Science and disinformation: handling nonsense on stilts by the media

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Organization of Newsombuds & Standards Editors Conference

Media24, Cape Town, May 2024

Similarities between journalists & scientists

- **The first couriers of technology: the fire messenger**
- Journalists & scientists are like Prometheus, bringing knowledge to empower people, to enlighten & enrich society

Prometheus carrying fire – Jan Cossiers (1600-1671; Prado Museum, Madrid)

What journalists should know about science

- **1. Not making a distinction between textbook science and frontier science**
- **Textbook science** is the settled scientific knowledge on which (in natural sciences) one can build one's own work.
- In contrast, **frontier science** is as it is actually being conducted. Its results have just been obtained, they are uncertain and unconfirmed.

- H.H Bauer. 1992. *Scientific Literacy and the Myth of the Scientific Method*. Urbana & Chicago: University of Illinois Press).

What journalists should know about science

- **2. The question of balance**
- “Balanced coverage of science does not mean giving equal weight to both sides of an argument. It means *apportioning weight according to the balance of evidence.*”
- Boyce Rensberger Nieman Reports, Fall 2002: http://niemanreports.org/articles/what-every-journalist-should-know-about-science-and-science-journalism/

No balance … evidence vs. wishful thinking

Hard facts,
proven by:
observation,
testing,
experimentation,
independent
confirmation
by others

Denial springs eternal;
No evidence;
No factual support of mere expectations;
scam artistry & quackery;
dreams, hallucination;b latant lies

What journalists should know about science

- **3. Not understanding risks <u>with</u> benefits:**

Not understanding risks with benefits

- **The Paracelsus Principle** (1493-1541):
- *All substances are poisons; there is none that is not a poison. The right dose differentiates a poison from a remedy.*
- *There are no safe drugs, only safe ways of using them.*
- John Trimbell: *The Poison Paradox – Chemicals as Friends and Foes (*Oxford University Press*)*

Not understanding risks with benefits

- “Virtually all new technologies pose risks along with benefits. Thus ‘safe and effective’, whether applied to drugs or new devices or processes, are always relative terms. It is irrational to ask whether something is safe or not. Nothing is 100 percent safe. Policy decisions involving science must balance risks and benefits.”
- Boyce Rensberger: Nieman Reports, Fall 2002: http://niemanreports.org/articles/what-every-journalist-should-know-about-science-and-science-journalism/

What journalists should know about science

- **4. Do not only accentuate the positive and ignore the negative**
- Don’t ever distort scientific findings to fit into the newsworthy mould. Journalists and science communicators should always keep a balance between the positive results of research findings, and the negative aspects, the latter often hidden away in the conclusions or discussion section in peer reviewed articles.

What journalists should know about science

- **5. Be sceptical of anecdotes – and avoid the *post hoc ergo propter hoc* fallacy**

- Humans have a tendency to assume that if one event happens after another, then the first must be the cause of the second.
- Anecdotes are dangerous because they are mostly selective and taken out of context, without the negative aspects being emphasised. “Although single cases may *illustrate* the effects of a treatment, anecdotes should never be portrayed as *evidence*.”
- Ragnar Levi. 2000. *Medical Journalism – Exposing Fact, Fiction, Fraud*. Athens, Iowa: Iowa State University Press.

What journalists should know about science

- **6. Be careful with your sources, always using the primary source first**
- Always read the conclusions at the end of a study first. Watch out for phrases such as “the preliminary results …”, or “further research has to be conducted …”, or “the uncertainty of these findings …”. Ask questions about the size of the survey and sample of patients, was it a double-blind study, the risks, the possibility of chance influencing the results, etc.
- “Results from one trial, particularly the first controlled experiment, should not determine the fate of a treatment.” - *New England Journal of Medicine*

What journalists should know about science

- **7. Wrong or insufficient interpretation of numbers:**
- Always ask: Is that a big number? Size matters.
- Understand what the **P-value** means and ask what it was in a study:
- A P-value of .05 or less, meaning there are only 5 or fewer chances in 100 (or a 5 or less percent probability) that the result could have happened by chance, is regarded as low, and thus statistically significant. The higher the value, the more likely the result is due to chance, and thus not reliable.

What journalists should know about science

- **8. Ignoring conflicts of interest:**
- The independence of a study's researchers is vital to its credibility. Always ask: who funded the study? Financial interests can have a direct influence and bias on results.
- A conflict of interest is defined by Ben Goldacre as "when you have some kind of financial, personal, or ideological involvement that an outsider might reasonably think could affect your reasoning" (pp. 321-322).
- Ben Goldacre. 2012. *Bad Pharma – How Drug Companies Mislead Doctors and Harm Patients*. London: Fourth Estate)

What journalists should know about science

- **9. Offering misleading or harmful tips:**
- Because of the nature of news presentation, news is often summarised by journalists giving lists of tips on scientific or other subjects. It has the advantage that it simplifies science news by giving short pointers to for example health matters. Make sure these tips are based on scientific facts, not on pseudoscientific marketing or misinterpretation by not reading the full findings or corpus of research.

What journalists should know about science

- **10. Always ask for the evidence:**
- “Scientific principles and laws do not lie on the surface of nature. They are hidden, and must be wrested from nature by an active and elaborate technique of enquiry.”
- John Dewey. 1920. *Reconstruction in Philosophy*.

Always ask for the evidence

- The need for evidence is linked to its trustworthiness: “Science demands evidence, and some forms of evidence are worth more than others are. A scientist’s authority should command attention but, in the absence of evidence, not belief.”
- Boyce Rensberger Nieman Reports, Fall 2002: http://niemanreports.org/articles/what-every-journalist-should-know-about-science-and-science-journalism/).

What journalists should know about science

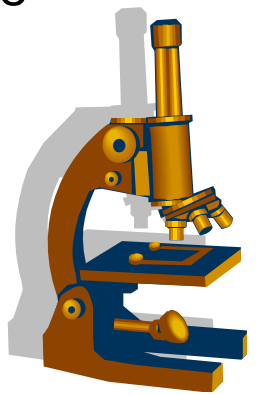
- **Red flags** on evidence in studies:
- Preliminary results
- No control group
- No randomization
- Few observations
- Non-representative sample
- Many dropouts
- No blinding
- Brief follow-up
- Irrelevant outcome measures

What journalists should know about science

- **11. The certainty of science is its uncertainty**
- “Uncertainty is a sign of honest science and reveals a need for further research before reaching a conclusion. Cutting-edge science is highly uncertain and often flat-out wrong.”
- Boyce Rensberger. Nieman Reports, Fall 2002: http://niemanreports.org/articles/what-every-journalist-should-know-about-science-and-science-journalism/).

What journalists should know about science

- **12. Know how scientists work, get to understand the scientific method:**
- Scientists follow an elaborate process, a scientific sequence containing the following elements:
- Observations and search for data
- Hypothesis to explain observations
- Experiments to test hypothesis
- Formulation of theory
- Experimental confirmation/rejection of theory
- Mathematical or empirical confirmation of theory into scientific law
- Use of scientific law to predict behaviour of nature
- Surendra Verma. 2005. *The Little Book of Scientific Principles, Theories & Things*. Sydney: Reed New Holland)



What journalists should know about science

- **13. Know the difference between science & pseudoscience:**
- Two rules determining the success and credibility of science, distinguishing it from pseudoscience & quackery:
- Expose new ideas and results to independent testing and replication by other scientists
- Abandon or modify accepted facts or theories in the light of more complete or reliable experimental evidence
- Robert Park. *Voodoo Science – The Road From Foolishness to Fraud,* p. 39

What journalists should know about science

- **14. Science is about unravelling myths**
- Science must begin with myths, and with the criticism of myths – Karl Popper

Science is about unravelling myths

- Ten or twenty billion years ago, something happened – the Big Bang, the event that began our universe. Why it happened is the greatest mystery we know. That it happened is reasonably clear. – Carl Sagan
- ‘My dear, descended from the apes! Let us hope it is not true, but if it is, let us pray that it will not become generally known.’ – Wife of an Anglican Church bishop, expressing her concern about the implications of Darwin’s *The Origin of Species* (Richard E. Leakey & Roger Lewin. 1977. *Origins: What New Discoveries Reveal About the Emergence of our Species and Its Possible Future*. E. P. Dutton, New York, p. 21.

Thank you!
Baie dankie!
Siyabonga kakhulu!
Siyabulela!
Kea leboha!
Danke schön!
Merci beaucoup!
Muchas gracias!
Mange tak!