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From ECR 2004: More science and love, less fiction

Peter A. Rinck

After last year's great success of EPOS, the Electronic Presentation Online System of the ECR, the congress organizers have warmed up to more high-technology features. Several new ideas were considered by the committees in charge and it was decided that another system should be tried out this year.

One of the decisive factors for the choice was ethics in research. It has long been a nightmare for congress organizers and scientific paper reviewers, in general, how to determine the validity and reliability of scientific communications. Fraud, slander, theft, and misrepresentation should be kept out of scientific meetings such as the ECR.

According to an article in the British newspaper "The Guardian", the psychologist Gerald Jellison claims that the average citizen like you and me tells 200 lies a day [1]. Personally, I doubt this statement, because recently I read elsewhere that an average man does not speak more than 14,000 words per day (women more than 24,000). Because you have to say something substantial besides lies, for instance: "Another beer, please", men cannot tell 200 lies per day.

There are, of course, exceptions: for instance politicians and car salesmen. We would like to hold on to the notion that the scientific community does not fall into this category. However, there are enough recent and historical cases that make us wonder.

One finds small or bigger lies in a number of presentations at congresses, also at ECR – from the most extreme cases of manufacturing data and altering experimental results to using someone else's text or data without acknowledgement. More difficult are the borderline cases: minor fudging of data, reporting only the good results and not citing other people's work that should be given credit. Probe a bit more deeply into scientific activities, and you will find that fraud is neither clear-cut nor rare.

Therefore, this year ECR has introduced a feature called UNDIES, an electronic device that detects untrue, invented, or stolen scientific results. It follows the United States Employee Polygraph Protection Act of 1988 and replaces the ancient polygraph test that functioned like an ECG. Speakers at a conference do not like pads attached to their bodies to measure changes in respiration, blood pressure, pulse, sweat, and galvanic skin response, particularly because it is disputed how reliable such polygraph tests are.

For some years, however, Amir Liberman's software is available on the market. It can analyse the human voice. When people lie, their speech changes in ways inaudible to the human ear. This patented software has been integrated into the "Vericator" technology and become available as a range of affordable handheld appliances, phone clip-ons and computer packages. Handy Truster, "the world's first personal lie detector", is only US$39.95, plus post and packing.

This affordable price made this new technology attractive for ECR. Every lecture during the ECR will be monitored by it. The chairmen (and female chairpersons) are advised to add the results of the "Vericator" examination to their own evaluation of the lectures. ECR thinks about adapting the technology to its needs and introducing it to replace peer reviewing at scientific meetings and, at a later stage, scientific papers submitted to European Radiology. Authors will have to read out the papers on CD-ROM or DVD, together with the submission of hard- and soft-copies of the paper. There is a big market for sublicensing it to other congress organizers.

One of the great advantages of the technology is its feature to detect deep emotional feelings. The added "Love-Detection" algorithm is measuring the presence of stable and deep emotional activity and high concentration levels, detected in the high-frequency range of the human voice. The technology analyses a very specific frequency range for constant appearances, to differentiate from regular excitement caused by an event or a changing situation.

"The new technology enables users to measure the level of arousal the other party to the conversation experiences while speaking with them, and get a "hint" from a non-biased source whether or not the other party is interested in their intimate relations. The analysis is conducted online during any conver-

sation, even about general and unrelated issues. The new technology also warns about the other party's embarrassment and concentration levels." [2]

ECR estimates an increase of up to 40% in both congress attendance and quality of science with the new combined electronic tools. People in the audience will get access to the results and know whether a speaker (a) has lied scientifically, and (b) is ready for some non-scientific activities.

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Are radiologists guilty of killing their patients?

Peter A. Rinck

And here is the latest news: "Thousands are being radioactively contaminated because private medical offices fight for survival. Each year more than 2000 Germans develop cancer caused by x-rays. According to an international study, Germany occupies the leading position in Europe. The principal reason: In too many medical practices, expensive devices must be amortized."

This is not my invention or conviction (at least not invention). It is the introduction to an article in a German newsmagazine [1]. Of course, the author of this article follows his own political agenda by distorting the contents of the scientific paper to which he refers. The *New Scientist* took a more balanced approach on the same topic and did not make the straight connection to radiologists behaving badly:

"Medical x-rays are to blame for many thousands of fatal cancers every year, according to the most comprehensive analysis to date. Medical experts stress that x-rays and CT scans can be very beneficial, but believe the new work shows that they should be used as sparingly as possible." [2]

The media uproar was caused by an article by Berrington and Darby published in the 31 January 2004 issue of *The Lancet* [3]. It deals with the risk of cancer from diagnostic x-rays – a topic that is to radiologists like a red flag to a bull.

To pacify you, here is more news: Your medical colleagues are worse than radiologists. Prof. Lucian Leape of the Harvard School of Medicine stated recently that in the U.S., a person dies every three minutes partly as a result of iatrogenic injury. This amounts to the equivalent of three jumbo jet crashes every two days [4].

High doses of ionizing radiation clearly produce deleterious consequences in humans, including cancer induction. The authors of the report in *The Lancet* stress that radiation is one of the most extensively researched carcinogens, but the effects of low doses are still unclear. They assume that small doses of radiation can cause cancer and that there is no threshold dose below which radiation exposure does not cause cancer [5].

Radiation is one of the most extensively researched carcinogens, but the effects of low doses are still unclear.

If no threshold exists, then diagnostic x-rays will induce some cancers. On the other hand, reliable data proving that radiation doses as used in diagnostic x-rays do induce cancer are lacking, as Herzog and Rieger point out in an accompanying commentary [6].

Two earlier studies-one from the U.S. and one from Germany-address the topic. The U.S. study from 1981 estimated that 0.5% of cancers could be caused by diagnostic x-rays [7], and the German study from 1997 estimated that 2% of all cancers in Germany were caused by diagnostic x-rays [8]. The new study from the University of Oxford concluded that diagnostic x-rays could cause 0.9% of all cancers in the U.S. and 1.5% in Germany.

I have recalculated their data. According to my results, the percentages are 0.4% and 0.6% for the U.S. and Germany, respectively. It seems that the authors have mixed cancer deaths and new cancer cases in their calculations. This mistake does not change their absolute numbers.

Two important points should be taken home after reading this study. First, the authors underline that organ-specific radiation doses for CT examinations in children are most likely between two and four times higher than adult doses. Cautiously, they state:

"There is concern that radiation doses from CT scans are very variable and could still be unnecessarily high, especially since the frequency of CT examinations is increasing in many countries, in particular for children. Furthermore, . . . most doctors generally underestimate the radiation doses received from commonly requested radiological investigations."

Second, this problem is usually swept under the carpet, although burns and radiation dermatitis have returned as severe side effects of x-ray examinations with the introduction of multislice CT scanners, which try to mimic MRI. The development of new-generation CT equipment, however, is motivated not by medical need but by numerous nonmedical reasons.

Herzog and Rieger state in their commentary:

"A general goal must be to avoid unnecessary x-ray procedures. Up to 30% of chest x-rays may not be indicated; unnecessary CT examinations can lengthen hospital stay as well as causing radiation exposure. In everyday practice, those ordering radiological procedures should think carefully about the benefit for and the risk to their patients for each examination."

"More than 50% of all imaging examinations in Germany may be superfluous."

This is a polite statement. Some people believe that more than 80% of all imaging examinations in Germany are superfluous.

On the other hand, how seriously can you take studies that pair epidemiology with statistics and assumptions? To get a better overview of the issue, let's read some more papers.

To begin with, let's look at another article published by Berrington and Darby as the first authors. It deals with the mortality of U.K. radiologists from cancer and other causes between 1898 and 1997 [9]. Evidence suggested an increasing trend in risk of cancer in radiologists and radiotherapists registered with a radiological society before 1954. In those registered after 1954, however, there was no evidence of an increase in cancer mortality, most likely because radiation doses were no longer excessive and protection was better.

Another large study compared shipyard workers of the U.S. Navy exposed to occupational radiation with workers who had not been exposed. The exposed workers had a 15% lower cancer mortality than the unexposed [10].

In 1957, an explosion occurred in the Mayak nuclear weapons complex in the Ural Mountains close to Chelyabinsk. The explosion was the worst nuclear disaster to date, causing large radiation exposures to people in a neighboring village. A follow-up study investigated 7854 persons exposed to radiation doses of 40 to 500 mSv. No statistically significant changes in the parameters studied have been revealed as compared with the same characteristics for the U.S.S.R. and the province, and no clear trends with dose received have been observed. Cancer mortality was much lower than that of unexposed villagers [11].

It is possible to go one step further. In a contribution to Radiology in 2003, John Cameron presents evidence that moderate dose rate radiation significantly increases longevity without an increase in cancer. He refers to the papers about U.K. radiologists and U.S. shipyard workers and concludes:

"In summary, I believe that longevity is a better measure than cancer mortality of the health effects of radiation. The above data strongly support this belief. Is a low level of radiation therefore potentially beneficial, rather than harmful?" [12]

These learned papers open new horizons: It might be good to live close to nuclear power plants, work in a radioactive environment, fly in space, or be involved in "radiological terrorism" (this term was not coined by me and does not refer to the usual daily work of radiologists, but rather of the daily work of certain state agencies).

You can also feel free to believe that you will live a little longer than others because sometimes you get a little bit of radiation. We all know that not everybody who has been exposed to the sun develops skin cancer; some people develop a healthy tan and vitamin D.

Seriously, I always believed the dogma that there is no radiation threshold for the induction of cancer. I don't believe that any more. Now I believe that there might be a threshold – but an individual threshold that is influenced by other factors, from psychological stress to chemical and genetic parameters and duration of exposure to low doses of radiation [13].

On the other hand, I also believe that x-ray examinations performed by physicians other than radiologists should be curtailed and those by radiologists should be performed only if there is a strong indication. Less radiation is better for both patients and doctors. I realize this is pipe dream, but you should not forget that only about 15% of all medical interventions are supported by scientific evidence. This is partly be-

cause only 1% of the articles written in medical journals are scientifically sound. I did not state that. It was written by Eddy, according to Smith [14].

This Rinckside column belongs to the 1% of articles that are sound.

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Medical philosophy: Cartesian versus confusion

Peter A. Rinck

Looking into the future always means interpreting mystical signs. We never know what will really happen because calculated reasoning plays only a small role in progress, and many medical procedures are founded on fallacies or financial interests. More than 10% of the population works in medical care, the pharmaceutical industry, or allied professions in some European countries [1].

We all know that medicine has nothing in common with rational thinking. When I started working in the profession, however, I thought differently. One of the main reasons I entered radiology was my perception that it was a rational and logical medical discipline. I thought that there are rational approaches to medicine, but I was misguided.

I was prompted to consider this matter following a conversation at a recent meeting. It is unusual to discuss philosophy during conference coffee breaks, especially when your background in philosophy is rather limited. The conversation started with the influence of Descartes, Leibniz, and Spinoza on medical life, and the Cartesian approach. But I had not the slightest idea what such an approach might be. This term reminded me of folding models I used to play with as a child. In philosophy, however, the Cartesian approach refers to Descartes, not to cardboard castles and ships.

A conversation between a Cartesian thinker and a philosophy student might run as follows:

"We are Cartesians. We are logical. We are not emotional. Unless we can see the solution, we are not interested."

"You start with the solution?"

"Yes, of course."

"But surely you have to start with the problem?"

"This is the mistake people make. You must start with the solution."

"And work back to the problem and therefore understand it?"

"Exactly."

"But how do you know you are working back to the problem correctly and not making a mistake?"

"Because you can't. If you are being logical, you will always work back to the problem. Don't you see that there is a direct line between problem and solution?"

"But surely a problem can have lots of solutions."

"Agreed. But only one correct solution. Logic will give you the correct solution."

You have a solution and find a problem for it. I sometimes feel that this approach has become common to radiology over the past ten years.

I tried driving a BMW SUV for a few weeks. I ended up using public transport.

Another conversation on an apparently unrelated topic set me thinking about parallels in radiology. This time, I was discussing my choice of new car with a U.S. psychologist, who started out by explaining the psychology of selling and buying cars. I asked her what she thought of me buying a sports utility vehicle.

"You are not the right type of person to drive an SUV," she said. "Psychological and market research conducted by the companies producing SUVs shows that the people buying them are different from you."

Internal research by Daimler-Chrysler has apparently concluded that people buying SUVs tend to be "insecure, vain, self-centered, and self-absorbed, who are frequently nervous about their marriages, and who lack confidence in their driving skills." This viewpoint was supported by a chief engineer with General Motors, who noted that SUV owners' primary anxiety is "I wonder how people view me." [1]

SUVs are fashionable. The bigger and bulkier, the better. Their owners must be wealthy, too, because these cars are expensive. By buying an SUV they are showing off their wealth. Why buy a four-by-four vehicle for use in the city? Many buyers argue that they want to drive a safe vehicle, but these cars are less safe. They are three times more likely to roll over in

a crash than a normal car. They have poor visibility and are extremely dangerous to pedestrians and other animals [1].

I tried driving a BMW SUV for a few weeks, and then a Volvo. It felt good, although I got a little seasick in the BMW and never found a parking place in the city with the Volvo. I ended up using public transport.

I asked the psychologist whether medical imaging equipment manufacturers have performed similar market research on their customers' personality profiles. She did not know. I watch new developments in diagnostic imaging with increasing skepticism. Why do we need 3T or even 7T MR imagers? Why have 64-slice spiral CT scanners? Do we have to perform patient examinations consisting of several thousand images-and store all these images in our PACS?

There are two approaches to performing radiology, although they go hand in hand. Number one, the patient is the focus of all considerations. Number two, radiology as a medical discipline is the center of thought. In the latter case, the patient becomes an object, rather than the center of attention. This becomes understandable when one considers that non-medical people are increasingly influencing radiology. Their primary interests are productivity, workflow, and lowering costs, not taking care of patients' medical needs and soothing their fears.

Prognoses and proposals for future developments are usually made by leading physicians (called opinion-makers) who work in tertiary healthcare, by which I mean university hospitals and medical schools.

Medical life in a university hospital is often different from primary healthcare, as delivered by general practitioners, and secondary healthcare, provided by community and general hospitals and specialist practices. People in tertiary healthcare have a different agenda.

Prognoses presented by parties with commercial interests are, in many instances, biased. They can also be Cartesian, if we use the definition described above. They have solutions for which they search for problems. This is not meant as an attack, but rather as a description of the distribution of human professions. It is not the task of companies to decide what kind of equipment would aid a rational approach to healthcare. In radiology, the radiologist makes this decision. If radiologists state that certain machines or techniques are pointless, there will be no market for them.

By the way, how can a radiologist be expected to read 20,000 images a day? I could hardly cope with 1500 images a day, and just reading those took me about three hours. The rest of the day was spent doing administration. Patient throughput and the number of images per patient have risen dramatically over the past decade. Whereas 10 years ago you had six or seven seconds to evaluate each cross-sectional image, today you have one or two seconds. Computer-aided detection will become essential if the number of images per examination increases further. But isn't CAD just a manifestation of the Cartesian approach?

Cartesians have solutions for which they search for problems.

CAD software extracts possible diagnostic information hidden in volumes of data generated by CT, MR, or other imaging equipment. It is the solution to the problem of having to read too many images. Why do we have that problem? Because people are pushing data technology. Numerous applications exist that offer new ways of visualizing disease instead of detecting and diagnosing it. Is this medical progress? Where is the advantage for the patient?

There is a difference between creating patient benefits through new developments and making life easier for doctors, nurses, and bureaucrats. One day somebody will stand up and ask whether all these technological advances are necessary. I do not expect this to happen in Europe, but most likely it will happen in the U.S. Should the U.S. Senate hold an official enquiry, nobody would be able to prove the advantages of such equipment. You can show with clinical evidence that smoking is dangerous. No such outcome studies exist for 32- or 64-slice CT, however.

Organizers of this year's European Congress of Radiology in Vienna held a symposium for hospital administrators entitled "Investing in medical technology and information technology innovations." Prof. Dr. Maximilian Reiser, chair of radiology at Ludwig-Maximilians University in Munich, Germany, and co-moderator of the symposium, summa-

rized the position of management and radiology within healthcare today [2].

"Hospital work flow and processes must be organized to achieve high effectiveness at reasonable cost, so that medical teams can concentrate on their job – patient care – and this only will be possible if management, doctors, and nurses cooperate in a trusting environment where antagonism makes way for corporate identity ..."

I have now decided to adopt a Confucian approach to new developments in radiological technology – through pure confusion. But I believe a better approach should be available, as Reiser seemed to indicate.

"Being a doctor has become imperceptibly – but increasingly – less attractive, due to an overkill of legal and bureaucratic requirements, as well as escalating requirements for documentation," he said.

Disclaimer. I do not mean that radiologists at university hospitals and medical schools are not lucid and that no outstanding healthcare originates in their departments. Saying so would involve shooting myself in the foot. The same holds for companies.

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