have a scientific dimension."

Matteo Merzagora, Journalist, SCIRAB (Science in Radio Broadcasting), Paris, France

Matteo Merzagora works with a network of European science radio programs called SCIRAB that is based in France. They produce a daily half hour program. When the network started there was little communication between science radio practitioners. The idea behind the project was to set up a network, and map and interview 70 different programs across Europe. SCIRAB has been behind academic research, seminars, and meetings. For the first time, people doing the same job are meeting. The future will bring collaboration that is more practical.

Deborah Cohen, Editor, BBC Radio Science Unit, London, United Kingdom.

Deborah Cohen works as the editor of BBC's science shows. The BBC produces a great range of programs for the world service and for weekly programming including magazines, documentaries, live broadcasts, and phone-in shows. She said that BBC producers recognize that people have to make time to listen to the radio. "These are linear programs, so you have to catch all of them to really get it." The BBC shows use recognizable voices from walks of life outside the sciences, or from unrelated fields to get their listeners' attention.

Questions from the moderator

The moderator started the discussion by asking, "What science makes good radio?"

McDonald answered, "Any science! We need good stories. We don't have images, but with radio you can capture the emotion of an event."

Villedieu agreed that there are no bad subjects (except perhaps 3D software programs, which are intrinsically visual). Many stories need eyewitness accounts. Often people working in science are

not used to media. With radio, it's easier to capture emotion, lightness, and rapidity. It is easier to get people who are fantastic storytellers, like Carlo Rubia, the Nobel Laureate.

Merzagora added that some elements of science are better captured in cafeteria conversations taking place between scientists working in different domains.

Cohen disagreed. "There's a lot you don't want to do." There are things that are too difficult to explain, such as chemistry, physics, and immunology. The BBC shows focus more on science as it relates to daily life: new medical procedures, drugs, earthquakes, and volcanoes.

Merzagora disagreed with this stance. It's not always a matter of offering an explanation, he pointed out. A radio show can ask why a scientist does a particular kind of study.

McDonald gave as an example an interview he did on Fermat's Last Theorem, which is high mathematics that would have taken an hour and a half to explain. He focused on what the problem was, how it was solved, and what that meant. "It is the science journalist's job to get past the complexity."

Villedieu described sitting in science conferences and allowing himself to be flooded with information, until he found a simple question—a "Why" question or a controversy. He deals with the surface of the science, not the depths that scientists understand. "What does this mean? What is new here? What is changing in perceptions?"

Cohen conceded that "in some cases, you're explaining why, and in other cases, what. I would still argue that there would be some subjects you've never touched."

The moderator asked how presenting science has changed.

Cohen has found that "We spend less time defining terms." The style now is less formal, and there are shorter scripts.

"Has the story range expanded?" asked the moderator.

Cohen concurred. "You never know what's going to come around the corner."

Merzagora added that the definition of authority has changed. "You can't just introduce someone as an expert. Anyone taking a position must explain who he or she is."

Said Villedieu, "Nothing has changed, except that what was outlandish in '88 or '89 is no longer outlandish. For more than 40 years, we've been covering controversies. But now there are more science stories in the news, stories that touch us or make us dream."

MacDonald noted that the audiences' level of education has increased. This "keeps us on our toes," he said. "There's a new distrust of science, people are questioning the safety of some science, like GMOs."

The moderator then asked how sound could be used well—or badly.

“Sound is a journey that will take you to another place.” Ambient sound and music may fuse science and art, said MacDonald, but “sometimes all you need is a person talking with passion.” Villedieu agreed that the human voice is the principle subject.

The moderator pointed out that a radio show couldn’t be made up of interview clips alone. Cohen agreed with MacDonald and Villedieu, commenting that it is important not to use aural clichés, like the rattle of a keyboard to signify computers.

Macdonald described producing a show on a neutrino’s flight path through the earth. He worked with a music composer and had an actor read a passage from *Journey to the Centre of the Earth*.

When interviewing on location, incidental environmental sounds can pose problems, Cohensaid, but it’s important to get those sound clips.

Merzagora referred to the effectiveness of incidental sounds, like the sound of a coffee cup set in a saucer. For an interview conducted in the largest particle accelerator in the world, the echoes caught on tape perfectly illustrated the scale of the space.

The moderator asked the panellists for advice to radio shows in the developing world.

Cohen said that the BBC is keen to get stories for their world service. Merzagora’s advice was to get interviews with the researchers who can describe their work in an engaging way. Villedieu pointed out that radio shows can be produced very economically. MacDonald added that his producers are open to ideas from freelancers in other countries.

Nurat Dalila Miquidade, host of Radio Mozambique was invited to speak.

Miquidade made the point that the challenge for a radio personality is to find a way to describe how science works. Apart from the challenges of producing good content, her station has to adapt to local languages, and sometimes has to make do with materials that are not the best. “In Mozambique, we have a different reality. We don’t have real science journalists, we have a group of journalists, like myself, who study science.”

Questions from the floor

An audience member asked MacDonald about his use of humour on *Quirks and Quarks*. MacDonald answered that humour is best used in restraint. “Not all science is funny.” Cohen added that BBC shows use humour. Some hosts are chosen for their ability to make use of humorous references to pop culture.

An audience member said he was impressed with the longevity of the panellists’ shows.

Macdonald explained that *Quirks and Quarks* has survived because it’s produced by a small unit,

has won many awards, and has consistently high ratings. So even if the higher-ups don't understand the success of the show, they have no reason to interfere with it. Villedieu said that his show was part of a 50-year tradition in Québec, where public radio is a vocation. BBC shows are always changing, said Cohen "We want to do what the commercial stations don't."

Another member of the audience asked if listeners were members of the general public, or a highly educated group. "Is radio threatened by other media?"

"This is one of the questions we are asking," responded Merzagora. "Almost no one knows who the audience is." He feels that "radio is the only media not threatened by others."

An audience member from Mexico said that in Mexico there are only pop stations. How, she asked, can science be integrated in a pop format?

Merzagora pointed out that he works in commercial radio. MacDonald said that the CBC listeners come from all age groups and walks of life. The BBC, Cohen added, has produced 45-second pieces and public information campaigns that make it into the mainstream.

Society's Challenges from Emerging Science

Moderator: Kathryn O'Hara

"Journalists have important roles in helping society make up their minds about emerging science." With that statement, Moderator Kathryn O'Hara set the tone for Society's Challenges from Emerging Science.

Pat Mooney, Executive Director, ETC Group, Ottawa, Canada

Pat Mooney began by giving a brief history of his work over the past 30 years. Mooney's focus has been on biotechnology and its effects on poor, rural people, primarily in developing countries. His current campaign focuses on banning nanotechnology until safer materials are available. Mooney compared the "theology of liberation" of 30 years ago, when many people were interested in the ethics of development, with today's philosophy that sees most people interested in "liberation technology" which relies on technology to solve the world's social problems. As Mooney described it, this focus on technology as a "fix-all" has resulted in less critical thinking and changes within social policies. Mooney disagrees with this philosophy and claims that science and technology should always be viewed in the context of policy because the implications of both often have drastic impacts on societies. If they are not viewed in the context of policy, undesirable consequences are often borne by the rural poor of the developing world.

Mooney's organization, ETC, is not opposed to technology, but wants to see it regulated so that adverse affects on poor rural people are minimized. He explained that any new technology that is introduced into an unjust society will increase the gap between rich and poor. Given the number of unjust societies, it means that almost all new technology will disfavour the poor. As Mooney

put it, “New technology cannot solve old injustices.” The elite of a society cannot be expected to see the risks that technology poses to the poor. The public needs to be interested in a social debate about new technology from the beginning if injustice is to be avoided. This is particularly true in the case of nanotechnology because of its extraordinary potential, for example, to provide solar power and clean water to developing countries.

Mooney expressed grave concerns over what he termed “a wild west in patenting” that is currently occurring with nanotechnology. He noted that several elements in the periodic table had already been patented, and that this sort of patent power could have deleterious effects on both human health and on the livelihoods of rural people in developing countries. While governments and nanotechnology companies claim to be avoiding the pitfalls encountered with biotechnology, Mooney asserts that he sees many of the same problems arising with nanotechnology. For instance, the discussion with biotechnology revolved primarily around environmental and health risks instead of who owned the technology. These same issues are being raised with the current development of nanotechnology. During the biotechnology debate, genetically modified organisms were available before regulatory schemes were in place. The same situation is happening with nanotechnologies appearing on the market without any regulation. Specifically, nanoparticles that have undergone no regulatory testing are present in foods, skin care products, and clothing in the United States and Canada.

While there is no way to tell if these nanoparticles are health hazards (because they have not been tested), there is no doubt that the presence of such nanotechnology will have deleterious effects on societies in developing countries. For example, The Gap has new stain-resistant pants that are coated with nanotechnology. Introducing this technology will dramatically decrease the demand for cotton thus negatively affecting families in 35 African countries that are dependant on cotton exports for their livelihoods. Similarly, nanotechnology is being developed to eliminate natural rubber. While it may have positive effects on the environment, the effects on communities that produce and export natural rubber in India, Indonesia, China, and Brazil will most certainly be negative. Mooney was quick to point out that his point is not that such technology shouldn't be developed, but that it should be regulated and that the people in developing countries who depend on the production of natural products that are replaced by nanotechnology should be alerted ahead of time so that they can prepare for it. Mooney stated his dissatisfaction at the lack of international regulatory boards for nanotechnology, and expressed his belief in such boards.

Paul Root Wolpe, Chief of Bioethics, National Aeronautics and Space Administration, United States

Paul Root Wolpe said that “...there is a gross underestimation of the profound changes that are going on with nanotechnology,” and offered participants an in-depth look at nanotechnology and its far ranging and primarily negative effects on self-conception and on human relationships. Audience members were treated to a collection of visual examples of genetic manipulation. From human ears being grown on the backs of mice to cloned cats, Wolpe illustrated support for his argument that such genetic manipulation is being done not just for scientific advances, but is being done for aesthetic pleasures. Sooner or later, one may be able to walk into a pet store (or a

doctor's office) and “design” a pet (or child) by choosing from a host of desirable characteristics. Wolpe expressed concerns over the ethics behind such manipulation, stating that, effectively, “Humans are becoming cyborgs!”

Wolpe described of the lengthening of fertility ages with reproductive technology. This has prompted an increase in the need for fertility drugs, serving as one example of the dangerous philosophy that guides much of nanotechnology development today. As he sees it, the baby boomer generation, which he belongs to, has “gotten everything they ever wanted in life and now they’ve decided they don’t want to die and they are going to do everything within their power to avoid doing so.” While his comment elicited laughter, he does not consider the subject a laughing matter. This philosophy is leading to an increasing dependence on “lifestyle drugs” and may, eventually, result in physicians becoming simply providers of drugs.

Wolpe is concerned that many people either don’t know about nanotechnologies or don’t understand them. He believes that, overall, the media has done an extremely poor job of relaying the realities of nanotechnologies. Stories in magazines and newspapers, and on the nightly news, tend to illustrate only the extreme viewpoints surrounding nanotechnology. The public is left in the dark about important details that reside in viewpoints that are more moderate. More importantly, people are not adequately prepared to make ethical decisions about the development of such technology. With gene manipulation, for example, society is faced with fundamental theological questions including, “When does life begin?” and “Which eggs are good and which are bad?” Essentially, nanotechnology is taking the role of God. Since the implications of allowing that to happen will be borne by society, society needs to be informed and involved in making decisions nanotechnology.

François de Closets, Science Journalist and Author, France

François de Closets discussed the changes science journalism has undergone in the past several decades. When de Closets began writing science in the 60s, society was keen to accept all scientific discoveries as progress. The 70s nuclear energy caused society to view technological advances as increasingly threatening. Currently, society seems less skeptical of technology than they were in the 70s. He contends that introducing new technology always causes some upheaval, but in the beginning stages of technology development, side effects and second and third generation effects are almost never considered. He cited safety cars of the 70s as an example, pointing out that while they made the road safer for those who owned them, it made the roads more dangerous for those who didn’t. Furthermore, the extra gas required to run these “safety vehicles” had negative effects on the environment and certain economic consequences. Because of the unforeseen effects that plague most technological advances, de Closets advocates responsible policies to regulate new technologies. He cautioned journalists against being swept up in the enthusiasm of new technology by lauding its merits without illustrating the negatives effects. To do this, writers must distance themselves far enough from the technology to see it in its entirety.

Questions and comments

O'Hara began the questioning by asking the three panellists if they felt that journalists had taken the time to cover these issues properly. Mooney believes that journalists have a spotty record, too often becoming fascinated with new technology without asking who controls it and whether there will be adverse effects.

One audience member pointed out that innovation could become stifled by fear of slow regulatory processes. Another asked the panellists for potential methodologies for achieving better citizen engagement. de Closets suggested that neither journalists nor the general public should rely on corporations or laboratories to tell the entire story about a scientific technology. He warned journalists against manipulation by scientists and/or corporations with specific agendas, and he cautioned against the tendency to conform to these agendas when reporting on science. Mooney gave an example of successful citizen engagement: the International Development Research Centre citizen jury, which involves farmers. He also cited non-consensus dialogues as a way of getting citizens involved. Wolpe advised journalists to resist the urge to assume that either the public knows the issues surrounding a piece of technology (and, subsequently, not reporting on the issue) or assuming that they don't know anything about it. As he sees it, the general public does hold values about scientific issues—even if the specifics aren't always correct—and the job of journalists is to relay correct information about the details to help citizens become knowledgeable and, thus, able to participate in decision-making processes.

The State of Science Journalism around the World

James Cornell, President, International Science Writers' Association, Tucson, United States

The goal of this session was to learn from each other how science journalism is done in different countries. Science journalists from six countries answered questions posed by the moderator and members of the audience.

Viola Egikova, President, Russian Association for Science Writers and Journalists, Moscow, Russia

In response to the first question, "What is the state of science journalism in your country?" Egikova said, "We are sometimes lucky with misfortune." She explained that science journalism in Russia had been difficult since 1990 when the former Soviet Union broke up and science research lost all government and industry support. However, during the past five to six years, the current government has started to show renewed interest in funding science and technology research. Still, she confessed that there are very few science communicators or new job opportunities.

Laura van Dam, President-Elect, National Association of Science Writers,

Cambridge, United States

Van Dam insisted that there is a plenitude of interest in science journalism programs at the university level in the U.S., but admitted that there are very few jobs in television, newspaper journalism, or radio. Still, she claimed there is a great need for science communication, which includes writing books, doing freelance writing for magazines and newspapers, and working in museums. Van Dam remarked that there is far more coverage of science by general journalists than by those who identify themselves as “science” journalists.

Pallab Ghosh, Science Correspondent, British Association of Science Writers, London, United Kingdom

Ghosh held that journalists in the U.K. take an aggressive and often adversarial approach to reporting. They are often suspicious of authority and, as a result, produce in-depth coverage of technological developments based on intense questioning of the scientist(s) involved. Science stories, Ghosh claimed, have moved from back burner issues to lead stores in the U.K.

Kenji Makino, President, Japanese Association of Science and Technology Journalists, Tokyo, Japan

In Japan, Makino noted that science journalists have not been organized as long as in some other countries and, because of this, it was difficult to estimate how many were out there. He described the situation in Japan as a “dynamic steady state,” where interest in science journalism—especially in young people—is increasing even though technologies have remained nearly the same for the past 10 years. He also indicated that while the public claims to want more information about science, their interest in listening to what science has to say has declined.

Each panellist estimated how many science journalists were in his or her respective country. Egikova estimated that there are roughly 300 in Russia; she attributed the low count to the departure of many journalists in the early 90s with the break up of the former Soviet Union. Freelancers are not common in Russia. The European Union of Science Journalists—headquartered in Hungary—has 2,500 members.

Istvan Palugyai, Vice President, European Union of Science Journalists Association, Nepszabadsag, Hungary

Palugyai added that freelancers are not common in Eastern Europe. In the United States and the United Kingdom there are 2400 and 1000, respectively, in formal associations. Both van Dam and Ghosh were quick to point out that in their countries, freelancing was common and that the number of journalists reporting on science is far greater than their estimates given that many do not identify themselves as “science” journalists. There are around 1,500 science journalists reporting in Japan. All panellists, as well as audience members, noted that all of these estimates may be confounded by the fact that many journalists do not identify themselves specifically as

scientific journalists, and by the fact that many journalists are not members of associations and, therefore, not included in the panel members' estimates.

Next, panel members discussed the role of science in the media. In Japan, where science journalism is on the rise, anywhere from 20 to 40 writers are on staff at national papers. These papers publish daily science profiles. In contrast, Ghosh claimed that science is integrated throughout radio, television, and newspapers in the U.K. but that there is not a strong division between science and non-science stories. Few American newspapers have special sections for science, and of those that do, many tend to focus on health and the environment. Magazines have increased the number of science stories they carry in relation to articles on social issues, because of the interest in new scientific technologies.

Questions and comments

Audience members were then asked where they get their story ideas. The answers were as varied as one might imagine. A member from Germany insisted that “science is out in the street!” and journalists don't need to go to specialized magazines (i.e. “agenda setters” such as *Nature* and *Science*) to find story ideas. A member from Barcelona claimed that the Internet helps her find new story ideas. A journalist from Columbia said that, historically, science news had been received from newswire services. However, this made readers feel that science was some weird thing that only happened in developed countries. Recently, there has been an effort to report on local science by looking inside the country for stories. Journalists from Uganda, India, and Egypt echoed the need for local reporting, especially in developing countries where scientific advances may be even less understood than they are in developed countries. Each agreed that science stories dealing with local issues were received better and were more useful for people in developing nations.

The process of becoming a science journalist varies from country to country. The U.S. has over 65 university science journalism programs that provide formal training in science reporting. In the U.K. it is common for general journalists to slip into scientific reporting. This seemed to be a trend in many countries. One audience member from Nigeria explained that he got into journalism initially by covering HIV stories, but soon felt as if he did not have enough of a science background to adequately cover these and other stories. He went back to school and obtained a science degree at MIT, but still he felt there was a disconnect between the public and what was being reported. Finally, he sought out formal training in scientific communication and he felt this was most helpful to his career as a science journalist. He stressed, however, that many journalists in Nigeria do not have such training and that this has resulted in what he sees as a gap between what is being reported and what the public understands.

Lastly, the panel considered whether or not scientists are afraid of journalists and, if so, how journalists deal with this. There was only time for two answers. The first came from Makino who believes that journalists should be coordinators between scientists and the public. He contended that scientists want their findings known to the public and that it is the journalist's job to provide accurate and understandable information. Secondly, a man from China pointed out that in China many scientists are forbidden to talk about their research, making coordination between scientists

and the public difficult. He also expressed the well known sentiment that scientists and journalists often don't know how to communicate with one another, making it difficult to relay scientific findings to the general public.

Writing from the Maelstrom

Moderator: Yanick Villedieu

Tamar Khan, Journalist, *Business Day*, South Africa

Tamar Khan discussed the challenges she faces in covering HIV/AIDS in her country and for her paper. A recently released report from South Africa's health department made a lead story, but only after significant debate with her editors. There is subtle, but overt political pressure on the South African media. She added that when journalists pursue stories that are subsequently trashed by editors, trust and relationships built with sources can be ruined overnight. This is exacerbated by the fact that journalists often work as individuals instead of as part of a team, which can lead to burnout and eventual self-censorship. Luckily, Khan noted, some of the pressure has eased with the government's provision of HIV/AIDS drugs. Now, people are more willing to talk and more coverage has been given to the issue.

There are also challenges in covering biotechnology in South Africa, said Khan. The definite effects of biotechnology on health and the environment are difficult to prove. Government reports underplay the risks, while critics overplay them. Furthermore, there are few independent experts and no tradition of consumer groups who might bring this debate to the fore. Unlike what she experienced in HIV/AIDS reporting, Khan noted that there is no outside political pressure to suppress biotechnology issues. "In all honesty the local media is almost indifferent to this topic."

She said that science coverage is often seen as peripheral, particularly in a newspaper where science literacy is low. "We have to educate our colleagues." She added that getting information for a balanced story has its own peculiar problems in South Africa since most scientific discoveries take place outside the country. South African experts are few and tend to be "fierce gatekeepers" reluctant to speak to reporters. Khan noted that the only people willing to speak are government opposition members and activists who have their own agenda. This can leave new, inexperienced journalists vulnerable to misinformation.

A delegate asked if Khan had seen the policies that forbid researchers from speaking of or disclosing information to reporters. Khan indicated that while she had not, she often receives letters from scientists asking her not to publicize any information because of university policy.

Matthieu Villiers, Editor in Chief, *Science et Vie*, France

Matthieu Villiers noted that writing from the maelstrom required knowledge of the "popular

current,” which may sometimes not be supported scientifically. Noting that for *Science et Vie*, science is defended as a method of thought, he added that scientific truth is different from non-scientific truth. Villiers remarked that the magazine has a moral contract with its readership to globalize science. Journalists are often at odds with the current trends in society, but he suggested that journalists also have an obligation to write against the current.

Villiers noted that *Science et Vie* is not a professorial journal yet it uses journalistic methods aimed at the general public to deliver the science message. Sometimes he admitted, the magazine has been wrong as in the case of homeopathy. The magazine sometimes pokes fun at some questionable sciences that are popular in mainstream culture, as they have done with astrology.

A delegate asked about the memory of water (i.e. homeopathic principle). Villiers indicated that *Science et Vie* was mistaken in this story; after considerable research the theory can't be substantiated. Another participant asked Villiers to elaborate about the contract with the magazine's readership. He replied that a magazine has the readers it deserves; it is a mutual knowledge sharing relationship. One delegate noted the clash of religion and science in Spain on such issues as stem cell research. How can rationality enter into religion? Villiers said that at his magazine there is a focus on rationality, religion is outside science, and belief is opposed to knowledge.

Barb Duckworth, Journalist, *The Western Producer Magazine*, Calgary, Canada

Barb Duckworth indicated that at the time of the BSE crisis, farmers didn't understand why this issue was important to them even though the impact would be devastating. Duckworth had to sort through many urban myths about BSE and verify information. Her magazine is careful to “sort through the urban BSE myths and to give all ideas equal time.” Duckworth added that the magazine calls diseases by their real name. She also cultivates relationships with scientists to better understand the issues.

Duckworth indicated that since the oil industry drives Calgary, few media outlets would tolerate inaccurate information about this important economic sector. “We forget, however, that agriculture is a serious economic engine, one that founded Alberta,” she said. As a result, editors and writers stumble around this topic. At her magazine, half the staff come from farms, said Duckworth, adding, “We know what questions to ask.” Duckworth noted, “We need to remember that science is a fluid framework, not a deity.” In this regard, she said that the magazine should have invited more articles from science and economics during the crisis. Still, “we cover this story every week and give facts and advice—our readers deserve no less.”

One participant asked how local and national media differ in their level of coverage. Duckworth's magazine tries to give very detailed information. The national media billed BSE as a big food-safety scare and, unfortunately, this was done with a lot of misunderstanding. The next participant wondered if Duckworth had written any articles on the origin of BSE. She indicated that she had done several, one in 1993, and one in 2000, covering the various theories of BSE origin.

Another delegate wondered about Canadian's trust in the food security system. Duckworth indicated that during the crisis, beef consumption rose by 5%, which was dramatically different from the U.S. experience. "Have you noticed a change in interest in agricultural reporting in the major papers?" asked one participant. Duckworth indicated she hadn't noticed this.

The next delegate asked Duckworth if Canada should follow Japan's lead in testing every animal. Duckworth replied that Japan's situation was troublesome with many recent food scandals. As a food-importing society, Japan is in a difficult spot.

Questions and comments

During the general discussion, one delegate asked the speakers if they were afraid of lawsuits from individuals or organizations. Villiers said that the magazine has had its share of lawsuits but has won all of them. Khan noted that South Africa is not a society that launches lawsuits and Duckworth indicated that her magazine had only had one lawsuit filed against it in 15 years.

In a discussion about balance, Duckworth noted that there had been considerable tension when a major communications company owned the magazine. This is no longer the case now that an investment company owns it. Villiers said that journalists are responsible for what they write. Another participant was curious about how much of the political pressure that face editors in South Africa stems from former apartheid. Khan indicated that this is more likely the manifestation of a new political reality. "We still have a culture in which when the Minister of Health speaks it gets on the front page." In returning to the point of journalistic balance, Villiers said that neutrality and impartiality is something to achieve someday. Khan indicated that "we do this on a case-by-case basis," adding that it is difficult to present a balanced story when there is a minority view on a big story. Balance might distort the debate in some cases. Duckworth added that at times it was difficult to stay balanced during the BSE crisis since her family farms beef.

The next delegate asked what pressures the speakers have felt if they are asked to make more of something than is deserved. Duckworth agreed that following the herd rather than leading it could be problematic. "We do get editor pressure, but we are aggressive journalists." Khan noted that her paper is serious, but likes controversy.

Another participant commented that groups of citizens and researchers in South Africa now sound the alarm and take a position if they don't agree with government. Khan added that the Health Department is defensive and difficult to penetrate due to fear and sheer incompetence. She said, "You are left to interpret information on your own or with an independent expert who is not as independent as you might think."

Asked about any outside pressure or obstacle that made writing more difficult, Duckworth noted that the biggest problem is time. "As a weekly, other papers always have the information out first even though we may have had the source first." "We are always behind the deadline and have a long mail period."

“How do we get people to want to know more when things are unsavoury?” asked another delegate. Duckworth replied that care is needed; there is always debate about the level of details. “We don’t run pictures of castration or other common agricultural practices anymore, for example.” Khan said that she is careful about assumptions she makes about her readers. When she assumed that readers were saturated with HIV/AIDS stories, she was proven wrong. The community is not static about what it wants either. Now, Khan noted that young women want to be named, something unthinkable earlier. Villiers talked about the debates within science and society. *Science et Vie* covers some of these debates and tries to write within these debates. Khan agreed that reporting on controversy is important but shouldn’t come at the expense of neglecting other important and interesting items.

Aboriginal Research—By, For and About

Moderator: John Medicine Horse Kelley (Clealls)

The moderator, John Medicine Horse Kelley (Clealls), began by saying “Our Elders know things about medicine. I am happy we are not being studied, but asked to share knowledge of 10,000 years or more.”

Eric Dewailly, Director, Centre of Inuit Health, Centre hospitalier universitaire de Québec, Québec, Canada

The moderator introduced Eric Dewailly as the Director of the Centre of Inuit Health, and one who has studied the impact of oceans on public health.

Dewailly’s presentation, “Research with Aboriginals, the Health of Inuit and Global Change” dealt with research done in Northern Canada, addressing the health of the Inuit.

Contaminants have been found in the arctic food chain since 1985, when studies were first made. The traditional diet, of which 20% to 40% is made up of sea mammals, is “a social glue.” As such, “Any work on Inuit diet has important implications and is a delicate issue.” The traditional diet is “basically the original Atkin’s diet.” No sugar or carbs are included, and 50% of the calories come from lipids.

Three metals have contaminated the food chain: mercury, cadmium, and lead. Lead has the most effect on fetuses. Mercury has been found in beluga meat, and mercury levels in Inuit have been found to be 7 ppm to 8 ppm, compared to the levels of 2 ppm to 3 ppm found in Cree.

The contamination of the food chain affects children’s attention span. A group of children have been monitored since the age of one; they will be turning five this year. It will be important, Dewailly noted, to monitor them as they start their school years.

Arctic char, which is low on the food chain and therefore has low levels of contamination, has been provided at no cost to pregnant women over the past year. This is in accord with the

decision of Inuit communities to encourage healthy eating.

The high levels of lead detected in children turned out to have been caused by the type of gunshot used to hunt fowl. Once the lead gunshot was banned, the lead levels dropped.

PCBs have had an effect on children's eyesight, and on the incidence of osteoporosis in adults. "Although the Stockholm Agreement made these pollutants illegal, they're still out there," he said. Still, the levels are dropping in Nunavik. But flame retardant chemicals are found to be increasing. "It's a tough pill to swallow. As one contaminant drops, another increases."

As the Inuit have been encountering more dietary problems, with increased sugar consumption, a sedentary lifestyle and the resulting obesity, the selenium and antioxidant found in traditional food is very important. Selenium, helps protect the cardiovascular system and lowers the incidence of colon and prostate cancer.

Omega 3 levels in the north are high at 15% (compared to 1% to 2%, in the general population) and are high in northern diets. This offers important health benefits. Even though the food chain has been contaminated, "When we discuss this with communities, we find the benefits outweigh the risks."

CCGS *Amundsen* has been travelling to communities involved with the study, which has involved 1,000 participants. Community youth have been active in the work, and have been getting training in research techniques.

Jeff Reading, Director, Canadian Institutes of Health Research–Institute of Aboriginal People's Health

Reading opened saying, "We have a national institution that focuses on indigenous health, and that has no comparison in the rest of the world."

Canada's indigenous population is "a diverse community of many different languages, spread over a wide area." It includes Inuit, First Nations, Métis, and urban Aboriginals. The context and scope of CIHR-supported research is broad, including Canada, Australia, New Zealand, and the U.S. Population patterns between indigenous and non-indigenous populations show that "third world conditions are nestled in developed, post colonial countries."

Diabetes is a problem for the population at large, "but rates are five to six times higher for Aboriginals." It also attacks Aboriginal people earlier in life." We used to say it was an adult disease, but now it is the disease of eight-year old Aboriginal children."

In Canada, smoking rates are highest among Aboriginal youths: three out of four Aboriginal youth smoke.

Treaties signed between communities and the Crown acknowledge "a special agreement

between” the two, and “special relationships with distinct peoples.” The Royal Commission on Aboriginal Peoples resulted in the Gathering Strength program, “a blueprint to improve life.”

“CIHR attempts to permit self determination in research.” It does this in part by respecting the OCAP protocol: Ownership, Control, Access, and Privacy.

The objective of CIHR is to make partnerships, build capacity, and fund emerging concerns. Over a five-year period, \$30 million will be invested in projects.

CIHR has developed agreements with Australia and Mexico. This cooperation will encourage growth and will promote an agenda that will address disparities among populations.

Reading concluded, saying, “The successful creation of the CIHR–AIPH is proof that a national health research program is technically feasible, scientifically valid, and politically appropriate.”

The moderator honoured the Elders, who kept the knowledge of medicines that might have been lost through colonization.

Pierre Haddad, Professor, Department of Pharmacology, Université de Montréal, Canada

Haddad explained that his research project, done in collaboration with the Cree of Eeyou Istchee (James Bay, Québec) studied plants traditionally used by the Cree to deal with the symptoms of diabetes, such as blurry eye sight, thirst, fatigue, etc. His goal was to identify plants with anti-diabetic potential. Haddad stressed that there was “continuous contact between the researchers and the Cree.”

An ethno-botanist held 23 interviews with elders in Mistissini, asking them to name plants that would provide relief from diabetes symptoms. An endocrinologist then ranked the 18 plants identified, by the frequency with which the elders identified them and by the importance of the symptoms they cured. The symptoms most specific to diabetes—foot sores for example—were ranked highest.

Extracts were prepared from the plants so that their active principles could be determined and to standardize the dosages that would be used in the research. Next, pharmacological studies were done to confirm which plants improved insulin secretion. The studies showed that the use of plant extracts did increase the uptake of glucose in muscle cells.

Once the results of the studies were compiled, the goal was “to find the most respectful and convenient way to return the information to the communities.” The information has been printed and will be distributed, along with plant samples, in Whapmagoostui.

Haddad stressed the ethical principles behind the research. “The first thing that drives us is human health. None of us (in the project) have connections with pharmacological companies.” The researchers tried to be respectful at all times. “We do make faux pas, but there is a good relationship of trust.” The project was designed to be transparent: results were presented at a

meeting of the General Assembly. Respect for traditional knowledge of plants and their habitats, and of the Cree culture was behind the project at all times.

Questions and comments

A freelance journalist asked if increased use of polar routes of aircraft have had an effect on health in the north. Dewailly replied that contamination is transported to the north by atmospheric currents from the south, and from industry and natural reservoirs such as the Great Lakes, not from local disturbances.

A freelancer asked Haddad who would retain intellectual property rights to the research results. Haddad replied that the Crees would have to have a share of any product developments resulting from the research. Reading added that ethical guidelines are being developed for this kind of research.

A journalist asked Haddad if he had a contract with the Cree communities, and whether he would go back and negotiate with the Crees if he were to develop the active ingredients in the plants studied. Haddad has, he said, a research agreement with the Crees and the research information will be kept confidential for five years.

A journalist from the *Toronto Star* asked why ownership and copyright issues are emerging in this case. Haddad replied that while plants cannot be patented, these issues might come up if an active principle is found.

A journalist from Argentina asked whether there were any anthropologists involved in the project. Two ethno-botanists studied the Crees' traditional uses of the plants

A journalist from CanWest News asked Haddad if the Crees would vet all publications. The Crees will have a month to consider any publication before it is published and they will indicate whether they agree with it, are impartial, or in disagreement.

When asked if he expected to publish his findings, Haddad said that he expects to in 2005.

How They Did It

Moderator: Tim Lougheed

**Jay Ingram, Host and Producer, The Daily Planet, Discovery Channel,
Toronto, Canada**

Ingram told participants that his career has been a series of flukes and chance opportunities. In offering some advice about “how he did it,” Ingram suggested having the ability to accept comment and criticism. “Your work will be better if you are open minded about comments and

are willing to share the credit.” He had a few more suggestions for science writers:

- ? Be as informed as possible. Ingram said he spent much of his spare time reading about science subjects. “It is critical to know about a diversity of science topics and how they relate to each other.” He added that there are only a few science journalists in Canada who can afford to specialize and that, generally, opportunities are greater for those who are better informed.
- ? Provide context. The context the public brings to any given science topic is negligible; in general, science literacy is low. Science writers have to supply the context. In television, this becomes an art with few lines to work with.
- ? Understand the medium. For example, one can create mind images of the big bang theory on radio whereas the same story doesn’t work as well on television. The eruption of Mt. St. Helens on the other hand is difficult to recreate on radio.

Ingram added that stumbling on a great story without keeping context and medium in mind is unrealistic. In conclusion, Ingram said that science journalism needs to take the next big step. “I have spent the past 20 years explaining science; I would now like to see the poetry in science—the artistic side that appeals to scientists—brought to the general public.

François de Closets, Science Journalist and Author, France

It is the journalist’s first mission is to distract—to get the science message across while entertaining, said de Closets. Questions need to be raised in the minds of the audience and the answers have to be interesting and clear, especially with topics that are not generally perceived as entertaining, such as physics. De Closets noted that with topics such as math and technology, half the readership is immediately lost, and the majority of those are women. Unfortunately, women still shy away from science careers.

In de Closets’ book about Einstein, he fictionalizes and humanizes his character amidst science. His attempt to break down science and explain it in quantum bits worked since the book was well received. De Closets noted that his lack of science training may have been an advantage. (He had a physicist verify the content.) Science journalists who are doomed to become science encyclopaedias—knowing something about everything—may not have this advantage. De Closets advocated academic review for accuracy, but certainly not for entertainment value—that is the author’s domain. Rereading and reviewing is a guarantee for journalistic success, but only in cases where there is a truth. The speaker illustrated his point with the stories on the Concord jet issues and the Hermes project.

De Closets cautioned the audience to maintain journalistic independence and not get too close to their sources or become contaminated by their milieu. Otherwise, science writers lose their skill, independence, knowledge, and impartiality. Journalists can never let their sources tell them what to do.

Robert Sawyer, Science Fiction Author, Toronto, Canada

Robert Sawyer suggested that the science fiction audience, unlike the public at large, is science literate. There is no need to explain Heisenberg's Uncertainty Principle. His book, *Calculating God*, opens with a lament on the McLaughlin Planetarium, which assumes that every visitor is an innocent newcomer. There is no acknowledgement of an accumulative audience. As this is even more so the case in science fiction, writers have to be extremely current. Sawyer, observed "that the science writer gives the most likely explanation for what is going on while the science fiction writer gives the most entertaining explanation that does not violate academic thought."

Unlike scientists, science fiction writers don't need to be wedded to one idea, but can write alternately from one or an opposing perspective. While scientists have to protect their positions, and author can track down anyone, even near "crackpots," to find an alternative explanation. Sawyer did just that for one of his books when he found someone who denied the theory that sleep is necessary for the consolidation of memory. "It is a pleasure to go to scientists to have them vet your work." Though he believes that science makes the world a better place, for an author the profit lies in anti-science writing, like that of Michael Crichton. Sawyer concluded by noting that science fiction is increasingly difficult to write as technology verges on the asymptotic. "There is no way to see where we are going."

Questions and comments

The moderator asked Ingram how easy the shift from radio to television was. Ingram noted that both media treat interviews and the transmission of the science message similarly. On television, however, "you have to become an actor," skilled in drama and comedy. When asked about book writing tips, Sawyer said "just do it; no one is waiting for your book." De Closets noted that the essential ingredients for a good book are a good author and an editor. Ingram added that the only way to know if it's a good book idea is to write it.

Following on Ingram's earlier comment of the poetry in biochemistry and microbiology, a delegate wondered about the existence of science video games. Ingram didn't know of any, adding that "a quick death for any video game is to have it look educational." However, biochemistry, which is rife with death, may be promising.

Another delegate suggested the idea that science is always right and scientists as artists seems incompatible. How would science be different in a world where scientists are artists as well? Only in an ideal world could this transpire, Sawyer said, where scientists could put aside career concerns and their own insecurities. De Closets noted that scientists who are able to imagine the black cloud must certainly have imagination, adding that science will only go forward in this direction. If one is too precise, the poetry disappears. He added that journalists are faced with a kind of superficial vision of science while science fiction writers can go further.

Ingram pointed to the difference between those with theories and those who do the experiments. It is the first group that have the catfights and leap ahead of the data. They move into the limelight; the others, however, are just as creative but stay out of the controversy.

Lougheed asked about how journalists deal with scientific concepts that are difficult to define and a delegate added that having scientists verify everything is not practical for a daily paper or news website. De Closets agreed, adding that when a piece can't be reviewed, journalists should stick with what they read. This brings into question journalistic freedom and closeness to scientific sources. Ingram cautioned against the idea of all journalism being vetted by scientists. "They look at their work with a very different emphasis: they want accuracy," he said, while journalists look, in part, to entertain. De Closets reiterated that scientists have to verify the principle of the piece and if there is concern about slant, the journalist goes to someone with a positive attitude.

Missing stories: Gaps in the globalization of science news

Moderator James Cornell opened the session by recalling a science journalism course in the 1980s where he had challenged students to find coverage of Third World science news in major daily newspapers. "They came back amazed" that reporting was limited to plagues, disasters, and mass murders, with "almost zero that had to do with science and technology unless it was some USAID program that was being reported on."

Based on that experience, Cornell organized a seminar at the annual meeting of the American Association for the Advancement of Science, where panellists concluded that news coverage is simply parochial—while U.S. media covered France about as extensively as developing countries, French publications were treating Spain the same way. "If it isn't happening in their backyard, if it isn't affecting their pocketbook or their kids' school lunch program, it doesn't make it to the forefront of their consciousness, or of their newspapers or magazines."

Twenty years later, Cornell said the news flow from south to north is still limited. Editors are still looking for local news, and the conglomeration of news organizations has created a demand for "production of global information, stuff that doesn't really need translation." This is bad news for science news, which "needs a lot of exposition, it needs a lot of explanation, it needs a lot of illustration to go with it." Cornell cited SciDev.Net as one of several glimmers of "news breaking loose" from a southern ghetto.

Nalaka Gunawardene

Sri Lankan science writer Nalaka Gunawardene, author of a recent article on media as the stepchild of the 2003 World Summit on the Information Society, suggested the gap between the industrialized North and the developing South is less a geographic divide than it has been in the past.

Increasingly, he said, the countries of the South have "little bits of the North, insular and insulated from the majority of people," that have changed the context for discussing disparities between north and south. "These people who live in the affluent pockets of the south, in

countries across Asia, Africa, and Latin America, are very much part of the Northern mentality, Northern lifestyles, Northern mindset. Their media preferences, their cultural points of reference, are very much Northern,” so that “the gaps are there, very much so.”

Gaps in science coverage occur at a number of levels: within countries and regions, and among developing regions. The overall trend is toward less science and technology reporting in the developing world, and less coverage of Southern science in Northern and global media. He suggested three of the most important contributing factors:

- ? The past 15 years have seen sweeping changes in the structure and ownership of media in the Asia-Pacific, and likely in other developing regions, particularly in radio and television. By the end of the last decade, most Asians had access to as many as three-dozen television channels, as well as “a cacophony of radio stations all trying to engage listeners.” At first glance, the transition from controlled government media to a range of more lively alternatives is good news. The problem is that the new, largely market-driven stations tend to favour infotainment directed at youth and the new upper middle class. There is limited interest in populations that have been sidelined or marginalized, and little effort to serve the rural poor, minority language speakers, or other media consumers who are considered less important. “News has to sell,” he said, “or else it’s not news.”
- ? The commodification of news has meant that the same company might offer a 24-hour news channel, a cartoon network, and an around-the-clock movie channel. “The paradox is that with more channels, more broadcast outlets opening up, there is less and less analysis and depth. There is just more of the same.” Newspapers and magazines are marginally better, but they are now trying to mimic the television networks that once took their cue from print. “This is not some Western-driven conspiracy to keep the Asians ignorant,” he stressed. “It’s being done by Asians themselves.”
- ? Science and technology, medical, and health stories are often complex and multidimensional, with important social and economic implications. But that plays poorly in national and global media that try to avoid complexity, preferring to “compress it into 120 seconds or 400 words.” When science coverage does occur, it “tends to be very one-dimensional, very superficial.”

Gunawardene added that coverage of the emerging IT and communications industries in South Asia has missed many of the substantive issues in the region—including barriers to adopting IT, options for increasing local language content, and the broader access issues that arise after someone gets online. Amid “uncritical cheerleading by the media,” he said Northern media have mostly missed the story of the mobile phone and its profound impact as an “affordable, valuable utility” for people across South Asia.

Jia Hepeng, a reporter with China Business Weekly and China Daily in Beijing, traced coverage of the Severe Acquired Respiratory Syndrome (SARS) outbreak in 2003—beginning with a period when the Chinese government did not want the story to get out. He suggested a series of institutional factors that have limited effective science communication in his country, including political censorship and a closed management system.

The changing treatment of SARS over the course of three outbreaks provided an opportunity to study the different ways in which science communication takes place, Jia said. When the disease

first appeared, infecting 305 people in Guangdong Province by February 9, 2003, most local and national media remained silent on the issue—but by February 11, the day the governments began to communicate, 80% of Chinese had heard about SARS, mostly through short messages. When the news officially broke, apparently prompted by public demand for more information, China's three major newspapers and subordinate tabloids produced 126 articles on SARS in one day.

Jia's content analysis covered a selection of print media in China, from party and government publications to the more market-oriented news outlets. For the month of March 2003, he found virtually no coverage. But on April 20, the true extent of the situation was publicized, two top government officials were dismissed, the volume of news story grew by orders of magnitude, and the focus broadened to public opinion about SARS and its impact on peoples' lives. In general, official organs focused more on government policies and initiatives, while the more liberal media reported from poor regions and captured grassroots reaction. But despite greater transparency, the official Xinhua news agency still exercised a degree of nominal information control.

By December 2003 and January 2004, China was dealing with a second SARS outbreak and a new form of avian flu, and the government seemed to be encouraging a greater degree of transparency. After a market-oriented paper, the Southern Metropolis News, published an unauthorized report on a suspected case of SARS, the government released all pertinent information the following day. The bad news was that the paper's editor in chief was dismissed, arrested for alleged corruption, and sentenced to seven years in jail.

Subsequently, the government released daily epidemic updates, co-operated closely with the World Health Organization, and permitted open debate on the proposed mass slaughter of civet cats to control the risk of transmission. The ministries of agriculture and health showed similar openness during the avian flu outbreak.

Jia concluded that technological progress, media market competition, and greater public awareness have pushed Chinese media in the direction of timely, accurate coverage of health, science, and environment issues, even though the government still seems to favour "selective transparency" over full openness. He said experience with both SARS and HIV/AIDS had persuaded top authorities in China to value scientific openness, even if the transition is causing short-term pain for some individuals and institutions.

Lisbeth Fog, Past President, Colombian Association of Science Journalism, Bogotá

Language differences and translation costs represent an obvious barrier to Southern news moving North is language, but freelance journalist Lisbeth Fog reported on a news service for Latin American science journalists that is generating tremendous pickup within the region and beyond.

The Colombian Association of Science Journalism was established in 1976, making it one of the oldest associations in South America, but went into a period of dormancy before being reorganized in 1996. Since 1998, the organization has been involved in training, research,

international networking, general publishing, and development of the NOTICyT newswire service.

In the first 15 months after its official launch in 2003, NOTICyT mailed out 191 science news stories from Colombia, generated 310 published credits, and reached 710 journalists across the region. The English edition is distributed to about 90 journalists around the world. The free service, based in Bogotá and sponsored by the Colciencias National Academy of Medicine, is expected to be a continuing priority for the association, along with science journalism training and research.

Fog identified SciDev.Net as the other pathway for online news and analysis on the role of science and technology in international development. The service has 2,743 subscribers in Latin America, including 213 from Colombia. SciDev.Net publishes a weekly email alert in Spanish that goes out to 1,047 registered users. So far, 14 stories have originated in Colombia, and 13 covered Colombian science news.

While SciDev.Net is a great way to deliver information to the world, Fog NOTICyT places higher priority on informing Colombians and building a culture of science in the country. “Knowledge is power,” she said, “but sharing knowledge is progress.”

Questions and comments

A participant asked Fog for any insights that would help the Arab Association of Science Journalists to launch a news agency. Fog said it’s critical to understand the domestic audience for national science stories and how to reach them. International contacts are important, and sponsorship can be a difficult issue: when the government cut funding to the Columbian national academies of medicine, contacts within the agency asked NOTICyT to leave the story alone. Fog said she ended up covering the story for SciDev.Net, “but in the national press there hasn’t been any news about it. In a way it’s good that you get funds, but in a way you are censored by your funding. It would be great if we could earn this money differently.”

An attendee said limited Northern coverage of Southern science may be a matter of the road less travelled. “Newspapers are so used to getting stuff from the developed world, that this is where science happens, that cutting a new path through the forest will take people getting used to the idea.” He asked Fog about the terms of distribution for NOTICyT stories. Fog said articles are free, but news outlets are asked to provide credit.

Cornell noted that the Chinese government is reportedly cracking down on the free exchange of information via text messaging and invited comment on the “powerful force of the mobile phone.” Jia said new technology creates demand for greater transparency, but no mechanism for people to verify the bits of information they receive via text messaging. Gunawardene said new technologies have been used during elections to topple unpopular governments, their impact can be unpredictable: Sony’s hand-held video camera was originally intended for family use, but in the hands of activists it became tool to document human rights abuses and environmental degradation.

Reporting on Risk/Statistics

David Ropeik, Director of Risk Communication, Harvard Center for Risk Analysis, Boston, United States

David Ropeik opened the session by explaining that the topic is really about looking into the psychology of fear—what humans are scared of, and how they decide how scared they should be. A risk is defined as anything that is perceived to threaten human survival on any level. The instinctive reaction of humans to risk is fear; biologically, the fear reflex (or the intuitive reaction) is quicker and stronger than the rational reaction. Humans are inescapably hard-wired to react with fear first, the “fight or flight” response; otherwise, survival of the species would have been precarious.

The perception of risk is based on a set of information personality traits, or psychological factors, by which humans subconsciously decide how much to be afraid of what. Ropeik lists these traits as follows:

- ? Trust
- ? Risk versus benefit
- ? Control versus lack of control
- ? Imposed versus voluntary
- ? Natural versus human made
- ? Dread
- ? Catastrophic or chronic
- ? Uncertainty
- ? Personal versus statistical
- ? Familiar versus new
- ? Children
- ? Personification
- ? Fairness
- ? Awareness

People in this day and age evaluate information given in the media for risk, using these personality traits. The response to a perceived risk (even in the media) is not always one of reason—remember the hard wiring—with people often making dangerous choices unnecessarily or putting themselves in a state of chronic stress, both with adverse health consequences.

David Andrews, Professor, Department of Statistics, University of Toronto, Canada

David Andrews talked about the role of statistics in science journalism and guidelines for using

statistics. Journalists need to know how to assess the evidence of risk and how to clearly present what the risk represents. He presented an example of bad interpretation and harmful results coming from lack of understanding and no reflection on the applicability of the statistical analysis. Scientific reports need to be written so that others can understand the results and come to their own conclusions; researchers should be able to explain their results in five different ways. If the statistical evidence indicates an elevated risk, it should be shown in twenty different ways.

Science journalists should remember that when evaluating risk, the risk to life is what should be important, not the increased likelihood of death. The worth of a story can be quickly estimated by asking what would change if the risk were eliminated. Several types of studies usually evaluate cause and effect. There are experiments in which the prescribed treatment is assigned randomly. These are rare, but provide conclusive results. Case control studies are often used to evaluate environmental risks and involve matching known cases to similar control subjects. Andrews finds these types of studies are subject to unknown and, therefore, potentially huge biases. One needs to question what other types of elements were matched for control in the study (income level, health, etc.). Retrospective studies are also dangerous. These studies look at old data in hopes of finding new information. Since there is a statistical probability of finding some coincidences, is the question under studied one of these coincidences?

The following guidelines can be used in evaluating relative risk, or how much the cause in question increases the chances of death or disease. If the risk factor is five or greater, one study should make this clear and it is worth reporting. If the risk factor falls between two and five, the study needs to be well done and very clear about how it drew its conclusion before it should be reported. A risk factor below two should not be reported.

John Flanders, Statistics Canada, Ottawa, Canada

John Flanders is the news editor of *The Daily*, a Statistics Canada website media source. He presented information on how to use this website, both for news items and as an in-depth research tool. Everything Statistics Canada releases to the media goes out through *The Daily*, which is specifically targeted to journalists. Ninety-nine percent of the information released is in a journalistic style, with about 900 stories released per year in 250 or so issues. There is a media relations hotline (613-951-4636) that is staffed from 7:30 am to 5:00 pm EST or later if the release concerns only inhabitants of the western provinces. If there is no reply, leave a message because it will be answered.

Questions and comments

The question period began with a journalist looking for more clarification on Andrews' recommendation that studies indicating anything less than a five times relationship between cause and effect were not necessarily news. Andrews addressed the concern by stating that it is very difficult to create matches between known cases and controls in studies and that this is the most common type of study done. If there is a big effect (numerically) the cause has most

probably been properly identified. If there is a modest effect, a study has to have been extremely well designed and well matched between cases and controls if it is to actually identify a cause.

The second questioner asked Ropeik to comment on the Bush administration's use of fear and the risk perception by the American people, particularly since the inception of the colour-coded "Alert Level" system. Ropeik replied that he sees a real split between people who are truly trying to increase the level of safety of U.S. citizens and those using fear for political gain. He said that while conducting workshops and consulting with the many levels of government working in this area, most people he has met are working to improve the situation. But, he believes that the highest-level officials (Ashcroft, Cheney, Ridge for example) have said things to raise the level of fear for political reasons. Ropeik sees this as more damaging to the state of public health than the actual threats themselves, given the scale of reaction that takes place. Examples of such actions taken by Americans that lead to increased health risks are things like buying guns, driving instead of flying, driving when extremely tired, and the uncontrollable increased level of stress. He went on to report that the level of alert had been raised six times, three times correctly so, but when political comment is attached to the statement of explanation, the level of trust in the validity of the action drops dramatically, resulting in an increased fear reaction and an increased stress level. The amount of damage to public health is very high.

Andrews was questioned about the level of confidence journalists should have in looking at studies. He replied that epidemiologists are looking for a number of things to ensure that they are right. If, when evaluating if A causes B, their study shows that those with A are less than two times more likely to have B than the average person, that indicates that they aren't really certain. Furthermore, studies don't really detect that A causes B; they find indications of an *association* between the two.

A member of the audience said she found studies on pesticides very confusing and asked someone from the panel to comment on them. Andrews replied saying that often pesticides and air pollution were connected in studies and it is very difficult to discern if the results provide any clear evidence. He would approach this issue by asking if it affected life and his answer so far as he has seen (in studies) would be that there is a very indirect affect. Ropeik expanded the approach by saying that one component of interpreting these studies would be to include a risk assessment by asking how hazardous is the substance. How much are people exposed to it? Are they eating it? Breathing it? The reality is that people cannot be directly tested for carcinogens and the testing model is not always good. Sometimes dose blasting on animals is used. Often the information below the levels where a negative effect is registered is not analysed. In the case of pesticides, the best test sample is people with high exposure (farm workers for example) but they need to be carefully matched to ensure that it is a comparison of apples and apples to provide any conclusive evidence. Ropeik added that, as far as he knew, there was no conclusive evidence that pesticides were dangerous.

The final question of the session was addressed to Flanders. He was asked if Statistics Canada knew who uses the material that *The Daily* makes available. Many experts in all fields contact Statistics Canada. Often these experts will ignore the analysis provided by Statistics Canada in *The Daily* and go directly to the original data and report, but *The Daily* provides a gateway into this information.

Doing it Differently—Innovative Practice

Moderator: Sonya Buyting

Sonya Buyting opened the session saying, “Our job is to cover stories on the cutting edge. Our approach should be on the cutting edge if we want them to be read and seen.”

David Dickson, Director, SciDev.Net, London, United Kingdom

David Dickson’s presentation, “How to Give a Story Legs,” started with the observation that the same skills are needed for print and web journalism.

He offered a series of tips for getting stories accepted by editors. After verifying what kinds of stories are covered by a publication, one should offer the editor a brief story outline. Be prepared to explain why the story is significant. “Editors hate old stories dressed up as new,” he warned. Once the assignment is confirmed, it is important to stick to the agreed upon length and deadline.

“If you rewrite something, make it clear (that it is a rewrite) at the beginning. We all recycle, but it’s upsetting (for an editor) to find out an article has already been published.”

Always ask the editor about the audience’s knowledge level.

“Never submit the same material to two publications simultaneously.” When an editor is given a story pitch, it is assumed that it is an exclusive offer.

When writing for a website there are some things to keep in mind. More white space is needed on web pages, so four or five lines is the maximum length per paragraph. Web editors will appreciate it if you include URLs to your original source and to any organizations mentioned with your article. Mentioning any possible sources for electronic illustrations is also helpful.

A web editor’s acceptance criteria are “similar to that of a news editor of a daily or weekly newspaper. It has to be new and significant.”

When submitting stories to *Nature* or *New Scientist* “don’t go for straight science. What you are looking for is issues at the interface of science and the public.” Dickson sees science journalism as “a two-way exchange of information.” Articles inform readers about the activities of scientists, but they also keep scientists in touch with the public.

Material may be legitimately reused: the rule of thumb is “acknowledge, but don’t plagiarize.” Acknowledgment is not necessary if the information is in the public domain, but it is essential if the story is exclusive to another publication.”

Dickson concluded by mentioning that the SciDevNet website has practical tips for science

journalists.

Pascal Lapointe, Editor-in-chief, Agence Science Presse, Montréal, Canada

Pascal Lapointe admitted that, as a small organization, Agence Science Presse (ASP) does not recycle articles as much as they would like to. The ASP did, however, recycle stories for a Québécois television show; Z-Mc2. Shorts were based on articles written in 2003. But there are very few examples like this, in part because the Québécois market is small, but mostly because the media at large is not interested in science.

The ASP has not developed a large distribution system for two reasons. The cost would be too high, and as a small French organization, international groups are not interested in them. All the same, the ASP will be 26 in November. Ironically, its limitations are also the secret of its success. The dynamic culture and economy of Québec assures the success of French cinema, television, and magazines. There is no equivalent of ASP in English Canada, Lapointe pointed out, because Anglophones will buy *Scientific American*.

The ASP runs on a budget of \$200,000 CDN per year, producing *Hebdo-Science* for its subscribers, and an open access website. Revenue is collected from the sale of articles, editing books, research for TV, and web site advertisements.

The ASP produces, among other things, international information capsules, reports for subscribers, two to three stories per week about science in Québec, press reviews, and radio spots. This content attracts 500,000 visitors to the ASP website every month.

Lapointe acknowledged that this is the norm for non-profit organizations. The passion of ASP journalists is behind the high quality content that wins praise from the media, teachers, researchers, etc. It is perverse, said Lapointe, that this success leaves them no time to develop any marketing strategies. The catch-22 is that if ASP were to recycle stories, there would be less time to write new articles.

Lapointe concluded by saying that others may wind up making more inroads in marketing and networking, and encouraged them to remember ASP.

Mark Miller, Producer, Daily Planet, Vancouver, Canada

Buying introduced Mark Miller as the “ultimate freelancer” who writes, shoots, and edits his television spots. He is a producer at Daily Planet.

Miller showed a video clip of a story he had written, shot, and edited on fire fighting by plane in British Columbia, and described how the story was shot in four days. His hook was the visuals—the action shots of the planes. Having got his audience’s attention with high-speed action, his story then delved into the science of fire retardants.

Having been a radio reporter, for Miller it has always been “natural to be a one-man band.” When he started producing stories for the Daily Planet, he didn’t have money for a crew, so he learned how to do it all himself.

Having repeat clients, he has not had to develop a distribution system. He does, however, recycle shots frequently. “Those airplane shots,” he said, “will be recycled for the next 15 years.” In another example, he told how he got 180 minutes of airtime from one shoot he did of a beached killer whale, simply because it turned out to be related to another, podless whale who turned up a month later.

Miller has been asked where he gets his stories. His inspiration lies in current events. “If I weren’t here, I’d be at Mount St Helens,” he said. “This is tectonic plate science happening before us. You could get the head of the U.S. geological sciences on the phone, but when you get there, it’s another story. There are visuals, and there are people on the ground the guy on the phone would never mention.”

Rather than submit scripts, Miller sends his rough cuts. Words would not do his shots justice. If the process of putting the story together is laborious—he does everything from filming to producing music for the spots—he is not on “the story treadmill” that print journalists are on. As he is paid for all the tasks he takes on, he earns enough on each story to warrant the extra time and effort.

Being a one-man band gives him greater access to stories. “How would you get four guys on those planes?” he asked. “As journalists, we have to have as low an impact in the field as possible.”

Questions and comments

A journalist from Sydney, Australia, agreed with Dickson’s observation that web journalism does not differ greatly from print. Although people had argued with him, he applied the same rules he had followed as a foreign correspondent for Reuters to the website and the site’s traffic had tripled.

Dickson noted that these journalistic practices had been developed over 100 years, and they result in trustworthy content.

Miller said that he left print when he noticed how much more response he got from readers when he wrote in the present tense. The constraints of print journalism would not have allowed him to do that.

The Australian journalist added that on the Internet, when there is an embargo on a story one may write it in advance, in the present tense. Lapointe made the point that the reader might only see the article later in the month: most readers go to their favourite sites only three times per month. Dickson specified that a date still must be included.

Miller suggested that journalists should stand up to editors who follow rules too rigidly. “Some rules are crazy,” Dickson agreed adding that the best book on the subject is by Harold Evans.

A freelance medical writer asked if the impact of the Internet has brought more respect to journalism. Dickson acknowledged the shoddiness of a lot of the material on the Internet. “We try to present reliable information,” he said.

Lapointe added, “The respect people have for journalists has been declining for 20 years. The Internet has some great work, but as to the future, your opinion is as good as mine.”

“The Internet,” Miller concluded, “is about convergence. Many stories that have still elements now will have moving shots in the future.”

Skeptical Environmentalist or Environmental Skepticism?

Nobel laureate physicist Richard Taylor opened a freewheeling debate between Danish economist Bjorn Lomborg and Canadian scientist David Schindler with the observation that humanity has been modifying the environment for thousands of years, sometimes deliberately, sometimes as an unintended consequence.

“There are very few people left in the world who think you can pour greenhouse gases into the atmosphere without having some effects,” he said. “The arguments are about how much effect, when it’s going to happen, and to some extent, whether the effects that have already been observed are due to greenhouse gases or part of a natural fluctuation.” He invited the two panellists to comment on the most sensible course of action, at a time when the world “should be doing all the easy things it can to reduce emissions.”

Bjorn Lomborg, *The Skeptical Environmentalist*

Lomborg, a professor of political science at the University of Aarhus in Copenhagen, discussed the ways in which science is used— and, in his view, misused—in the effort to decide the best way of dealing with major issues. He urged participants to step back from questions about how bad a problem like climate change is going to get, in order to ask whether it will be a problem at all and how expensive it might be to solve it. “It’s not just a science issue, but an issue of priorities that can be used in a democratic discussion,” he said.

While acknowledging that there are problems in the world, Lomborg said the trends on many key issues are positive. “This is important, because people have a tendency to think things are getting worse, that somehow we’re spinning out of control,” and that assumption affects the way scarce resources are allocated. “The real issue here is that if we’re focused on myths, they actually affect the way we prioritize, which means we do less good than we could have done for the world.”

Lomborg suggested several indicators of progress. Global statistics show that people have more leisure time, greater security, fewer accidents, more education, more amenities, higher incomes, healthier and longer lives, and greater per capita access to food calories in both developed and developing countries. Despite dramatic population increases over the next 30 years, the United Nations still projects an increase in average caloric intake.

He suggested that scientific researchers have a built-in bias in favour of identifying problems that will require funding, adding that media have a tendency to report the bad news that people want to read and hear. While all the interest groups on environmental issues have valid viewpoints to put forward, he expressed concern that green organizations are more credible with the public than environment ministries or independent researchers, and far more credible than industry groups.

Summarizing some of the key issues from his book, *The Skeptical Environmentalist*, Lomborg repeatedly challenged science journalists to get out the following messages:

- ? Despite dire predictions that the world was about to run out of oil, coal, natural gas, copper, zinc, aluminium, and other non-renewable resources, ingenuity and technology have always closed the gap. “Of course, we’ll eventually stop using oil,” he said, but that will be because better alternatives come along. With prices dropping at a rate of 50% per decade, he said it seems unlikely that renewable energy “won’t become competitive.”
- ? Air pollution may indeed be getting worse, but the different types of pollution must be prioritized. If 86 to 96% of the social benefit from environmental regulation comes from controlling airborne particulates, as the U.S. Environmental Protection Agency (EPA) suggests, regulatory dollars should be allocated accordingly. Based on data for particulates and sulphur dioxide going back to 1585, he suggested that the air in London is cleaner than it has been in more than 400 years. Air filters on diesel vehicles turn out to be a good idea, he said, but “we should do it because it’s a good idea, not because we’re scared witless.”
- ? In developing countries, meanwhile, people might be willing to accept environmental costs if it enables them to feed and educate their children. “Journalists have a responsibility to point out that the goals and aspirations for developing countries are so very different,” he said. Indoor air is a more immediate problem for many people than outdoor pollution or climate change, but “if you don’t know where your next meal comes from, you can’t care about the environment 50 or 100 years down the line.”
- ? Environmental problems as diverse as oil spills, landfill volumes, pesticides, cancer risks, and climate change have all been overstated or overdramatized, Lomborg claimed.

In May, Lomborg helped to convene the Copenhagen Consensus, a group of eight professors who reviewed and attempted to prioritize the major issues facing the world, presuming limited resources to fund corrective action. HIV/AIDS, micronutrient deficiencies, free trade, and malaria topped the list. Climate change placed sixteenth, and the Kyoto Protocol was singled out as a questionable initiative with poor return on investment. He urged journalists to help “restore perspective” to the debate, through an effort to “get the trends back in there and tell people that things have actually been improving.”

David Schindler, University of Alberta

David Schindler, a professor at the University of Alberta and winner of the Canada Gold Medal in Science, agreed with Lomborg that a lot of good work has been done on environmental issues. “If there hadn’t been, you ought to have fired people like me a long time ago.” He also agreed that spending should be prioritized, but questioned the way Lomborg had attempted to balance the issues. “Despite our best efforts in winning some battles, we’re still losing the war for the environment,” he said.

Schindler said science reporting has been “quite balanced,” adding that it isn’t journalists’ responsibility to “blow sunshine into dark cracks.” But turning to the science itself, he cited one reviewer who had accused Lomborg of “wilful ignorance, selective quotations, disregard for communication with genuine experts, and destructive campaigning.” He listed several points where he disagreed with Lomborg’s conclusions in *The Skeptical Environmentalist*:

- ? Lomborg cites data from the UN Food and Agriculture Organization to suggest that the world is in no danger of losing its forest cover. But there have been serious methodological errors with the FAO research, and the book makes no reference to the importance of intact forests for ecosystem integrity and species survival. In Canada, primary forests have decreased rapidly over time, and giant forest companies are “rapidly munching up the landscape.”
- ? On acid rain and forest death, Lomborg cites six popular books, one piece of environmental “grey literature,” eight government reports, and two peer-reviewed scientific papers, but ignores a database with 8,000 citations as of 1988. Lomborg’s commentary on acid levels is off by one or two pH units—which translates into a 10- to 100-fold error, since pH is calculated on a logarithmic scale. “This is not science,” Schindler said. “I’ll put my money on peer-reviewed literature published in *Science*, particularly if no one has challenged it after several years.” He said the acid rain map has shown general improvement, not because of bad environmental reporting, but because “we recognized a problem, we reported it scientifically, science journalists made sure it got out, and we goddamn well did something about it.”
- ? Lomborg concludes that global water supplies are sufficient by dividing all the world’s water by the total population. But much of the water is in remote locations, and Lomborg’s arguments are based on data for water withdrawal—a different term from water access, with a totally different meaning. In a line-by-line analysis of Lomborg’s claims, Schindler noted that Mexico’s groundwater supplies are decreasing by one metre per year, supplies in the southwestern United States declined throughout the 20th century, and questionable water projects in the Aral Sea, the Yellow River, the Colorado River, and at the Three Gorges Dam contradict the assertion that humanity has learned its lesson on water.
- ? Schindler agreed with Lomborg that concentrations of toxic contaminants are declining, but credited that change to the alarm raised by author Rachel Carson and the solid scientific work that followed. He recalled an era when chemical salesmen would jump into barrels of DDT to prove that it was safe, and cited chemical concentrations and health impacts in peregrine falcons, cormorants, fish species, and northern aboriginal people. DDT is still used to control malaria in the developing world, but if not for sound environmental science, “we would probably not have any fish-eating birds or any raptors today,” he said. “The problem continues, it’s not over, we need to investigate, the public needs to know the risks, and they should be prioritized.”

? The key question about energy is not whether supplies will run out, but what the oil will cost—in economic and environmental terms. During the week of the conference, oil was selling for \$50 per barrel, up from \$15 when Lomborg wrote his book. And in Schindler’s home province of Alberta, where the tar sands make Canada (not the Middle East) America’s biggest energy supplier, some waterways are too toxic for birds to land. “It will not be reclaimed,” Schindler said of one proposed development. “It will be one enormous toxic pit....This is another priority we need to get straight.”

Scientific discoveries, a vigilant environmental community, effective regulation, and good science reporting have solved many environmental problems, Schindler said. “But I don’t believe we’re keeping up with the production of new problems. Media coverage has been balanced, but we need more of it,” even if it means persuading editors to prioritize science reporting over “some dolt who scored a touchdown.” He identified global warming and nitrogen pollution of estuaries as two among many priorities for further scientific work, and encouraged participants to seek out sound science by reading peer-reviewed journals, adopting prominent scientists as advisors, and remaining “suspicious of controversial books by non-scientists.”

Debate, questions, and discussion

Lomborg responded that the progress on acid rain illustrated his point that public priorities have to be sorted out. He added that scientific journals like *Science* or *Nature* may not be the place to debate public policy priorities that go beyond scientific debate—that was why Lomborg called in a group of economists to deal with cost trade-offs. Schindler said he appreciated Lomborg’s attempt to prioritize but, “frankly, economists get under my skin. I’m sick of seeing everything environmental regarded as an externality,” based on a system that would treat the Exxon *Valdez* disaster as a positive contribution to Gross National Product. He conceded that “economists and ecologists are at opposite poles, and they need to be brought together.”

A participant thanked Lomborg for highlighting the need for skepticism, suggesting that journalists had reported uncritically when Greenpeace wrongly criticized Royal Dutch Shell for burying an oil platform at sea. He also cited a couple of articles in *Science* that had reached questionable conclusions. Schindler replied that both articles “got roundly trounced in letters” to the magazine, demonstrating that peer review is a robust process.

An attendee asked Lomborg for his opinion on ecological economics. Lomborg said it’s useful to bring the two disciplines together, claiming that “most economists are trying to do that on a clear, level-headed basis.” He expressed concern about efforts that take place outside mainstream economics, suggesting that economists’ contribution is to clarify choices about the way money can be spent.

Schindler said a key disagreement is over the extent to which industrialized society is burning up its natural capital. “We’re not living off the interest of the environment anymore, the annual production. We’re gradually munching into things that could harm our future economy down the road,” but mainstream economists tend to reject that argument. Lomborg said it might make sense for a poor generation to use up natural capital as a way of getting ahead and essentially

taxing its eventual descendents.

In response to a question on persistent organic pollutants, Schindler acknowledged that “malaria is the big killer of people in the world, and it’s somewhat ironic that to protect people in the tropics we’re contaminating our Arctic food chains.” He said he would like to see science produce an alternative that kills mosquitoes but is not transported in the atmosphere. Lomborg suggested a more “hard-nosed” approach, noting that the best alternative to DDT costs four to five times as much. The moral dilemma, he said, is whether to save a large number of people in developing countries for the per capita cost of a pair of jeans or prioritize “a few people and polar bears and natural habitats in the polar region. That is a fairly easy moral dilemma, but it’s one we should pose very clearly. We make these kinds of trade-offs all the time.”

Mind Reading: What Do We Know About the Brain (Neuroscience)

Ravi Menon, Professor of Neuroscience, Robarts Research Laboratory, London, Canada

Ravi Menon spoke about his research entitled “One Brain, Two Visual Systems.” Menon and his research team have been able to use major technological advances that allow non-invasive methods of imaging brain activity by measuring variation in blood flow (magnetic resonance imaging or MRI and functional MRI or fMRI). Their studies have married psychology and technology while investigating an unusual case of loss of functioning in visual perception. The team found that the visual system that was required for action, such as grasping, was still functioning normally while that of description (or perception) was not. As testing and mapping the areas of the brain that control different actions and desires continues, possibilities arrive for new treatments for brain-damaged patients.

Testing has been done to see if a monkey can think about moving a cursor on a screen and have it happen (through electrical devices) with results that are better than chance would predict. Now training is being devised to see how accurate that thinking can become. The fMRI can indicate what is going on in the brain even when there is no physical output. It can not only show where action is controlled and what it is controlling, but where perception happens and what the brain wants.

Remi Quirion, Scientific Director, Douglas Hospital, Montréal, Canada

Remi Quirion spoke about the move from neuroscience to neuroethics. Brain research appears to be the most exciting area and the last frontier of medical research, but Quirion also sees the importance of thinking about the social impact of all this new understanding. When he started at the Douglas as a researcher in Alzheimer’s, each day was spent in a different lab working on a different aspect of the disease. After a while, he realized how much more productive it could be if everyone researching some part of the disease came together to discuss the whole of it. He is now working on bringing together all Canadian brain researchers under the umbrella of the

Institute of Neurosciences, Mental Health and Addiction (INMHA).

As neuroscience research has advanced, the field of neuroethics has developed to consider issues such as informed consent and the privacy of test results. The emerging issues are enhancement of normal functions, particularly moods and cognitive abilities. These issues need open, public discussion now. They have implications for insurance, immigration, and employment. There are currently places in the U.S. where one can have their brain “read.” The way the breakthroughs in neuroscience are used will shape society and some guidelines need to be defined.

Oakley Ray, Professor of Psychiatry and Psychology

Oakley Ray spoke about how the mind can prevent (or cause) disease. He started with references to well-known examples of the mind controlling the body such as hypnosis and placebos. When he looked at these kinds of phenomena, he saw “no magic, only mysteries.” He cited documented cases in which surgical recovery rates were improved when the surgeon visited the patient the night before and verbally expressed confidence that all would go well.

Ray brought up many other scientifically evaluated examples of the state of a person’s mind influencing physical health. The interaction between the mind (or psyche) and the body is clearly seen in the human hormonal control system. Mental stress produces disruption in the cortex, which in turn inhibits the natural feedback system that usually maintains the proper hormonal balance. High levels of cortisol destroy neurons and slow the rate of production of natural killer cells that often keep the growth of cancerous cells in check. This natural system explains some of the ways the state of mind can affect the health of the body.

Questions and comments

The first question from the floor was directed to Ray and asked him to link the psychoanalytical methods of Freud with his (Ray’s) research into the control of the mind over the body. Ray replied by stating he thought that Freud was closer to the target than his students were, illustrating his point with a study in which students were asked to talk or write in a journal for an hour a day for a week or so. They could choose the subject, but those who chose to talk about something traumatic felt depressed for about two weeks at the end of the study. After two weeks, a change occurred and that same group exhibited signs of improved health, improved even over those who chose not to talk about something traumatic.

The next question addressed the possibility of reading into the future with brain imaging techniques (Could actions that would be taken in a week’s time be predicted?). Menon suggested that that really isn’t that far into science fiction. If the right questions are asked, observations of the stimuli the responses give could lead to a reasonable prediction of actions. This would not work at all with impulsive behaviours. Dreams can be imaged, but can only be “read” in a general way—dreaming about travel or food can be discerned, but the destination of the travel or the specific food cannot. Quirion added that as imaging gets better and better, fewer numbers of subjects will be needed to produce more detailed maps of the brain. At this time an image of a

single brain is virtually useless, something that society needs to be mindful of as this technology begins to find its way into the judicial system.

Someone questioned the benefit of imaging in treating brain diseases for which there is no cure. Menon replied that most brain disorders have no cure, only medications. Some comparisons between normal and affected brains have been made, but now other disciplines, such as pharmacology, have to step in and work on the chemistry taking place and figure out how the neurons are communicating.

Menon commented on the fact that the three panellists all work in psychiatry, but with a huge range of subjects. Quirion added that the field has become more multidisciplinary than ever. He added that it is now possible to find the cause of a problem or a mechanism, but what lies ahead is being able to assess the social and scientific impact. Ray cited the example of intelligence tests; every one knows what the test is, but who knows what intelligence is? As testing in neuroscience becomes more and more sophisticated it is imperative that the ethics side of the discussion is considered.

A member of the audience stated that after reading an article produced by a colleague on the placebo effect, he has reached the conclusion that traditional medicines are benefiting from the placebo effect. Quirion stated that it is now known that the brain does respond in studies of the placebo effect. Parkinson's disease studies show that there is a physical response to placebos given for pain. Menon's research group has looked at pain and has evidence that the anticipation of pain produces a stronger response. They call this an anticipatory response and it is well documented that it amplifies the actual response. Ray mentioned placebo experiments in which the physical responses to the placebo were very real; the real interest should be in what creates this difference, this reaction to a placebo in a certain group of people. If people could do only one thing to improve their health, it should be developing an optimistic outlook.

A member of the audience commented that traditional medicines probably link into peoples' ability to access the placebo effect, but wondered if another factor that increased the benefit of traditional medicine was allotting more time for telling personal stories. Menon replied that there are so many neurons talking to each other in the brain that they invariably generate a variety of mindsets.

Ray was asked to comment on the mind-body connection. He said that the brain is a monstrous control centre sending out messages. What is being studied now is thought and every time a door is opened, it leads to a series of doors that are yet to be opened. He doesn't think the story will be told for a long time but hopes researchers will have fun looking for good questions to ask with good answers to be found.

Unhealthy Planet: The Collapse of Ecosystems

Following a photo essay by Canadian astronaut Julie Payette, featuring spectacular views of the earth from orbiting spacecraft, participants heard updates on the findings of the Millennium Ecosystem Assessment (MEA). Moderator Peter Calamai said the Assessment will do for ecosystem issues what the Intergovernmental Panel on Climate Change (IPCC) did for global warming.

Robert Watson, World Bank

Robert T. Watson, Chief Scientist with the World Bank and Chair of the Millennium Ecosystem Assessment, said the initiative has involved hundreds of specialists in the natural and social science in a review of what is and is not known about the state of the world's ecosystems. The report is intended to be "policy-relevant but not policy-prescriptive," setting out implications for action from the local to the global level.

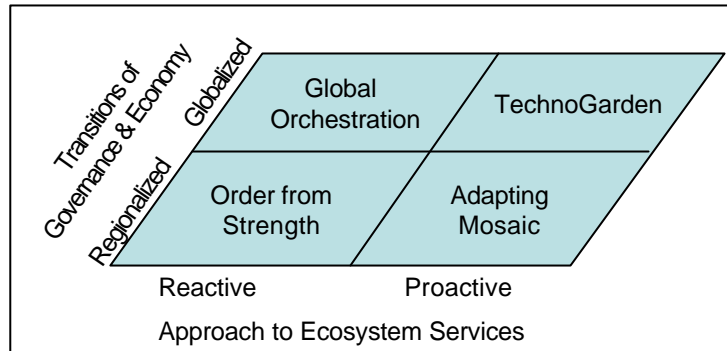
The conceptual framework for the Assessment takes in a series of indirect drivers of ecosystem change: demographics, population, family size, rural to urban shift, economic growth, trade liberalization, privatization, governance, new technology, and cultural/religious issues. Those issues are then linked to the direct drivers: land use, land cover, invasive species, climate change, water and air pollution, food and water supply, ecosystem regulation of climate and disease, and cultural and ecosystem aesthetics, all of which affect human health, material well-being, social relations, freedom, and choices. Four large working groups are conducting the assessment: ecosystem conditions and trends, scenarios for the next 50 years, global responses, and sub-global assessment.

Watson provided a glimpse at the MEA's provisional findings:

- ? The research shows major deforestation in the Amazon, parts of Africa, Southeast Asia, and now in the former Soviet Union. There are also areas where forests are regrowing, including some in high northern latitudes.
- ? The nitrogen cycle is an even bigger concern than the carbon cycle, with major disruptions due to fossil fuel burning, agroforestry, and fertilizer. World nitrogen emissions have increased from 20 to more than 150 teragrams per year, accompanied by huge nitrogen deficits in the United States, Europe, India, and China.
- ? The number of people worldwide who are malnourished decreased from 920 million in the early 1970s to about 780 million in 1998, before increasing slightly to about 800 million. Food production is growing in real and per capita terms, and the finished product has never been less expensive. China has been a major success story, reducing its malnourished population to roughly 100 million. In Africa, however, food insecurity has increased significantly, and the required doubling in food production over the next 30 to 40 years will have to be achieved with less labour, due to HIV/AIDS and malaria, with less land, and in spite of climate change.
- ? Ecological degradation is likely to inhibit a number of the Millennium Development Goals for food and water access unless environmental considerations are fully integrated with

classic development concerns. Recent progress has been achieved by favouring material well-being over regulatory and cultural services, but a more holistic balance will be needed in future.

Watson presented four broad “storylines” for the year 2050, differentiated largely by the degree of international co-operation and the extent to which humanity is proactive or reactive in response to ecosystem issues. There are four possibilities:



- ? Global Orchestration, a scenario in which global economic and social policies are the primary approach to sustainability;
- ? A “techno-garden,” where technology is used to provide or improve the delivery of ecosystem services;
- ? An Order from Strength scenario, where primary emphasis is placed on economic growth and national security;
- ? An Adapting Mosaic, where local and regional management is seen as the primary approach to sustainability.

In all four scenarios, Watson said, the demand for food, fibre, and water increases, and land use remains a major driver. Food security remains out of reach for many people, and child malnutrition is *not* eradicated by 2050, decreasing from 165 to 65 million in the best scenarios but becoming more prevalent in the worst. There are vast changes in freshwater resources. Climate change exacerbates the water shortage, and dry land ecosystems are extremely vulnerable to population growth. Developing countries increase the volume of agricultural lands at the expense of forest systems and biodiversity, while forested areas increase in the developed world, especially North America and Europe.

Watson said global action over the next 50 years will have to integrate government, private sector, and NGO responses, address synergies among issues like food, water, and diversity, and rely on a mix of regulation and private sector measures. There is enough uncertainty about the data that it will be necessary to adapt an adaptive management strategy, in which the overall approach can shift as new information comes in. Environmental and economic planning will have to take advantage of synergies between local and global policies.

To stop significant degradation of ecological systems, and of food, water, and human health in developing countries, the increase in global mean surface temperature will have to be limited to about 2°C, suggesting a maximum concentration of atmospheric carbon dioxide of about 450 parts per million. Watson stressed that the goal in endorsing this calculation from the IPCC was not to be prescriptive, but to link choices to consequences.

Angela Cropper, The Cropper Foundation

Angela Cropper, President of the Cropper Foundation in Trinidad and Tobago and co-chair of the MEA's assessment panel, discussed the implications of the study for developing countries. The analysis focused on a range of ecosystem services, including water, food, timber, fibre, fuels, biodiversity, nutrient cycling, waste management, disease regulation, and cultural services, and drew on the results of the MEA's sub-regional assessment in southern Africa.

Cropper said the assessment team learned a lot from the effort to disentangle the concept of human welfare and well-being, recognizing that we seek more from our surroundings than the ability to feed, clothe, and house ourselves. The research linked key elements of human well-being like choices, freedom, health, and good social relations to the role of ecosystem services. She cited demographics as the most prominent indirect driver for developing countries: of the 9.5 billion population projected for 2050, 90% will be in the developing world, and 60% of that total will be living in cities by 2030, with serious implications for human well-being, food and food security, water availability, solid waste management, air pollution, nutrition, and health.

The MEA has several provisional findings:

- ? Drylands cover 41% of the earth surface, are home to more than two billion people, and are perhaps 10 to 20% degraded. Overcultivation, grazing, and poor irrigation have led to a loss of biodiversity, which in turn affects economic productivity and the ability to improve the well-being of a growing population.
- ? Coastal societies and ecosystems, including small islands, are undergoing rapid change due to the failure of the fisheries on which they rely.
- ? The productivity of inland fisheries has been affected by the loss of more than half the world's wetlands, leading to massive changes in biodiversity.

While human well-being has improved in the recent past, Cropper said a growing number of people are at high risk due to ecosystem change. Species composition is emerging as an important issue at the local level, and the interactions among species will have important implications for long-term food production, due to supporting services like pollination and pathogen control. Nutrition and food security is a huge issue that depends fundamentally on the biological capacity of the ecosystem, while water scarcity will be a serious concern—already, 2.2 million people die each year due to water, sanitation, and hygiene issues.

The situation is even more serious in the world's drylands, home to two billion people worldwide, and 270 million in Africa. Water withdrawals are already unsustainable in some parts of the continent, making water scarcity a major factor in health vulnerability and a severe constraint to development. Scarcity is also an issue in the western United States, parts of Europe, China, and southern and sub-Saharan Africa. All four MEA scenarios call for increases in water demand through 2050, leading to increased water stress in arid regions. "We are still leaving a lot of people behind, and in all scenarios, the numbers left behind as measured by malnourished children will indeed be very high," Cropper said.

Daniel Pauly, University of British Columbia

Calamai noted a recent poll by the Québec firm of Leger & Leger, indicating that newspaper readers do want a bigger picture beyond their own backyards, before introducing Dr. Daniel Pauly, Director of the Fisheries Centre at the University of British Columbia. Pauly noted that “fisheries stories are usually framed as local affairs,” in which the resource declines and people want a bigger piece of whatever is left. But he warned that the world’s fishery resources have been in decline since the 1990s—despite data from the UN Food & Agriculture Organization (FAO) suggesting that the total catch was increasing. The issue is not that fishing quotas are going down, but that there are fewer table fish in the ocean.

Using maps of the North Atlantic continental shelf from 1900 to 2000, Pauly demonstrated an enormous difference in fish populations over a 100-year period. Ecosystem models also suggest a factor of 10 decline in fish populations off Southeast Asia since the 1960s, driven by troll fishing encouraged by the Asian Development Bank. The response in North America was a massive movement of fishing fleets to West Africa between 1990 and 1999, where host countries receive about one-tenth of the value of the fish.

Pauly compared fishing practices to harvesting on land: People start with species that are easy to catch, then move to smaller fish when the preferred species become less abundant. But when the emphasis shifts to younger fish and to species that are lower on the food chain, the marine food web is gradually wiped out.

People in industrialized countries have not yet noticed the shortfall in fish harvesting because of immense imports from the south—Pauly said 50% of the wild fish caught anywhere in the world are transferred. Aquaculture may be part of the solution, but much of that activity in the west focuses on carnivorous species, meaning that humanity is farming its way up the food web while it fishes downward. Coastal farming also contributes to water pollution, with well-known “dead zones” established in the Gulf of Mexico and the Adriatic.

The only solution, Pauly said, is to establish marine protected areas and allow fish stocks to regenerate. But “most fisheries people hate them. They want to go there.”

Alain Bourque, Ouranos Consortium

Alain Bourque, interim executive director of the Montréal-based Ouranos Consortium, described his group’s approach to the development of a regional climate change strategy for Québec. He said strategy must be balanced between greenhouse gas mitigation and adaptation to unavoidable changes, adding that a multidisciplinary environment is the best way to address the issues and apply the available scientific knowledge.

Greenhouse gas (GHG) emissions are increasing in step with energy production, which is in turn driven by economic growth, Bourque said, and it is also clear that industrialized countries have set an expectation for the developing world that will lead to a further increase in GHGs. An optimistic assessment suggests total emissions will double this century, and the main scientific

debate is whether output will actually triple or quadruple.

Although climate impacts were initially defined by the extremes that could result, Bourque said there is growing understanding that the world will see changes in average temperatures, heating degree days, and other ecosystem effects that are even more important for long-term planning.

The Ouranos Consortium is a multidisciplinary group of about 95 scientists, specialists, and stakeholders, set up to link greenhouse gas mitigation with climate change adaptation. Canada produces less than 2% of the world's GHGs and Québec accounts for about 0.1%, so while there is an opportunity to set an example, the provincial government saw the need to anticipate the social, economic, and environmental impacts of climate change. At Ouranos, stakeholders identify priority issues for study, and Bourque said those issues tend to spread well across the province's regions and ecosystems.

The research approach is deliberately broad. In its work on permafrost melt, for example, the organization brought together permafrost specialists, Ministry of Transport engineers, public safety officials, and communities, with the common goal of adapting to a change that is already taking place. Hydroelectric dams are planned for a 50-year operating life, and climate change raises issues about the productivity of existing equipment, water volumes in reservoirs, shifts in electricity demand due to warmer winters and summers, future water supply, and opportunities for power exports. Bourque said a hydro engineer neglecting climate change would be like an economist forgetting to account for inflation in a 25- or 30-year projection.

The overall challenge is responsible adaptation—not to exclude mitigation efforts, but to recognize that significant ecosystem change is already occurring. If the goal is to protect polar bears, adaptation might mean extending protected areas to cover some of the territory they might occupy in the future.

WFSJ President Véronique Morin closed the session with the announcement that Melbourne, Australia had been selected as the location of the 5th *World Conference of Science Journalists*.

Meet the Editors

Editors with four very different publications shared insights on what they look for in the pitches they receive from freelance journalists, and then critiqued a series of story ideas that had been submitted in advance by participants.

Jeremy Webb, *New Scientist*

Jeremy Webb, editor of *New Scientist*, described his publication as a popular science weekly that is aimed at the largest possible audience. It covers all the most important discoveries in the science community, while capturing the science behind current news events. The magazine gathers exclusives by sending reporters out to conferences and lab visits, and by “trolling

through the more arcane journals that are difficult to understand and of little interest to anyone else.” Writing lengths vary from short news items to 3,000-word features.

Stories are tailored to lay readers who know nothing about scientists, and to researchers who may be unfamiliar with jargon outside their own specialties. “The only way to talk to all those people is to cut out the jargon and speak in plain language,” Web said. “We aim to use language and concepts that would be familiar to a 17-year-old high school students.” Opinion pieces, physics stories, scientist profiles, humour, and offbeat topics all play very well with the magazine’s 700,000 readers.

The magazine has six in-house writers, uses 10 to 20 freelancers per week, and is always on the lookout for new talent, Webb said.

Nadia El-Awady, IslamOnline

Nadia El-Awady, Health and Science Editor with Cairo-based IslamOnline, stressed the importance of science in the Islamic world. “Seeking knowledge is an integral part of Islam,” she said, and even if the region is in a state of “scientific backwardness,” people are “well aware of the importance of science in the development of their lives and societies.”

IslamOnline generally produces separate bilingual sites in Arabic and English, with only minimal translation between the two. The service receives more than 10 million page views per month, producing news, in-depth coverage, special folders, polls, dialogues, and a variety of other features in topic areas as varied as politics, arts and culture, society news, religion, and science. Since its launch in October 1999, the English edition of the science page has produced 965 articles, working with 65 writers in 27 countries spanning four continents, 48% of whom are not Muslim. Through 2003, monthly page views for the health and science section ranged from 31,179 to 77,925.

El-Awady said the science and health page ranges widely across topics like health and alternative medicine, environment, genetics, natural science, technology (especially appropriate technology), faith and science, institutions and scientists, computers and communications, all with a focus on the developing world. Much of the content is drawn from SciDev.Net.

Based on writers’ advice on selling news to the Islamic world, El-Awady advised participants to follow the same approach that work elsewhere: Write well about a topic (and in a cultural context) that you understand, look for topics that are relevant and interesting to the intended audience, and respect readers’ cultural and religious sensitivities. While science is an international language, coverage of scientific controversies like cloning or abortion should include the opinions of Islamic scholars—otherwise, readers would see the article as advocacy: One survey found that 60% of Muslims would be offended by a positive story on condom use or alcohol consumption, both of which are forbidden by Islam.

Mathieu Villiers, *Science et Vie*

Mathieu Villiers gave a short introduction to *Science et Vie*, a publication based in France that serves eight- to 12-year-olds. *Science et Vie* specializes in theme issues and special edition, and publishes 800,000 copies per month.

James Gorman, *New York Times*

James Gorman, Deputy Science Editor, with the *New York Times*, noted that the paper's science desk employs six editors, 15 staff reporters, art and graphics editors, and a number of regular freelancers and contributors. In addition to daily coverage, the desk produces a weekly supplement that is one of the most widely read sections of the paper. News stories are almost invariably written by staff reporters, and most freelancers are people with whom the *Times* already has a relationship—breaking in as a freelancer is not easy, though Gorman said he sometimes takes pitches “over the transom” from new writers with solid experience writing science articles for newspapers and magazines.

Stories usually run 1,000 to 1,200 words, rarely more than 1,600. Stories must be new, clearly-written, quick, and interesting, and Gorman cautioned against proposing subjects that have no story to tell: “If it’s just a subject, we have 15 reporters and regular contributors who have their beats and subjects they’re aware of.” Beat reporters have first pick of stories in their realm, so “if it has something to do with genetic engineering, even if it’s a good story, we’ll almost certainly say we have a staff reporter who does that, because that’s part of our bread and butter.”

The pitches

Session moderator Bob McDonald read out a series of story pitches the panel had received as part of an “overwhelming response” to a request for advance submissions. He led the panel through a series of responses to both the content and the style of the proposals.

- ? A participant suggested a story on whether the x-prize, as a successful catalyst for private space travel, could be applied to other emerging technology areas. The writer argued that the timing for the story was right and the angle was new. Webb said he liked the idea of a story that stepped outside the expectation that science will be funded primarily by governments and industry. Gorman said the proposal was too general and abstract, but might work as an essay or a commentary from an established scientist. Villiers said the story sounded interesting, but might be too ambitious for a freelancer. El-Awady said she would look for an angle that was relevant to the developing world. From the perspective of a television science show, McDonald said the story would need a tighter focus and compelling characters.
- ? In response to a story on the use of fish and fish oils to treat depression, El-Awady said IslamOnline publishes a lot of material on alternative medicine, but stressed the need to obtain information from the right sources. Webb said he would have to see the data—his first question was whether fish oils increase the suicide rate. Gorman said he’d be very skeptical unless the pitch cited an important scientific study, appearing in a major peer-reviewed

journal. Villiers said the story had already received considerable attention in France, so his publication would only be interested in proof that the treatment was ineffective.

- ? A participant proposed a story on what happens after a species is declared endangered, noting that international officials were debating whether to designate the Great White Shark. Gorman and El-Awady agreed that the story was timely and the angle was good. Webb said he would be interested in hearing about who wins and loses when a species is protected. McDonald said an endangered species meeting in Bangkok would be difficult to cover for TV, but “white sharks make great video for our program.” In response to a question from McDonald, panellists expressed a strong preference for two- to three-paragraph pitches that explain why a story is fascinating and who will be interviewed.
- ? An attendee proposed a story on uses of virtual reality technology to prevent falls among older adults, as a means of reducing health costs, extending lives, and increasing personal independence. Gorman said he would want to know who the writer and what access s/he would have to the story. El-Awady, Webb, and Villiers agreed that the pitch was too general.

Questions and comments

A participant asked panellists whether a freelancer would ever get a chance to cover a broad, recurring story with general appeal, like human origins or how the universe began. Gorman said he would always assign those topics to staff writers, and Webb agreed that he would do the same if the topic had shown up in a peer-reviewed journal. A freelancer might score an exclusive, he said, by interviewing a researcher whose paper is due for publication in a few weeks.

A couple of attendees asked how public relations officers can capture editors’ attention. The panellists recommended email releases and advance journal notices, with Gorman urging PR practitioners to “save your ammunition and send [a release] when it’s something that’s really good.” Webb agreed that “if it’s going to the whole world and it’s a good story, everyone else is going to do it.” An exclusive on an event taking place the day after *New Scientist* appears might be more interesting, but the item would still have to hold some intrigue for readers.

A participant asked the panel for advice for new freelancers entering the field. El-Awady said smaller news outlets with limited contacts in the west might pay less than larger publications, but would get a starting writer on the road. Webb recommended contacting editors, seeking out internships, and taking every opportunity to get published. Gorman said new writers should start out as staff on small newspapers rather than trying to freelance right away.

Science and Security: Balancing the Need to Know Against the Need to Protect

Mark Gwozdecky, Director of Communications, International Atomic Energy Association, Vienna, Austria

Mark Gwozdecky introduced the session and speakers and then briefly outlined the functions of the International Atomic Energy Association (IAEA) as the world's nuclear watchdog. Drawing on his experience with the war in Iraq, he observed that good journalism in times of war is doable yet difficult. "Iraq has not been journalists' finest hour," he said, adding that many of the weaknesses in reporting lay with political journalists who "are easily fooled by their sources." Although the IAEA found no evidence of weapons of mass destruction (WMD) in Iraq, the perception of their existence remained and was widely reported on. Why did so many journalists buy into this? Certainly some explored this allegation more deeply. Most didn't despite the fact that both reliable, open-source information and experts willing to talk were available. The IAEA website, for example, has thousands of pages of intelligence on Iraq and a team of spokespersons to help journalists understand. Gwozdecky attributed part of the blame to his organization for missed opportunities to comment and statements that were too carefully balanced. He indicated that journalists need to better evaluate their sources and should shy away from single sources. It doesn't help that "editors are allergic to stories with inconclusive leads."

"What strikes me is not the nuances that were missed or the lack of scrutiny of the evidence, but that the media missed some basic facts—the blind spots," said Gwozdecky. He pointed out that there were two weapons inspectors although only Hans Blix was reported on. The other inspector, however, was the one charged with the nuclear file. Another missed fact was that Iraq's nuclear program was dismantled in the 90s. This news barely got out and the perception remained that the inspectors were a "bunch of Inspector Clouseaus stumbling around in the dark."

Gwozdecky pointed out that the pyramid structure of news journalism is not effective when views alternative to the mainstream are given low priority or dropped entirely. "I see news reporting more like an iceberg with 90% of the news buried, unread, or even unseen." Explaining that the issue of WMD still remains inconclusive, Gwozdecky urged that "rushing to judgement" in matters of war and peace is unwise until all the evidence has been gathered. Journalists must continue to assess and re-assess the credibility of their sources and not succumb to the "cry wolf" phenomenon. Gwozdecky remarked that all journalism can't be judged by Iraq and that there are many superb science journalists willing to expose alternative views and papers willing to soul search.

Raj Chengappa, Managing Editor, India Today, New Delhi, India

Raj Chengappa took the audience to the nuclear scene in India and recounted the day the story broke about the disclosure of the state's nuclear weapons program. Chengappa recalled that it was difficult to get his story, but he followed some basic tenets of journalism. He started by asking some fundamental and different questions—"How did India fool the CIA?" The resulting

story was remarkable, entailing intricate descriptions of how India fooled the CIA with an extensive, lay explanation of nuclear weapons. Chengappa indicated that the story didn't stop there. "When everything is said and done you will be surprised how much has been left unsaid and undone," he remarked, giving an example of one of the follow-up stories: "Is India's H-bomb a dud?" and an exposé of Dr. Khan, who shared nuclear technology information with other countries.

Chengappa felt that journalists should always reveal their sources and be on record. "If I am wrong, I am willing to correct it, but if not then...." In the end, people have a right to know—journalists can't ignore this. He noted that while writing on security issues is difficult, with many inherent problems with sources, honesty will lead to information. Finally, the speaker observed that information and questions lead to infinitely more stories written with accuracy, balance, and fairness.

Hervé Kempf, Le Monde, Paris, France

Hervé Kempf discussed the close relationship between nuclear and transgenic issues and the military arena, referring to the mini-nukes developed in the U.S. for use in future conflicts. With the development of this powerful underground bomb, Kempf said, the U.S. would be free of the traditional weapons bans used for ordinary conflict as well as the nuclear proliferation treaty. This view is problematic in itself, but has rekindled interest and research in these weapons in other countries—nuclear proliferation.

In another example of the intertwining of science and security, Kempf noted that biological warfare commenced during the Cold War and that the subsequent progress of biotechnology has transformed the development of biological warfare. Organisms such as anthrax could be readily used by the military since now many biotechnology studies are carried out in name of defence. Kempf added that there is a fine line between defence and offence. The U.S. has withdrawn from the Biological Weapons Convention and is currently developing vaccines against biological agents. Kempf observed that these types of military developments can lead to control of the scientific community. The close relationship between biotechnology and intelligence also stimulates interest in other countries.

Kempf then returned to the issue of information sources. Science writers have access to open source information as well as credible agencies that follow arms control. There are always experts who are willing to confirm the work on record. Kempf concluded by noting that questions of national security, democracy, the protection of freedom, and world peace are key issues that the public needs to be informed about.

Questions and comments

Commenting on the BBC's role in the question of WMD in Iraq, a delegate noted that science journalists aren't as good at investigative reporting as they once were. Remarking that controversial information needs to be verified, he said that "at the end of the day, one should get

most of the story mostly right” and not leave it all to the political journalists.

In a question to Gwozdecky, a participant asked if more could have been done to compete with the false information that was in the media at the time. Was the IAEA’s communication strategy lacking? Gwozdecky noted that their communication policy was far from lax yet the “world was consumed by these stories and we were a drop in the ocean.” Furthermore, as an international organization the IAEA didn’t want to get embroiled in a political debate. The IAEA, while not definite on their findings, did try to make the point to journalists, but it wasn’t enough.

Another delegate asked how President Bush could get away with his statement quoting IAEA information that Iraq was six months away from producing a nuclear weapon despite the fact that this was untrue. Gwozdecky noted that while some journalists did report on this major error, “whenever the U.S. President speaks, other views fall by the wayside.” Only much later when the correction had little public impact was it reported that the president had misquoted and had meant to refer to another organization with a similar acronym as the IAEA.

One participant asked Kempf and Chengappa how they remain calm with the daily pressures they face as journalists dealing with highly sensitive issues, where colleagues have been censored and muzzled. Chengappa noted that if he is convinced that he has been fair and honest in a story then he can handle many unsavoury situations. “When at the end of the day, what was written is true, those who don’t speak to you now will come around eventually.” Kempf added that he has often had difficulty getting both colleagues and editors to accept his stories. He attributed this partly to their lack of scientific knowledge, but also to the provocative nature of the questions, especially in the emotionally charged atmosphere of 9/11. Kempf dealt with this by being persistent and not giving up after the editor had rejected a story.

Internet Research—Beyond Google

Moderator: Kathryn O’Hara

**Jim Henderson, McGill Health Sciences Librarian, William Osler Library,
Montréal, Canada**

Jim Henderson introduced himself, explaining that he has a background in mathematics, but is now an administrator and works with journalists and editors at PWAC and EAC. He has also written for the *BC Medical Journal*.

He offered to present his “best guesses from a science librarian’s perspective.” He started with a quiz, asking the audience what percent of the Internet Google searches. It searches only 0.3% of the Internet.

Journalists currently use newswire feed, press conferences, contacts, Google, and EurekAlert for story ideas. And some journalists get advance notice of embargoed stories at the American Association for the Advancement of Science website.

Henderson presented an overview of the life cycle of science literature: the pre-publication stage, the testing and experimentation stage, and proposal and grant applications. At the primary public stage, grant approvals turn up on university sites. Technical reports are sometimes available as well. Conference presentations can be useful to journalists.

Publications such as the *British Medical Journal*, which has a website and offers an email alert, are helpful. The email alert sends a message whenever a particular pre-selected topic turns up. More and more journalists are using this function.

From a librarian's point of view, many websites are suspect. Henderson suggested going to good directory sites, like Health On the Net (HON) to find the reliable, peer reviewed sites. He also encouraged the use of academic library sites. Technical libraries keep reference lists of recommended sites.

There are changes afoot in the world of online journals: many are making the move from free, open access to proprietary. Henderson advised participants to keep in mind that they can always access a journal's table of contents without a password. Overall, the movement from open access to subscription journals is provoking to researchers. "The researchers are realizing that the proprietary journals are profiting from their work. The researchers want their articles to be available." The National Institute of Health is taking the stance that "everything funded by the Institute should be available to the world in a reasonable amount of time."

The free flow of information is increasing in another way: journal editors are requiring that clinical trials be registered. If a drug company is releasing information, negative clinical results must be available alongside the positive results.

Other sources for breaking news are conference transcripts available through InterDok and Allconferences, and preprints through ArXiv. For those who wish to look at dissertations, contacts at universities would be useful. One can use university abstract and indexing services.

Henderson listed web services, both fee-based and free. Among the proprietary sites he included SciFinder, INSPEC (for physics), and OVID. Among the free sites mentioned were Pubmed and Entrez, Scientific and Technical Aerospace reports, International Nuclear Information Services, and Highwire.

In conclusion, Henderson pointed out that the Internet is only 25 years old. Tools of the future may include RSS feeds and blogs, as well as more sophisticated alerting services.

Julian Sher, Creator and Webmaster of JournalismNet, Montréal, Canada

Julian Sher described his background as an investigative journalist and writer. Among other things, he has written about the Hells Angels and has made a documentary on AIDS.

He promised to share Internet tools that he himself uses, and introduced his site,

JournalismNet.com. The site provides information in French for Radio Canada. It includes news, jobs, specific “beats,” as well as useful research links.

Advanced tools can help determine if a potential news source is reliable. If one is going to use a website as a reference, it is possible to find out who is funding the site. JournalismNet.com’s “finding people” section has a link to the search engine WHOIS.com. Even sites that have anonymous contact information, like the Earth Liberation Front—who are terrorists—have people funding their sites. WHOIS will give the name of the site administrator.

“Chat groups are full of crazies, but they can be useful,” said Sher, adding that he used chat groups to research a story on a sham doctor. To find a pertinent group, one can check Google groups and do a search on a topic. People in the groups do not realize “that you can spy on everything they’ve said on the web.” This means that it is possible to do a background check on people before using them as a source. Also, “people will post articles for free, so it’s a great way to do research for free.”

As an example, Sher did a quick search on a couple of chat group posters. He looks for people who are in reasonable chat groups, and who have no extreme habits. One individual he checked had posted 2,000 articles (“so he needs to get a life,” Sher joked) and didn’t have any odd Internet habits. Another chat group member, however, could have useful information on volcanoes, for example, but turn out to hang around drug chat groups as well.

“I am always surprised,” Sher said, “that journalists will not trust press releases, but won’t use Google’s advanced search tools.” An advanced search allows one to specify domains: it’s possible to leap straight to Harvard’s search engine, for example. The site box allows one to search a particular site. An even more sophisticated option allows searches of particular formats: slideshows, and PowerPoint presentations. “You can combine two advanced tricks: you can select the American military domain name, slideshow, and do a search on anthrax, and find out what the Pentagon is telling their soldiers.” Searching only spreadsheets can offer valuable studies, and searching PDFs will bring up actual reports, rather than general websites.

Sher suggested referring to Google News for late breaking stories. It searches 4,500 good newspapers. The advanced news search offers the option of searching only one country’s publications. The news alert allows you to specify particular publications. For example, it can send an email alert every time the *New York Times* mentions a topic.

Finally, one can sign up for JournalismNet, a free “Internet research site for journalists who are trying to be on the cutting edge.” Sher’s final bit of advice was to check out science journal websites and listservs.

Questions and comments

The speakers were asked if they found any valuable information on scientists’ personal websites. Henderson replied that there aren’t a significant number of personal sites at this point. Sher said that he does google people he is researching.

Sher offered another search tip, saying that the Canadian government's GEDS site lets one search titles, even if without a contact name. Henderson added that as a reference librarian, he has found that the phone book is a good tool.

An audience member asked if television and radio content is searchable on the web. Sher said that there are tools that allow searches of aural transcripts, and there's a video search guide called footage web that will pull out images. But these services are just beginning. Henderson agreed that this is coming. An audience member who works with the Discovery channel added that it has material archived on its website.

There was a question about open access sites. Sher said that organizations such as the Ontario College of Physicians have searchable databases. Henderson noted that while open access is a subject dear to librarians' hearts, journalists do not want all their articles to be available free of charge.

An audience member from the Netherlands asked if the speakers use translating programs from other countries. Sher's site includes links to free instant translators. He mentioned some that are "remarkably good": AJEEB, and Softisimo.

Asked if his site included a link for a search engine for free images, Sher cautioned that one has to deal with copyright fees when reproducing an image. However, it is possible to search video stills. Google, Alta Vista, and Lycos offer searches of uncopyrighted images.

Covering Complexity and Controversy

Moderator: Tim Lougheed

Mark Winston, Biologist, Simon Fraser University, Burnaby, Canada

Following a brief introduction, Mark Winston said, "I don't believe in complexity." Complexity arises from bad writing and poor speaking. Simple science is often made complex through unclear reporting by journalists and scientists. The preliminary results syndrome is one example. Winston also indicated that the take-home message from seemingly conflicting study results is "that there is nuance out there."

"I do, however, believe in controversy," he said, mentioning his involvement with the Wosk Centre for Dialogue, which advocates non-adversarial approaches to conflict resolution. "Controversy gives rise to complexity," Winston said. "There are many diverse views in society, but we don't reflect this balance in our writing. Citing his book as an example, he remarked that "the most controversial place is in the middle." Controversy is complex because society's values are complex. Winston illustrated this point with the controversial study of the negative effects of GM crops on monarch butterflies. This preliminary experiment spurred a ream of bad reporting and writing. In the end, this controversy reflected complex values—whether the audience

believed in butterflies or in food production. “If people are able to understand that there are many valid viewpoints they will better understand science,” noted Winston.

Joe Schwarcz, Director, Office for Science and Society, McGill University, Montréal, Canada

Joe Schwarcz said that the mandate of universities is to demystify science. McGill does this through its media work and website, which serve to inform people and to foster critical thinking. “We try to separate sense from nonsense.” Schwarcz’s own efforts led him to a weekly radio show on demystifying chemistry. Through this show, he has cleared up many science misinterpretations that confusion. His experience illustrates that details are important in allaying people’s fears. Unfortunately, he said, “You can’t explain science in a sound byte.”

Data presentation can either elicit fear or have a calming effect. Schwarcz cited a study that concluded that there was a 30% increase in the risk of breast cancer in post-menopausal women on hormone replacement therapy. Using the same data, the results could have been presented differently. Finally, he underscored the importance of science literacy in the general population and that kindergarten is not too early a start.

Harvey Cashore, CBC Investigative Reporter, Toronto, Canada

Harvey Cashore said he didn’t consider himself a science journalist although he had been involved in scientific controversies, adding that science coverage is no more complex than other topics. Science reporters look for the logic, the how and the why of the science. As a first example, Cashore related a report of a deeply flawed study with results tailored to the study’s funder. Reanalysis of the data comparing injuries of junior hitting and non-hitting leagues came to the opposite conclusion on bodychecking in junior hockey that led to the elimination of a 20-year ban. In the reanalysis, “We asked the right questions,” said Cashore.

Showing a video clip of the controversy of caffeine in soft drinks and their marketing to kids, Cashore noted that journalists should elevate science to another level. This tenet was also illustrated in an expose of a study that claimed a 500% increase in testosterone level with antler-velvet pills. “It was a win-win situation, we either had a good story or a flawed piece of science,” said Cashore. While some science is bogus science, most science is actually good science; it is the people behind the science that are questionable.

In his last example, Cashore discussed CBC’s strategy for the SARS story. The World Health Organization (WHO) blamed China and “we wanted to test that thesis,” said Cashore. How could there be dead silence from China on this issue? In its expose, CBC found that the WHO fell back on protocol and relied on official government statements rather than local information. Cashore concluded that while a science background may help, he would suggest that not having one can provide a fresh approach. “Sometimes we can see the simple answers in what appears to be a complex story.”

Questions and comments

One delegate wondered if there were positive repercussions from the Monarch butterfly study. Even though the initial study was flawed, subsequent research was good. Winston noted that on the downside of this controversy the public was left confused by the contradictory study results. Secondly, researchers missed opportunities to study the environmental and health effects of GMOs. However, he noted that one good outcome of this controversy was an increased awareness of the stakes in genetically modified crops and the underlying economic, commercial, and patent issues.

The next participant asked Schwarcz if he took vitamins. “I only take Vitamin C when I feel a cold coming on,” he said, adding that he never took multivitamins given his balanced diet. However, Schwarcz commented, a recent dietary survey of North Americans suggests that the benefits of taking multivitamins outweigh the risks. The same participant also wondered if Schwarcz was concerned about pesticide residues to which he replied that he wasn’t. She continued, remarking that the public has a need for simple risk assessment tools in their daily lives. The existing tools, however only seem to add to anxiety and confusion. Perhaps, she suggested, people should rely more on common sense. Schwarcz indicated that confusion comes from information surplus. The Internet, abounding with information, purports to have all the answers. The downside of the information age is that it is easy to make pseudoscience sound good. There are grave examples of this when very sick people grasp at alternatives to conventional medicine to treat, for instance, cancer.

The moderator noted that the CSWA has discussed risk assessment and alluded to Environment Canada’s rating of dangerous chemicals that attempted to provide risk assessment using toxicity data and average exposure levels. Winston felt that scientists could better assess risk with a more integrated system of data collection.

One delegate noted that many questions are so obvious that no studies are necessary. Data was collected for the hitting/non-hitting hockey issue yet the fundamental answers were ignored.

“Does the media have a bias toward bad news stories?” asked another delegate, adding that the big picture of society’s progress is often missed. Cashore agreed, saying that he looks and tries to expose only false stories but is definitely a “good news guy.” Schwarcz added that newspapers are in the business of selling and are, therefore, interested in stories that present risks rather than those that celebrate our increased life expectancy.

Returning to Schwarcz’ example of the 30% increase in risk of breast cancer with estrogen, one delegate noted that this still represents an elevated risk no matter how it is positively phrased. Schwarcz agreed, but noted that for those women who suffer post-menopausally, the benefits outweigh the risks. The next delegate noted that in the debate about scientific credibility, there is a lot of scientist bashing and elevating going on. He asked “are we partly responsible for the growing scepticism?” Winston noted that a lot of scientist bashing is actually interest group bashing. Again, while there is some bad science, there is also a lot of good science presented with different values. The many positive scientific developments should be reported on.

Cashore saw the issue differently. Rather than looking for the viewpoint, he “tackles science by asking how and why, and looking for the facts.” Schwarcz remarked that “people have the impression that there are two sides to every story but they forget that both don’t have equal weight—the truth is always closer to one.” He suggested that having a science background is useful in “sniffing out” the right side.

A final question from the floor focused on the support that universities lend to their public scientists. Is it enough? Is it support at the moral or fiscal level? Winston said that universities “are all for it” noting, however, that most university faculty is not trained in this area and has no interest. “We need to work on our students and give them the tools to be more comfortable with the public.” Schwarcz echoed that both the McGill University administration and fellow colleagues support those who “go out.” “They are happy someone else is doing it.” A representative from Environment Canada added that Treasury Board policy states that its scientists are available for comment and encourages them to operate in the public arena.

Understanding the U.S. Government Scientific Agenda

Moderator: Laura van Dam

John Rennie, Editor-in-Chief, *Scientific American*, New York, United States

John Rennie asked “What does the future hold?” As the possibility of a change in administration looms “it’s an interesting and unsettling time,” he said. Will the general nature of the agenda change in rhetoric or in reality?

The Bush administration has a long tradition of paying lip service to the benefits of science. “The problem is that there is a breakdown between words and action.” While there has been a 44% increase in spending on science, much of it has gone to the military and to anti-terrorism. “The Bush administration has demonstrated a genius for making policies that manage to be both pro- and anti-science.”

Money has been dedicated to stem cell research, but the administration has restricted lab studies on embryonic cells. Money has gone to the study of global warming, even though scientists have protested that enough studies have been done. When it comes to missile defence “the administration says we should build it first and study it later.”

A Kerry administration might be more promising. Kerry has said that he would increase funding, loosen restrictions on embryonic stem cell research, and make missile defence a lower priority. But Rennie questioned whether Kerry’s budget would allow him to make good on these promises.

Has the Bush administration policy abused science to an unprecedented degree? “We were hearing allegations of that at an anecdotal level at *Scientific American* for years.” Rennie stressed that the Bush administration has “been interfering to a degree that should not be tolerated.”

Whether they are doing it more (than past administrations) is beside the point.”

Scientific American did not set out to criticize the Bush administration. The magazine has run politically charged articles—on nuclear disarmament, for example—since the 70s. An opinion piece that suggested that lessons about what happens when ideology runs science should be learned from the Russians elicited a tremendous amount of hate mail. Readers have argued that science shouldn't mix with politics. But science, Rennie said, “is trapped in policy.”

There's a larger trend afoot: “a steady erosion of the traditional authority accorded to scientists.” He concluded, “If I am right about this, then the Bush Administration is a symptom of a deeper phenomenon that has been taking place over decades.”

Daniel Greenberg, Contributing Editor, *The Lancet*; Author, Washington, United States

Dan Greenberg introduced himself as a science journalist who got his start during the Kennedy administration.

At present, he said, productivity in the sciences is up. But “there are legitimate concerns about what is going on at the interface of science and politics.” Grant money has been earmarked in suspicious ways. In the past, there was “an unspoken division between science and politics, there was an understanding that the housekeeping of science would be kept to the scientist” as concerned awarding grants and setting priorities.

Funding has been affected by politics for a long time. The Bush administration, however, has made two kinds of intrusions in the housekeeping of science.

The first “annoying but justified” category emanated from the 9/11 attacks. Tight security restrictions have closed off campuses; more material must be kept under lock and key. Foreign students have difficulty returning to their universities in the U.S. These impositions have some justification in peoples' minds.

The second category of intrusion, however, springs from a “desire to satisfy the Christian right wing.” Greenberg cited restrictions on health research, stem cell research in particular. An example of a “nasty” form of ideological interference is a website that made a close association between breast cancer and abortion. (After some protest, the site was shut down.)

As far as the Bush administration's “care and feeding” of the scientific community, Greenberg sees less to worry about. Science is seen “as the goose that lays the golden egg.” In all, productivity levels and budgets have been good. The administration has also made some lauded public appointments.

The scientific community can enlist public support by using “the power of embarrassment ... No administration wants the public to believe that the government is against science.” American public support for medical research, for example, stopped the administration from going as far as

it wanted to in limiting stem cell research.

Greenberg finished by warning that scientists are not up to speed in their dealings with the administration. Science journalism has developed as a translation service for scientists. “This is not suitable training for what will happen if the Bush administration gets a second term.”

Kevin Knobloch, Union of Concerned Scientists, Cambridge, United States

“Everyone is entitled to their own opinion,” said Knobloch when opening his presentation, “they’re just not entitled to their own facts.”

Physicists founded the Union of Concerned Scientists at MIT to ensure that science and technology would improve our quality of life. Its members now include average citizens and scientists in many fields.

They have dealt with issues such as nuclear power, climate change, and GMOs. “We don’t just raise alarm bells,” said Knobloch, “we always talk about solutions ... When we put a report out, we will be very transparent, and translate it into the language of public policy.” The UCS is non-partisan. “It is an equal opportunity critic.”

The Environmental Protection Agency (EPA) health scientists have complained that research has been systematically suppressed, ignored, and censored. A UCS report release in February 2004 came to the conclusion that scientific research “is often not making it unfiltered and unadorned” to the public or to policy makers.

In one case, an EPA study that found dangerously high levels of mercury poisoning in women was held by the Bush administration for nine months. A leak forced the administration to release the report, just as congress was being asked to reduce air pollution standards. This is just one of many cases where information on issues such as climate change is suppressed.

The UCS started a petition charging the Bush administration with systematically interfering with studies. It now has 5,000 signatures.

Since then, the popular media has picked up on the rift between the government administration and scientists. Knobloch showed a series of editorial cartoons, one of them depicting administrative filing cabinets labelled “Political Science” and “Politicized Science.”

Knobloch concluded saying, “This administration is trying to cut the credibility of scientists as messengers, because so often the policy they want to follow is not supported by science.” Leaders involved in research should “rise up out of their fox holes.” He acknowledged that “these people rely on the U.S. government for funding: it takes tremendous courage for them to speak out.”

Questions and comments

A BBC news reporter agreed with Greenberg that science journalists effectively work as translators “but that has started to change because of the stories we cover ... we have to stop the term science journalist from becoming an oxymoron.” The successful journalists will be the ones who do the most questioning. “We have to be more skeptical.”

Another science journalist asked if Rennie was concerned about the impact of ideology. Rennie pointed out that if Bush gets a second term, he will start to think about his legacy: “There’s some prospect that Bush will shift gears.” At the same time, Rennie has heard of a memo being sent out to coal companies, referring to the possible second term as “payback time.” But he stressed that an administration run by Kerry would bring its own problems.

Knobloch was asked whether it was possible to measure the impact the UCS has had on the American public. “It’s hard to know,” said Knobloch. But there has been a significant response from the scientific community. And Kerry and Bush have made science a topic in their campaigns. Rennie admitted to being more pessimistic. The UCS got the public’s attention, but will it change opinions?

Greenberg argued that the administration “will keep a keen sense of political reality. While being on the alert that these guys mean science and technology no good, we should recognize that they would have a hard time interfering in any way.”

Educating the Science Journalist, Part I

Sharon Dunwoody, Professor of Journalism and committee member of The Academies’ Office on Public Understanding of Science, University of Wisconsin, Madison, United States

What sort of formal education background should science journalists have? Is it necessary for science journalists to have a strong grounding in science or is this knowledge something that can be gained through experience?

Sharon Dunwoody gave an overview of science journalism training in the U.S. Science journalism programs there are usually university based, are located predominantly in journalism departments, and occur more often than not at the graduate level. She estimated that the total number of programs for science journalists ranged from 65 to 75 and noted that recent growth has occurred in niche training—specifically in environmental and health journalism.

While there is nothing special about science writing (as compared to other types of writing), she feels that teaching science writing courses allows her to address more general journalistic issues with an ease not found when teaching other types of writing. Issues of evidence, for example, were relatively easy to teach to science writers because science is a discipline that requires hard data to support its theories. She also noted that teaching about writing to her students’ level of

understanding was easy in science writing courses because of the well known complexity of science in general.

She was asked if formal science journalism training was important to being an effective science journalist. Dunwoody provided evidence from several American studies indicating that science journalists were aided by formal training at the beginning of their careers, but that it took a back burner to experience as journalists progressed in their careers.

Vladimir de Semir, Science Journalist and Professor, Universitat Pompeu Fabra, Barcelona, Spain

Vladimir de Semir claimed that one of the toughest challenges facing science journalists was transmitting scientific information in an Internet era. He hinted at the possibility of science journalism becoming obsolete with increasing importance being put on Internet sources for obtaining scientific information. De Semir pointed out that 50 years ago newspapers carried stories of scientific discoveries three to four weeks after their findings were released. Today the Internet can provide images and stories of such discoveries within three to four hours of their release. In his opinion, websites such as the new one run by *Nature* magazine are not science journalism but, rather, simply “providers of content.” He emphasized that the confusion over titles was a problem for science journalists because, in a sense, their job title was being used to describe a different form of communication altogether. What readers can’t find on the Internet they rely on television to explain to them, further increasing the vulnerability of science writers. De Semir concluded with a doomsday prediction that science journalism will become obsolete because the Internet has trivialized science news.

Bertrand Labasse, Science Journalist and Professor, Centre d’études en communication publique, Lyon, France

Bertrand Labasse claimed that science journalism education is typically seen for its extremes—as either having no relevance or of being on the cutting edge. He outlined several problems with the professional status of science journalists:

- ? They typically have weak professional legitimacy.
- ? Recruiters often demand flexible, jack-of-all-trades reporters instead of specialized ones.
- ? Content gathering can seem impossible, leaving many journalists feeling as if they have to know or understand all science or not report on it at all.
- ? It is uncertain whether “social” sciences should be included in scientific journalism. If they are, then in fact, every subject imaginable is “scientific” journalism.

As Labasse sees it, the main problem is determining if the title “science journalist” actually means anything. A recent *USA* weekend study claimed that 50% of the top 100 stories of the century were scientific in nature, but Labasse was quick to point out that many of these stories had economic and political sides as well. Why, then, couldn’t economic or political journalists—instead of science journalists—cover them?

Labasse identified several general journalism problems, including vanishing readers, credibility issues, and a lack of strong journalism training programs that actually advance journalism instead of focusing on journalistic “basics.” In his mind, journalism has stagnated. He proposes that science journalism has the potential to lead the way to better journalism because of its unique features, including its acute epistemological awareness, as well as the way it strives for understanding and relevance. He believes that most general journalists should take science journalism courses, and he hopes that science journalism courses will become obsolete as all journalism rises to an advanced level.

Questions and comments

Whether or not critical thinking should be a focus of science journalism education was the theme of the first part of the question and answer period. Dunwoody contended that a good journalism course should teach critical thinking, but, unfortunately, she has not seen much of this happening. While many employers give lip service to critical thinking, they are not, in fact, hiring critical thinkers. She emphasized the importance of teaching critical thinking to students to get them to reflect on, among other things, what it means to report on contested science. Vladimir echoed the importance of teaching critical thinking by stating that students need to be taught how to choose what is and isn't important—in journalism and in their lives.

When asked their opinions on how extensive science journalism programs should be, panellists had varied answers. Dunwoody admitted that teaching how to write in the classroom is difficult at best because writing is a skill that can only be developed through experience. She contended that science writing courses should focus on conceptual issues, such as the meaning of accuracy and truth, and analyzing how to determine whether something is accurate or true. Vladimir asserted that science journalism courses should be interdisciplinary, teaching not only “natural” sciences but the history and philosophy of science as well. This, he argued, allows journalism students to understand the process and thinking behind the subject they will be reporting on (i.e. science).

When asked by one audience member why she felt issues were more easily discussed in science journalism courses, Dunwoody observed that students in science journalism courses typically expect more complex and difficult issues, given the nature of science.

A science journalism professor from Cornell stated that there is an inherent conflict between teaching epistemologies and the types of jobs journalism students get. While teachers are told to teach a richer, deeper journalism, the jobs students typically get are short, “to the teeth” story writing. Vladimir proposed teaching students both good journalism and real world expectations and skills. Dunwoody argued that science journalism teachers are not in the business of preparing students for their *first* jobs but, rather, that they are interested in training them for a *lifetime* of jobs. She reiterated the idea of critical thinking as a way of teaching students how to survive in the real world while still teaching them good journalistic skills.

A session member from Mexico claimed that science journalism suffers from a lack of firm definition. He proposed developing minimum standards that would be applicable world wide to

raise the quality of science reporting. He, along with another journalist from Burkina Faso, emphasized the importance of scientific training for those reporting on science. A background in science, they claimed, will better equip journalists to translate complex scientific information to the public.

Educating the Science Journalist, Part II

Peter Calamai, Science Reporter, *Toronto Star*, Toronto, Canada

The second half of this two-part session started with a presentation by Peter Calamai. Calamai insisted that the kind of education that science journalists need depends both on why they are wanted and what they are expected to do. Many of the skills that good reporters have do not come from formal training but from experience. He used himself as an example, confiding that he does not consider himself a science journalist but, rather, a reporter who covers science. The distinction is not a trivial one to Calamai who covers stories in a multitude of fields including politics, law, and conflict. No other field required that he have formal education to report on it. He believes that you do not need a formal science background to be a good science reporter. Among the skills that he deemed more important than knowledge of science were critical thinking, knowledge of history and philosophy (both as it pertains to science and to society in general), a grasp of the economics of journalism, a short attention span, and a renewable supply of curiosity.

Calamai believes that what editors want in a science journalist is a comfort level. In other words, they want a science journalist who will worry about the complex world of scientific discovery so that other reporters don't have to. He also believes that science journalists need to be comfortable in a "ghetto environment" because often science is not front-page news, but is placed in small, separate science sections. In reflecting on why there are fewer staff people reporting on science, Calamai proposed that editors have not been educated about why science matters. While the public hungers for more science, this may often reflect a "halo effect"—in other words, people say that they like science to look good, but they aren't necessarily genuinely interested in science. For example, when the *Washington Post* removed the science section for a brief period, there was no public outcry. This stood in stark contrast to readers' reaction when the sports section was removed. Calamai asserts that it is because people have stronger feelings toward sports than they do toward science. It is editors, not journalists, who need to be educated about the importance of science in our society. It is useless to train science journalists if there is no place to publish their writing. This means getting editors excited about science so that they want more science reported and readers become more interested.

Bernard Schiele, Professor, Université du Québec à Montréal, Canada

Bernard Schiele proposed that the paradox of science is that it has become so connected to everything in human societies that it is not thought about by the public anymore. At the same time, science has been so successful in gathering knowledge that it has transformed human

societies. Knowledge itself has become a by-product of knowledge production. Science journalism training should certainly emphasize formal training in science because scientific knowledge has reached a high level of specificity; journalists must know something about its complexity. “One can’t rely on watching the gardener, but, rather, needs to be a gardener themselves in order to discover what gardening is all about,” he said.

Schiele admitted that scientific training is not enough, and he cautioned journalists against getting too caught up in scientific jargon when translating complex ideas to the public. He echoed the sentiments of all previous session speakers by asserting that critical thinking is essential. He sees the primary goal of science journalists as helping people to understand the world so that they can take part in society in a meaningful way.

Richard Taylor, Winner 1990 Nobel Prize in Physics, Stanford University, United States

Richard Taylor provided insight into how scientists view journalism. Taylor, a physicist now in his 70s, admitted that he was extremely skeptical about science journalists—so much so that at the age of 60 he had decided he never wanted to speak with journalists again! He has changed his mind since then and acknowledges that relaying science to the public is necessary. When asked whether science should be part of a science journalist’s training, Taylor confessed that he didn’t know, but that he certainly felt it would be helpful. He emphasized that the most important thing for journalists to understand is the method of science, not the specific content. He expressed his concern with the increasingly evident trend of government labs hiring scientific journalists with the goal of “putting words in their mouths.” Taylor cautioned journalists against being involved in such activities because the labs most often have very specific political agendas they are trying to push. He said that he wished science journalists had more understanding of statistics and what they mean. He also acknowledged that most scientists do not communicate their science well—hence the need for science journalists.

Questions and comments

A question and answer period saw several audience members frustrated with the discussion. At least two members stated that the two questions that were to be discussed in this session—“What is special about science journalism?” and “How do we educate science journalists?”—had not been dealt with by any of the presenters. A brief discussion—somewhat off topic—about the proposed Canadian Missile Defence System ensued. In a reply to the initial concern expressed, Bertrand Labasse, a speaker from part I, suggested that science journalists need to be better trained than other journalists because of the technical nature of reporting science.

A former intern of *Canadian Geographic* noted that there had been talk of a gap in understanding between journalists and scientists and that most of the discussion had spoken of a lack of understanding on the part of journalists. She questioned how much of the responsibility for understanding should, in fact, come from scientists. Calamai quickly championed this idea, stating that he has experienced frustrating conversations with scientists who didn’t understand

the first thing about the process of journalism. Often scientists get upset with journalists for issues that journalists have no control over—such as the word limits that results in some of the story not being printed. Calamai guessed that science journalists take more of the responsibility because they have to, to do their jobs.

A scientist in the audience expressed dismay at the afternoon’s proceedings, claiming that “science journalists all suffer from multiple personalities.” He implored those in the field to clarify the definition of science journalist. Calamai responded by insisting that journalism is a craft, not a profession, and that because of that, many are reluctant to define exactly what they are.

Science and Religion

Nadia el-Awady, Health and Science Editor, *IslamOnline*, Cairo, Egypt

Nadia el-Awady recounted her reaction when asked by the WCSJ organizers to participate in this session as a presenter. She did not understand why the session was being held and was not even aware that there are people who find friction between science and religion. A Hindu friend told her not to worry, commenting “It’s a Western issue.” El-Awady then presented the history of scientific contributions made by Arabs and went on to describe her publication, *IslamOnline*. Started in 1999, it is directed toward a varied audience and is produced in two distinct versions for its two language issues, Arabic and English. The health and science page is the second most popular page and has 65 contributing writers, 52% of whom are Muslim. The Arab-language science and technology page also registers a very high number of page views.

El-Awady did some surveys, one of readers and one of contributing science journalists. Among the results: a majority of Muslims and Christians thought scientists should be more observant of religious values when making their decisions. All three reader groups (Muslim, Christian, and atheists) thought that religious scholars do not receive enough information before making decisions on scientific issues. The third interesting response was that Muslim readers would be more proactive in environmental issues if they were put into a religious perspective.

The journalist survey was received with the same question as she had—“Why are you making an issue of this?” Findings revealed that 52% thought their science reporting was influenced by living in a society that was highly influenced by religion, 44% had removed religiously offensive material from a report, and 98% would not publish something shunned by their audience’s religion.

She then reviewed some of the real problems facing science journalism in the Arab world. Science stories are hidden in small weekly sections, there is poor financing for science journalism, stories are presented with minimum local relevance, there is poor networking among journalists, and many are working with outdated technology.

Denis Sergent, Science Journalist, La Croix, Paris, France

Denis Sergent explained that *La Croix* has a policy of editorial liberty while remaining doctrinally faithful. Although he has a lot of freedom, he does not feel it is total and he probably practices a form of self-censorship. He presented a 1992 survey of readers; there were few surprises. Sensitive topics are astronomy (including the Big Bang Theory), evolution, life sciences, ecology, military research, and the archaeology of biblical sites. Because of the position taken by the Roman Catholic Church (the dominant religious influence in France), the ultra-sensitive topic is the embryo and any related research. Sergent does report on these issues, but thoughtfully. The paper allows the movement opposing this type of research a voice and the two sides of the debate are seen as co-existing and talking to each other. The conclusions Sergent drew were that there are no major conflicts between science and religion (as el-Awady also said) but there are sensitive issues. The controversy occurs around ethical debates, but it remains easy to talk to opponents.

Margaret Wertheim, Science Writer, Commentator, and Author, Los Angeles, United States

Margaret Wertheim participated by telephone. She said in her Roman Catholic upbringing she never saw any conflict between science and religion. The point made by El-Awady that this is a Western dilemma is accurate and Wertheim would even narrow it down to a North American, if not U.S., problem. Part of the source of tension between science and religion originates in the way science journalists present issues as challenges to faith when they are not, suggesting that there is an inherent conflict, and trying to show the power of science over religion. The creationist movement, growing since the 70s, but still small in number, is another cause of tension and all religions are being judged by the reaction of this small slice of Christianity. A majority of people see science as beneficial and find that their faith is supported by science. The problems arise when a particular form of religion is being fuelled by ignorance, a problem Wertheim blames on the neglect of the education system. Science writers should have a better understanding of religion and refrain from irresponsibly spouting off, should refuse to feed into the “warfare model” of journalism, and should incorporate more of the historical relationship of compatibility that science and religion have had.

Questions and comments

Sergent asked Wertheim why American scientists defend the creationist view. Wertheim replied with a historical review of the rise of the creationist movement, the separation of church and state in the U.S., and the need for the creationists to present their beliefs as alternate scientific theory to get it into the school curriculum. There is now a creationist scientific institute with half-a-dozen scientists working to prove the theory. Wertheim classifies this as a faulty tactic as schools teach the most commonly accepted theories.

The questions from the floor began with an audience member asking if the panellists believed in a non-physical God who had interacted with a physical world. Wertheim replied that after deep,

long reflection she has become an atheist, because of the problem of evil and suffering, but is willing to accept that there are religious believers. She went on to reiterate that throughout most of western history, science and religion have worked in concert with each other, citing examples of many great scientists who were very religious, including Newton and Kepler. Sergent said that he has no certainty in this matter, is very interested in questions of religious belief and in the behaviour of people around him who are “believers” and live without a fixed dogma.

Sergent was asked what special care he takes when writing about a sensitive subject. He answered that he presents the facts, the hypotheses, and tries to capture the truth. Concerning stem cell research, he writes on the evolution of the research.

El-Awady was asked what are the sensitive topics in her part of the world. She replied that sometimes very superficial topics (research on the benefits of consumption of alcohol, for example) would elicit a reaction, but she has found that the key is in *how* something is presented.

The next question dealt with El-Awady’s survey and journalists replying that they felt religion could have a positive influence on science writing. El-Awady brought up the example of environmental questions, where incorporating religious thought and goals into a story could promote action on the readers’ end. Wertheim added that science journalists should not be asking scientists to weigh in on religious issues unless they are practicing because they are not experts in that field and often their answers are judged as those of experts (because of the value placed on science).

An editor from the audience reported that she had received calls from people asking about the magazine’s (a science serial for children) stance on evolution. These people do not subscribe after hearing the reply. The editor was wondering if Wertheim had any suggestions on how the affected children could be reached. Wertheim said that this is a critical issue that will be solved by nothing less than a revolution in the education system and at some point the U.S. government is going to have to change its policies on private and home schooling. She suggested at this point that perhaps the best approach is for science journalists to write for community publications, using sensitivity as El-Awady does.

A science journalist from Bangladesh indicated he did not include references to the Koran in his writing. El-Awady replied that she was able to do so because she worked for an Islamic website. The panellists were then asked if they thought that religion should be incorporated into science articles. El-Awady replied that it depends on the article, the topic, and where it is going to be used. Sergent does not think it needs to be incorporated systematically and in his approach to writing is as an atheist. Wertheim agreed that it depends on the appropriateness and the audience.

A question was asked about whether the western scientific approach breaks with nature while that of the east is more in harmony with nature. Sergent felt that if this is so, it is a reflection of a philosophical difference rather than a religious one.

The last comment was directed to El-Awady, the speaker saying that he had the impression it was easier to practice science journalism in countries where Christianity is the predominant religion. El-Awady stated she encountered no problems reporting something that is *scientific*.

Wertheim added that she saw El-Awady carefully addressing her readers, as all editors do, in an effort to convey information to as large an audience as possible.

Genetics of Common Diseases

Moderator: Anie Perrault

Tom Hudson, Founder and Director of the McGill University and Genome Québec Innovation Centre, Montréal, Canada

Tom Hudson remarked that understanding the cause of a disease is key to selecting its therapy. This was central to the Genome Project that aimed to better classify diseases and has now sequenced 99% of the human genome. “We now know some gene functions and that we don’t all have the same genome.” These differences give rise to disease, with about 10 million polymorphisms (the variation between two chromosomes), which are linked to an increase in the risk of disease. Such polymorphisms are found more often in people with a disease than those without. The APOE gene, for example, is more frequent in Alzheimer patients compared to the general population. He cautioned that these genes do not predict disease but merely indicate a greater risk. “We haven’t found an asthma gene yet, just an asthma risk gene.”

Hudson noted that polymorphism on one gene is generally highly coordinated with a neighbouring gene. This haplotype method is a very efficient way to find disease linked genes and has led to an international HapMap project that describes common patterns of sequence variation in the human genome from worldwide data. “Technology is moving very fast; every year the accuracy increases and costs decrease.”

Hudson indicated that sample collection and cohort information are essential to take the genetic data to the clinical level. While the Genome Project has provided many new clues, it is still just one piece of the puzzle. “We need to know the whole gamut of genes—not just one gene or the other.”

While there is much good news in genomics, there are also some pitfalls. Although association studies are powerful, they are problematic with false positives and false negatives. “You may be measuring population rather than genetic differences,” he said. Citing a review of 160 polymorphism studies, Hudson noted in only six of them were they seen consistently. This is due to the large margins of error in some of the studies, which was directly related to the small sample size used. Studies of 1,000 cases or more, on the other hand, all give consistent results. Hudson suggested that these discrepancies may be a thing of the past with significantly lower costs of analysis, replication, and the reporting of only low probability values.

Hudson observed that environment has an important role to play in increasing risk and that the gene-environment combination is a complex one. Finally, he said “what is true for populations is not always so for individuals,” noting that patient information has to be integrated.

Fernand Labrie, Director, CHUL Research Centre, Montréal, Canada

Labrie related that the ATLAS project determines profiles of steroids. The project's objectives are to identify candidate genes as key regulators of steroid action in physiological phenomena and disease, and to identify potential therapeutic agents with an end goal of producing hormone encyclopedias. Some hormones under study include estradiol, DHT, progesterone, cortisol, and aldosterone. Steroids influence all body tissues and hence, diseases, such as breast, prostate, uterine, and ovarian cancers.

Labrie explained that hormones can bind to specific cell receptors, which activate other cell factors. All cells have the same genome yet some receptors respond while others do not—a result of tissue specificity. Research indicates that hormones not only come from gonads but also from peripheral tissues. “This has important implications for treatment,” said Labrie. In young women, 50% or more of estrogen is released from the ovaries compared to menopausal women in whom not only overall production has decreased, but also 100% of estrogen production comes from peripheral tissues.

Labrie noted that hormones used in doping are also used for diagnosis, prognosis, and therapy in cancers. Furthermore, gene expression is clearly modulated by hormones with many inherent “brakes” and stimulators, using androgen and its role in prostate enlargement as an example. In one application of the ATLAS project, Labrie talked about designer steroids that are undetectable to testing. One example is tetrahydrogestrinone (THG) that induces a genomic signature typical of a potent anabolic steroid—DHT. He illustrated that the genetic pattern of DHT and THG are highly similar as are their actions in building certain muscles.

One participant asked how scientists struggle with the notion that they are feeding into the drug industry rather than focusing on prevention. “Are we driving diabetic native people to take more drugs as opposed to considering different lifestyle choices?” Hudson replied that there is never just one answer to a public health problem. In colon cancer, for example, the genetic work is clearly preventative. For diabetes, however, no genetic work is necessary to understand the risk factors. “There is a myth that we already know enough, yet this is not the case.” The more researchers know about risk factors, the more that preventative programs can be tailored to the individual. Still, the issue of translating genetic research to health care practice is not an easy one.

Labrie added that in the case of cancer, many genes and risk factors are involved; clearly, prevention is very important. At the same time, knowledge of hormones and associated genes can further understanding of the mechanism of these diseases. “New findings can bring new knowledge to allow us to better shoot in the right place.”

Another delegate noted that since the development of analytic technology, humans have been largely concerned with themselves; more recently, however, the technology has been turned toward the “enemy” (i.e. a virus). Labrie agreed that the technology no longer applies to humans only, but other organisms as well (i.e. SARS).

Hudson underlined that the genomics of microbes and humans are distinctly different.

Furthermore, “they are fast mutators and we are slow.” Nonetheless, there have been some important applications of the Genomics Project, such as leprosy infection resistance where the haplotype approach identified a nerve cell gene. Perhaps leprosy resistance is not a question of immunity but genetics.

Questions and comments

On the point of study credibility, one participant questioned if journalists should be reporting on studies where reproducibility is low and genetic polymorphisms are only seen once. Hudson agreed that this was a difficult issue, but that journalists should watch for high levels of confidence, low margins of error, and large sample sizes. Additionally, some journals have more rigorous peer review processes than others. It is surprising that in only six of the 166 gene association studies that were reviewed, genes were recurring. It is less surprising, though, in the context of a field where no one wants to publish marginal P values or negative results. Hudson reiterated that in the early years of genetic research, studies had small sample sizes due to financial restrictions that are now no longer barriers. The genes that had consistently highly reproducible associations included CCR5 implicated in HIV/AIDS, a factor in flavitis, INS for Type I diabetes, and factors in Creutzfeld-Jacob disease and in Alzheimer’s. These genes represent natural blocking actions that drugs are trying to mimic.

Another delegates asked if the speakers could discuss applications of the Genomics and ATLAS projects. Hudson noted that the main purpose of his project was to give scientists a tool for finding receptors. The project paved the way for the HapMap project, which also shares the goal of finding risk factors for diseases. The direct application is that all genetic labs use these genomic maps to do their research. “Today it is for the research community, down the road for therapy.” Labrie noted that ATLAS has enabled researchers to pinpoint genes responsible for the main mechanisms of some cancers, yet “we are still looking for the driver’s manual” for this mechanism in secondary tissues. Once there is a genomic profile for a tissue-specific hormone and there is an understanding of how it is modulated, there will be an avenue for intervention. Hudson remarked that “tissue specificity means a lot for scientists,” noting that side effects of many drugs are the result of non-specificity. An example is the use of inhaled, yet non-tissue specific steroids in asthma treatment with the side effect of osteoporosis. “Once we know how to get more tissue specific, we can better target drugs and reduce side effects.”

Perrault asked if TGH was the steroid that couldn’t be tested on athletes. Labrie confirmed that this previously undetectable compound was indeed an androgen. Another group member wondered if the pre- and post-menopausal slide in hormone production could be affected by maintaining muscle mass. Labrie acknowledged that there is a clear difference in adrenal production of estrogen and androgen in peripheral tissues. While estradiol levels aren’t measurable in blood, they drop significantly in breast tissue. This doesn’t happen in breast cancer, Labrie noted. This again underscores the importance of tissue specificity where researchers have to look in each cell. Bone osteoporosis, for example, is likely due to a local decrease in androgens that could be averted with estrogen formation blockers.

Another participant asked if there was a simple set of rules that journalists could use to

distinguish study results from small and large sample sizes. Hudson noted that there is no simple rule; however, if researchers suspect a gene that increases disease risk 50-fold then fewer samples are required. Few genes are like this; more frequently a two-fold increase in risk is expected, suggesting a sample size of about 500 cases. A better gauge is if the study can be replicated with a second cohort. Hudson cautioned that false positive and negative studies also arise due to overriding environmental factors. “You need to know about the cohort and their environment.” Labrie added that sample sizes may be population specific and that the results may only be applicable within the study context. Hudson disagreed, noting that red flags are raised when studies have no replication and can’t be reproduced.

Appendix: Acronyms and Initialisms

ACSQ	Association des communicateurs scientifiques du Québec
APOE	apolipoprotein E
ASP	Agence Science Presse
BSE	Bovine Spongiform Encephalopathy
CASES	Canadian Arctic Shelf Exchange Study
CCOHTA	Canadian Coordinating Office for Health Technology Assessment
CIHR	Canadian Institutes of Health Research
CIHR–IAPH	Canadian Institutes of Health Research–Institute of Aboriginal People’s Health
CSWA	Canadian Science Writers’ Association
EAC	Editors’ Association of Canada
EPA	Environmental Protection Agency
FAO	UN Food & Agriculture Organization
GHG	greenhouse gas
GMO	Genetically Modified Organism
HON	Health on the net
ICT	Information and Communication Technologies
IAEA	International Atomic Energy Association
IDRC	International Development Research Centre
INAHTA	International Network of Agencies for Health Technology Assessment
INMHA	Institute of Neurosciences, Mental Health and Addiction
IPCC	Intergovernmental Panel on Climate Change
IPY	International Polar Year
MEA	Millennium Ecosystem Assessment
NSERC	National Science and Engineering Research Council
NWRI	National Water Research Institute
OECD	Organisation for Economic Co-operation and Development
PBDE	a class of brominated compounds
PCBs	polychlorinated biphenyls
PI	Perimeter Institute of Theoretical Physics
POPs	Persistent Organic Pollutants
PWAC	Periodical Writers’ Association of Canada
RHT	Risk Homeostasis Theory
SARS	Severe Acute Respiratory Syndrome
UCW	Union of Concerned Scientists
UCS	Union of Concerned Scientists
UNEP	United Nations Environment Program
WMD	weapons of mass destruction
WHO	World Health Organization