Responsibility of media coverage and media attitudes towards Science and Technology

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I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

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Abstract

The media have a great responsibility to communicate more science to improve public understanding of science to help them make sense of their world. The aim should be to popularize scientific ideas and to create a better understanding of how science is daily altering lifestyles and culture. Scientific literacy is an important element of an all-round educated person, and the media need to fill whatever blanks have been left by his or her formal education. The function of the scientific journalist is to transform scientific ideas and results into a form that other groups can understand. This transformation is as much an intra-scientific as well as an extra-scientific matter, and the forms that such communication take and the consequences for intellectual development vary according to the sort of field involved, the audience addressed and the relationship between them. This transformation process must not affect the truth status of scientific knowledge, but it obviously changes the form in which this knowledge is expressed. Scientists need to unveil the secrets of nature, and need to explain to the public that science is always incomplete and incremental, that knowledge is imperfect. Communicating with the media is becoming an obligation, and popularizing of science is becoming an integral part of the professional responsibility of practicing scientists. This overview indicates that there is a need for scientists to increase their communication skills and activities across a broad field and for journalists to increase their understanding and training in science.

Opsomming

Die media het ‘n groot verantwoordelikheid vir beter wetenskap verslaggewing om die publiek te help om sin te maak van die wêreld waarin hulle lewe. Die doel moet wees om wetenskap te populariseer en om ‘n beter begrip te kweek van hoe die wetenskap die daaglikse lewe beïnvloed. Wetenskaplike geletterdheid is ‘n belangrike komponent van die totale opvoeding van die mens en dit is die verantwoordelikheid van die media om die leemtes te vul wat gelaat is na sy of haar formele opleiding. Die funksie van die wetenskaplike verslaggewer is om wetenskaplike idees en resultate te transformeer in ‘n formaat wat ander groepe sal kan verstaan. Hierdie transformasie geld net so veel op intra-wetenskaplike as ekstra-wetenskaplike gebied, en die wyse van kommunikasie en die gevolge van intellektuele ontwikkeling wissel na gelang van die betrokke gebied, die teiken gehoor, en hulle verhouding met mekaar. Alhoewel die transformasie proses nie die korrektheid van die wetenskaplike kennis moet verander nie, beïnvloed dit wel die wyse van aanbieding. Wetenskaplikes moet die geheime van die natuur ontbloot, en aan die publiek verduidelik dat die wetenskap altyd onvolledig en toenemend van aard is. Kommunikasie met die media het ‘n verpligting geword en die popularisering van die wetenskap is nou ‘n integrale deel van die professionele verantwoordelikheid van aktiewe wetenskaplikes. Hierdie oorsig dui daarop dat daar ‘n behoefte is vir wetenskaplikes om hulle kommunikasie vaardighede op te skerp oor ‘n breë veld, en vir joernaliste om beter begrip te toon vir die wetenskap.

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INTRODUCTION

The scientific establishment and national governments have come to the realization that the public must understand science if they are to be useful citizens, capable of functioning correctly as workers, consumers, and voters in a modern technological world. The media, under the direct control of neither scientists nor government, have nonetheless been put under pressure to communicate more science. It makes new demands on busy scientists, journalists, and the public. The aim should be to improve public understanding of science and to address the real needs of citizens and to help them make sense of their world. The "Public Understanding of Science Movement" is eloquently described by Gregory and Miller (Gregory, 1998 Ch 1).

The popularization and dissemination of scientific knowledge is seen here as a major aspect of relationships between groups of knowledge producers (the scientists) and knowledge acquirers (validators and wider publics). As empirical natural sciences grew in prestige and ability to control substantial resources, their intellectual standards came to dominate general conceptions of knowledge and truth and, at the same time, separated the production of scientific knowledge from the educated public so that research became an esoteric activity. The emergence of intermediate publications such as *Scientific American* or *New Scientist* aims to popularize scientific ideas and often claim general implications and their relevance for broader scientific concerns.

The expansion and enlargement of the problems dealt with by the sciences has led to popularization becoming as much an intra-scientific as an extra-scientific matter. In many cases, to gain access to necessary resources, to gain major reputations across specialist fields and to gain assistance with broad problems spanning particular skills,

popularization of ideas, approaches and results to other groups of scientists and stakeholders has become essential. Thus the term needs to be broadened to include all communication to non-specialists which involves transformation. The forms that such communication take and their consequences for intellectual development vary according to the sort of field involved, the audience addressed and the relationships between them. Richard Whitley from the Manchester Business School, U.K., elaborated on the importance of the popularization of science as a relation between scientific fields and their publics and how it impacts on society (Whitley, 1985 p.3-28).

It is important to identify the various parties and groups involved in the process of generating and understanding the relevance of science in the context of the modern world:

The Public

The recent explosion of new scientific knowledge brought immense changes to the lives of ordinary people. The public needs a better understanding of how science is daily altering lifestyles and culture. Science underpins so much of modern civilization that a scientifically informed public is essential to the democratic process. Many issues that come up for political discussion involve science, and informed voters are able to exert pressure through the ballot box and by lobbying. Scientific literacy is an important element of an all-round educated person and a scientifically informed younger generation is essential for the future prosperity of a country.

The media play an important role in the relationship between the scientific community and the public and have an important educational role to play in this regard. The public are constantly faced with newspaper headlines that directly affect their lives – such as "Genetically Engineered Tomatoes on Shelves" - and the media need to fill in whatever blanks have been left by their formal education in order to understand the issues involved.

"Public understanding" of science could be equated to "knowledge" or "appreciation". The public needs some understanding of the nature of scientific concepts, models and theories and how they can be tested and verified. The public also needs to know that science only gives provisional answers to the questions to which it is responding and they should realize just how costly it is to reach even the relative truths of science. Underlying much of the reasoning of the public understanding of science is the notion that greater knowledge leads inevitably to greater appreciation and more positive attitudes toward it.

The Journalist

The function of the scientific journalist is to transform scientific ideas and results into a form that other groups can understand. The 'scientific journalist' must be seen here either as a designated specialist journalist in science, as well as the scientist's journalistic role in the publishing and dissemination of his newly acquired knowledge.

Although popularization is mostly viewed as communication to the general public, but it could also be seen as communication to a variety of distinct audiences, including researchers of other fields and disciplines. This transformation must not affect the truth status of scientific knowledge, since that is guaranteed by the procedures and norms of the scientific community, but it obviously changes the form in which this knowledge is expressed. The knowledge itself is assumed to remain unchanged throughout the transformation process, but any communication of knowledge involves some re-description which subtly alters them so that the popularization of true knowledge to a wide audience always results in some alterations to it. The greater the linguistic and cognitive distance between the audiences, the more alteration occurs and it is worthwhile bearing in mind that knowledge producers and non-specialist audiences vary in their conceptual overlap and proximity, both across fields and across historical periods.

Journalistic leaders must take a new look at science so that the public might be better equipped to understand and participate in the growing debates. There is more to

informing the public about science than just reporting a mere string of facts. There must be some underlying theme and purpose, how science can be applied to our daily lives. Science journalists are translators of scientific facts, and need to interpret, analyze, and spell out the consequences and relevance of science to their readers. The truth (or what passes for it) is filtered through the media funnel of journalism and then passed on to the public.

The historical dimension of science must emphasize the fact that science is incremental and making progress. The evolution of science is part of the history of ideas and is an essential component of the culture of the times. Cultural literacy brought a new dimension to history which is no longer taught merely as a succession of kings and battles as it was taught at school. Science is part of the historical process, and the influence of science has extended beyond the intellectual field. Because of the technological consequences of science there is also a major impact on social and economic history this century. Philip Graham, the publisher of the Washington Post, commented appropriately that "Journalism is at best a rough first draft of history."

This is what makes science newsworthy; it is a record of achievements, progress, disaster and how to cope with the inevitable. All of these are human interest stories that may affect our lives profoundly. We need to understand the social and political consequences of scientific achievements in order to take part in the democratic decision making process.

The Scientist

Scientists, on the other hand, need to unveil the secrets of nature, and need to explain to the public that science is always incomplete, that knowledge is imperfect. It starts with curiosity and inquiry, and is carried on by a combination of persistence, many false trails and occasional flashes of insight. Progress is not predictable, and real scientific discovery is sometimes quite a coincidence.

Researchers are an elite group with highly specialized and extensive training who produce “truth” in esoteric ways which can then be translated into ordinary language for public dissemination.

For this reason, communicating with the media is becoming an obligation; the ethic is changing, and popularizing of science is becoming an integral part of the professional responsibility of practicing scientists. Scientists are understandably wary of the fact that over exposure in the media may lead invariable to the pronouncement that the celebrity scientist is really not a true scientist at all.

A study done by the Royal Society in 1985 concluded that: “Scientists must learn to communicate with the public, be willing to do so, and indeed consider it their duty to do so. All scientists need, therefore, to learn about the media and their constraints and learn how to explain science simply, without jargon and without being condescending” (Report: The Royal Society, 1985 p. 5).

Research requires resources from external agencies that have to be convinced that the work is worth undertaking. Even where this is decided by strict peer review methods, the applicants still have to translate their ideas and goals into a form that specialists from other, related fields can understand and appreciate. Additionally, of course, lay officials within funding agencies also need to understand proposals if they are to handle them competently. Thus popularization in a broad sense is necessary to obtain funds and so affects what work is done. In many scientific fields non-specialists are directly involved in the determination of research strategies, of topics to be pursued and of approaches to be followed.

Researchers, or “knowledge producers”, also need to communicate with neighboring scientists who may share some educational experiences but are using different technical procedures or forms of representation to explore different problems, and this involves less translation and simplification. Intra-scientific communication across organizational boundaries to colleagues in other fields may be necessary to obtain the assistance of

specialists from other areas. This is essential where collaborating across skill and intellectual boundaries is necessary to ensure adequate coordination of research topics and approaches.

The dimension of cognitive distance between researchers and their audiences, which incorporates differences in intellectual background, research skills and intellectual goals, is an important variable for distinguishing between contexts of popularization since it refers to the extent of common experiences, competencies and interests between specialist scientists and their audiences. Therefore, in communicating research results to more prestigious and powerful audiences researchers present evidence that dominant procedures have been followed and explicate how their conclusions were arrived at and why they are significant in terms of the audiences' criteria. Although communication to scientific colleagues in a cognate area is likely to be highly technical, general reports for a scientifically literate audience are written in ordinary language yet use technical terms quite freely and rely upon a common background in school and early university science. Scientists can thus rely upon a considerable degree of understanding of their audience of the intellectual background to their work

On the other hand, a low degree of technical sophistication and justification of arguments in the popularization of scientific knowledge occurs when there is considerable cognitive distance between scientists and their audience. The presentation of results and conclusions to non-specialist audiences necessarily involves taking them out of the intellectual context in which they were generated and removing much of the contingency and circumstantial detail which qualified their truth status. Communication to non-specialist audiences is thus more discursive and non-technical. Ordinary, every day language is used as opposed to an esoteric and technical symbol system. The more heterogeneous audiences are, the more simplified and apodictic popularization is likely to be (Whitley, 1985 p.13).

Thus there is a need for scientists to increase their communication skills and activities across a broad field and for journalists to increase their understanding and training in science.

CULTURAL LITERACY

We need to examine how the news media interact with and report on the scientific community, and how the scientists, who want the public to achieve a more profound understanding of their work, can ensure that crucial information about the value of scientific and technological research gets communicated to the public in a responsible way. The public needs to be informed by scientists and journalists how science advances the quality of life. Both scientists and journalists are data collectors who utilize their experience and insight to bring understanding and order out of uncertainty.

There is little question that the South African educational system has failed to produce a reading and viewing public prepared to grasp the nuance and significance of scientific developments. It is noteworthy to remember the words written by Mark Twain (1835-1910), the United States most famous humorist and the author of popular and outstanding autobiographical works, travel books and novels: "The person that does not read good books, is none better than a person that cannot read" (Claassen, 2007, October 11).

Post graduate students enrolling for journalistic studies at the University of Stellenbosch, revealed a low level of cultural literacy (Prof George Claassen, 1997, October 20). Cultural literacy is eloquently described by E. D. Hirsch from the University of Virginia in his book *Cultural literacy – what every American needs to know:* "the network of information that all competent readers possess. It is the background information, sorted in their minds, that enables them to take up a newspaper and read it with an adequate level of comprehension, getting to the point, grasping the implications, relating what they read to the unstated context which alone gives meaning to what they read… The achievement of high universal literacy is the key to all other fundamental improvements in American education" (Hirsch, 1987, p.10).

A comprehensive cultural literacy including a sound knowledge of science and technology will make an important contribution to ensure an informed public. The public is not scientifically literate enough to interpret new information within the context of the information overload where research often produces contradictory findings, thus confusing the public. The journalists need to translate science into understandable format into the public domain. The media, like schools, have a duty to inform and educate the public.

There is agreement that the public is gullible about much science news, easily believing in miracle cures or simple solutions to difficult problems. When the cascade of scientific and technological information reaches the public, they must be well prepared to receive it and know what to make of the information that gets through. Pseudoscientific articles distort the truth, and are misleading the public to believe in wonder cures. The public needs to know how to interpret the truth, and how to distinguish truth from lies. The *truth* lies between perception and reality, and is often combined with *opinion*. The media are projecting events through the prism of their editorial standpoint and often report truth selectively to catch the attention of their readers. Because the concept of truth is rooted in neutrality it is not very interesting to publish. Ill-informed people are not interested in a dry list of facts reported with clinical precision, but are attracted to seemingly sensational reports.

The Progress in International Reading Literacy Study (Pirls) done in 2006, tested the reading skills of gr. 4 and gr. 5 children in 40 countries: South Africa ranked the lowest of these countries. A similar study demonstrated that South African children's numerical skills are also unsatisfactory. This has a direct influence of children gaining access to university studies in science and technology (Claassen, 2007, December 7).

Our educational system will have to educate our children to read, develop numerical skills, and to stimulate students to develop skeptical thinking and inquisitive minds to discover the secrets of life themselves by questioning current dogma. This will create a

fertile and receptive environment for absorption of scientific knowledge. This is a tremendous challenge to our school system, and it is questionable if the caliber of our teachers will be able to bridge the gap, and to increase the level of cultural literacy of the children in South Africa in the near future.

The role of the media to get involved in the general enterprise of informing and educating the public about scientific matters must not be underestimated. Science should be seen as part of education rather than an integral and increasingly important part of our cultural heritage.

EXPLORING THE ATTITUDES OF SCIENTISTS AND JOURNALISTS

It is important to explore the attitudes of journalists and scientists toward each other and their views on transmitting and translating new scientific information through the media to the public. An important contribution to this field was initiated by the First Amendment Center in the USA that led to the publication of *Worlds* Apart (Hartz and Chappell, p.1-113). The yearlong study leading to the publication of *Worlds Apart* began with a survey of scientists and journalists to probe their attitudes toward each other and their views on transmitting and translating new scientific information through the media to the public. The following points are amongst the main findings of the survey:

- Scientists complained that reporters do not understand many of the basics of their methods, including the proper interpretation statistics, probabilities and risk.
- Journalists complained that scientists are much to wrapped up in esoteric jargon and fail to explain their work simply and cogently.
- Scientists said the news media oversimplify complex issues.
- Reporters and scientists don't understand that "news" is a perishable commodity that must be made relevant to the reader and viewer.
- Both groups said the American public is often confused and gullible, due largely to the low level of scientific literacy in the population at large.

In its broadest terms, the survey indicated that both groups recognize serious shortcomings in the reporting of science stories, but feel there is no fundamental reason why the process cannot be significantly improved.

There is good reason to believe that the relationship between the scientists and the media in South Africa do not differ significantly from the situation in the USA, and that the above findings can be made applicable to South Africa.

Scientists tend to view journalists with suspicion, as likely to trivialize rather than simplify their work, probably make mistakes in the reporting, having a tendency to exaggerate, and often blame the sub-editor for the headlines. The scientist (erroneously) sees the journalist as imprecise, mercurial and possibly dangerous – "a man who knows the price of everything, and the value of nothing," – to borrow Oscar Wilde's phrase: (Wilde, 1891).

Journalists, on the other hand, see scientists as tediously lengthy, afflicted by scientific jargon and with a pedantic emphasis on detail and accuracy. They tend to see scientists as narrowly focused, self-absorbed, cold-eyed and arrogant. This unfriendly assessment is counter productive for the advancement of science communication, and is fortunately the exception rather than the rule.

Fortunately, scientists are beginning to see the advantages of explaining their research to a wider audience. But they also realize that communicating science to non-specialists is difficult, and making it interesting can even be harder. The media, understandably, tend to highlight the human angle, the politics and the 'gee-whizz' factor. But this can obscure what seems the essence of science – that it is a collective and cumulative enterprise which, albeit fitfully, is bringing the wonder of nature into sharper and truer focus.

Informed readers and viewers of mainstream media complain that they are overfed with information they don't want and starved for news they need. Ironically, in the tabloid-tainted, media-saturated society, the statement by Oscar Wilde could equally be true, even today:

"The public have an insatiable curiosity to know everything – except what is worth knowing…"

Oscar Wilde (1854-1900)

Despite the importance of science and technology as human interest stories, adequate coverage of science stories is rare, found in only a handful of news outlets. Regular and structured science reporting in South African newspapers is without structure and superficially presented by journalists with inadequate scientific background (Claassen, 2007, p.50).

Science literally affects our daily lives because we are forced to make scientific decisions on life-and-death matters on a daily basis; what to eat to stay healthy, how genetic engineering affects our lives, how global warming threatens the world, the impact of smoking, cancer, TB, AIDS, diabetes and heart disease on the health of the South African nation.

Scientists and journalists should communicate with each other about ways in which their needs and the needs of the public can be met. There is a need for scientific papers to be written in understandable language that put the work in perspective and explain its relevance and importance within the context of the society where we live.

RESPONSIBLE SCIENTIFIC REPORTING

In order to inform the public on science and technological matters, journalists should increase their understanding of and training in the sciences. Journalists should pay close attention to the peer review process to avoid overplaying potentially questionable work

Although peer review is no guarantee of total accuracy, proper peer review produces the best current thinking and evidence of the scientific community on a given body of research data. Peer review and formal publication do give journalists the guarantee that the work presented is accurate to the best of the experts' knowledge. The best available evidence comes from carefully conducted meta-analysis of pooled similar research projects to produce evidence-based scientific opinions.

The biggest problem with science reporting is that it only tells a small part of the whole story. Journalists should take cognizance of the fact that the science process is incremental. True scientific progress is primarily the cumulative outcome of many scientists' work that may stretch over many years of basic and applied research. It very seldom presents as a "major breakthrough". Most new knowledge – especially in major fields such as AIDS or cancer research – comes in dribs and drabs over a period of months or years, and usually not from one laboratory.

Journalists are often confronted with short time frames to comment on a science story. They have to demand information which may not be readily available and obtained, write the story anyway, whether it is accurate or not, and then leave the organization to take the consequences.

Over-sensational claims by scientists are hazardous for responsible journalists, especially in the medical field, where false hopes can be raised, or where scare-stories can arouse unnecessary fears. It can be very difficult to rectify misrepresentations of science in the media, because the gullible public can be easily be misled by hopes raised by overoptimistic media reports of cures for cancer and other frightening diseases.

Scientists routinely publish preliminary evidence, not waiting until they have absolute proof. In the real world, the cutting edge of science sometimes is speculative. The sharing of findings invites criticism from colleagues and allows other researchers to duplicate and verify the work. Even failed experiments have vastly improved scientists'

understanding of the scientific process. Research results are written up and may initially be circulated amongst colleagues or presented orally at conferences worldwide.

Formal acceptance for publication of major research in reputable peer-reviewed journals – typically after months or years of research – may take more than a year to ensure the integrity of the experiment and analysis of the data. Even with esteemed academics as gatekeepers, questionable papers with misleading information are inadvertently published in reputable scientific journals to the embarrassment of the editorial board.

A recent example is the scandal involving famed South Korean stem cell researcher Professor Hwang Woo Suk. In 2004 the South Korean research team reported that they had used cloning techniques to create stem cell lines of 11 people. The report followed up a 2004 report indicating success in using nuclear transferring techniques to produce an early stage human embryo. Both reports appeared in one of the most eminent scientific journals in the world, *Science.* A review panel found that no human stem cell lines had been produced as described (Murphy, 2006, p. 674).

Misrepresentations are among the worst transgressions of ethics in science. *Science* uncovered its own errors, but these false reports inflicted collateral damage. Although Professor Hwang's fraud did not go undetected for very long, it went on long enough to produce a domino effect of false expectations among policy makers, politicians, bio-ethicists, and disease therapy advocates. Nevertheless, falsified science is not just a betrayal of the research community: it is also a betrayal of the public.

"What is perceived to be true, even if it is false, has real consequences"

Sociological saying

RESPONSIBILITY AND ACCOUNTABILITY: ETHICAL DECISION-MAKING

The media have a responsibility to adhere to strict ethical codes, and can be held responsible and accountable for their reporting. *Die Burger's* ethical code clearly outlines their accountability for their reports (Claassen, 2007, September 6).

Accountability in *Die Burger* rests on these four pillars:

1. Truth telling and reporting as complete as possible about the issue
2. Fairness in reporting to minimize the damage
3. To maintain independence from the government, or any other pressure- and/or pressure group
4. To accept accountability for published material

Most responsible publications established the principle of an ombudsman where journalists are exposed to public scrutiny by the readers. Although ombudsmen are considered representatives of the public, they should also be even-handed in their handling of complaints. They must be fair to both readers and their newspapers and editors. All articles are evaluated according to a set of ethical guidelines. These guidelines are available to any reader on request.

Journalists should seek out and speak the truth in the public interest. There is a moral obligation to act justly and with integrity. If moral values such as truth, fairness, justice and respect for persons mean anything, they must be considered fundamental and applied universally. Morals are personal values, beliefs and principles that guide our behavior. However, moral values are subjective, and may be different from person to person, and are linked to cultural beliefs, attitudes and opinions.

Derek Wyatt, MP for the new constituency of Sittingbourne and Sheppey in north Kent and former director of the Computer Channel at BSkyB, commented that there are two

sides to the notion of 'truth'. "One is ***perceived truth*** and one is the ***actual truth***. Many people hold the perceived truth that the MMR vaccine causes autism: quite untrue. Even more people hold the perceived truth that genetically modified food is intrinsically dangerous to mankind: not true, or certainly not justified. These beliefs are deep seated, and their proponents do not believe anyone who tells them the contrary, not experts or scientists and certainly not their governments" (Wyatt, 1998, p.235).

It is noteworthy to remember the words of Gandhi, architect of India's freedom through nonviolent revolution, and founder of *satyagraha,* "force which is borne of truth and love or non-violence:

There is no religion higher than truth.

Mahatma Gandhi (1869-1948)

Ethics is the formal study and codification of moral principles into systematic frameworks so that decisions about what is right and wrong can be made in a reasoned and structured way. There are various traditional ethical theories that may guide journalistic decision making in compiling reports:

ETHICAL THEORIES

Much of the theoretical development started with broad-based universal ethical theories grounded in Western philosophy (Beauchamp and Childress, 1994).

Kantianism

Ethical decision-making is based on the principles such as honesty, integrity, promise-keeping, fidelity, fairness, caring for others, respect for others, responsible citizenship, pursuit of excellence and accountability. Such principles form the basis of Duty ethics. The eighteenth-century German philosopher Immanuel Kant (1724 – 1804) was the principle proponent of Duty ethics where people are encouraged to 'do the right thing' irrespective of the consequences. Kantianism, also known as Obligation-based ethics,

where an action is done in good faith, supported not for its outcome, but for the underlying good intention where you acted. In other words, one has a duty to tell the truth, even if it might result in harm to others.

Utilitarianism

Duty ethics has its limitations, because it is apparent that the consequences of decisions and actions have to be taken into account. An action is described as right or wrong based on its outcome or consequences. John Stuart Mill (1806 – 1873), the best known of all English speaking philosophers of the 19th century, are credited with introducing utilitarianism into the mainstream of modern Western ethical thought. Utilitarianism is a consequence-based theory and is based on the principle where a good outcome is the one that produces the greatest good or happiness for the greatest number of people. They are concerned with the *consequences* of an ethical judgment. On balance, therefore, a utilitarian approach would favor a breach of confidentiality.

Rights-based theories

Liberal individualism

The human rights culture dominates all aspects of life today in Western society. Liberal individualism is a rights-based ethical theory with the main features of positive and negative individual rights with obligations and responsibilities.

Communitarianism

On the other end of the spectrum compared with liberal individualism, is Communitarianism, which is a community based theory. This is a relevant theory in the context of African tradition and culture where the needs of the community as a whole are placed above the needs of the individual. The African concept of *ubuntu* bears testimony to this theory.

Character ethics

Finally, most people would agree that the motivation of practitioners is important too, not just the actions *per se* or the consequences of those actions. Character ethics is virtue based, and is one of the oldest theories, with its origins in the philosophy of the ancient Greeks, Socrates (ca. 470 – 399 B.C.), Plato (ca. 428 – 348 B.C.) and Aristotle (384 – 322 B.C.) Approximately 2500 years ago, the Greek philosophers Socrates, Plato, and Aristotle engaged in independent theoretical attempts at understanding the world and this thinking was subjected to the demands of rationality. Theoretical insights had to be pursued in a rational way in order for them to be valid (Gregory, 1998, p.98-109). Much of the time was spent in understanding the concept of happiness, and what it meant to lead a 'good life'. A dominant theory of this time was virtue ethics. Aristotle believed that virtue lay between the extremes of excess and deficiency. Aristotle's virtue ethics emphasizes character. Here the practitioner must display certain key traits or virtues, such as compassion, trustworthiness, integrity and discernment. Was the practitioner's motivation honest? Did he or she try to be fair? (Magee, 1998, p.102-186).

In the years that followed, during the Middle Ages, Christianity became a dominant force and much ethical reasoning was influenced by the teachings of the church. The modern period was heralded by the Age of Enlightenment. The scientific era was from about the seventeenth century to the twentieth century, when Newton heralded the reductionalist, bio-medical model. Objectivity and pure rationality were valued above all else, and the influence of the church diminished. Science distant itself from irrational fundamentalistic thoughts propagated by certain religious groups, and became almost secularized. In keeping with this era, modern ethics was universal and objectively founded, and based on rules and abstract theories. Modern ethics was dominated by the development of theories, rules, codes of conduct, and principles (Mash, 2000, p.292-320).

DECISION-MAKING MODELS

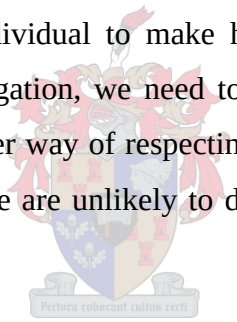
The problem with these theories and codes of conduct is the gap between universal theories and real-life dilemmas in journalism. Some ethical decision-making models

have been developed to help the practitioner go through a logic process of thought. These models are based on ethical principles which can be turned into questions to help identify the ethical issues (Parsons, 2004, Kogan Page):

- Veracity - tell the truth: is there harm involved?
- Non-malfeasance – do no harm: is there a missed opportunity to do something good?
- Beneficence – do good: could anyone be misled?
- Confidentiality – respect privacy: will anyone's privacy be invaded?
- Fairness – be fair and social responsible: is it unfair to anyone?

Respect for autonomy.

It refers to the right of every individual to make his or her own decisions. Before subjecting a person to any interrogation, we need to obtain his or her **agreement** and **consent. Confidentiality** is another way of respecting the person's autonomy. Without a promise of confidentiality, people are unlikely to divulge highly private and sensitive information.



Respect for the person's autonomy requires us not to deceive them. Trust, the keeping of promises, and loyalty are the foundations of confidentiality. This means **veracity,** and to **tell the truth**: is there harm involved? **Good communication** in the context of journalism is an ethical requirement.

Beneficence and non-malfeasance

Beneficence refers to doing good; could anyone be misled? Non-malfeasance literally means 'do no harm'; is there a missed opportunity to do something good?

Justice

This principle deals with the fair treatment of people, to be fair and socially responsible to everyone. Obligations of justice may be divided as follows:

- Respect for people's rights – rights-based justice
- Respect for morally acceptable laws – legal justice, and
- Fair distribution of limited resources – distributive justice (Mash, 2000, p.309).

Sound ethical principles require a lot of integrity; i.e. being honest, keeping promises and arriving at sound judgments. The journalist must seek to build and maintain relationships of trust that are mutually beneficial. Trust implies reliability, integrity and good faith.

Science is usually free of politics and outside influences. The free universal exchange of ideas is an important part of the scientific ethos, and the benefits of science should also be spread equally over the globe. Barriers of language and culture are less marked in science than in other fields. Science is a great unifying endeavor of mankind. Science itself is concerned with objective truth and hard facts, and it is thus normal conduct to adhere to sound ethical principles to obtain and disseminate knowledge. Knowledge is power and science has given us increasing power over our environment and our daily lives.

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In view of the above mentioned ethical theories and models, the media have the responsibility to expose absurdity where false claims or actions are not in the interest of the public. Scientific investigative reporting often has to fulfill this role, for example the aggressive advertising of glyconutrients by Mannatech, making health claims without any substantial scientific evidence to support their statements (Brits, February 7, 2007). After the media exposure of the false scientific claims of the health claims of glyconutrients, the manufacturers of these products, Ambrotose, was charged by the attorney-general of Texas because of these misleading health claims (Brits, 2007, August 30).

A troublesome trend in recent years has been the gradual blending of news, entertainment, and commercial values. "Advertorials", which are advertisements that bear a striking resemblance to editorial content, and TV "informericals" that resemble programming have also become ethically controversial. This trend toward blurring the line between the various media functions raises ethical concerns ranging from audience manipulation to outright deception. The manufacturers of antioxidants continuously propagate the intake of high doses of their commercial products despite of the fact that these 2007, June 2).

Dr Peter Aldhous from the international science journal *New Scientist,* questioned the influence of the pharmaceutical industry on the media's ability to report objectively on health matters. The acceptance of pseudoscientific advertisements and promotional articles in a newspaper or journal is also question the integrity of the publication. *Die Burger* regularly publishes promotional material such as the Rayma-bangle, despite the notion that there is no objective evidence for the efficacy in the treatment of arthritis (Claassen, 2007, March 30).

There are numerous instances where organizations have used public relations to close down legitimate, opposing voices and where the public's interest has not been served as a result. For example, for years the tobacco industry denied any link between smoking and cancer and used public relations and marketing to dispute any suspicion that there was a connection. Even today, they promote smoking in developing nations through channels that are forbidden in the developed world and do not display the same prominent health warnings. These activities are perfectly legal, but are they ethical? The scientific community exposed these denials through objective scientific reporting. Through these efforts, anti-smoking legislations came into effect in many health-conscious countries.

THE MEDIA'S RIGHT TO FREEDOM OF SPEECH

There are instances where the media have the right to breech ethical codes when reporting on news items that is in the interest of the public. Recent debate about the

exposure of private information of prominent public figures in South Africa demonstrated clearly the social responsibilities and rights of the media. *Public interest* is perhaps the most compelling justification for disclosure. Information is the lifeblood of democracy, and where certain knowledge is essential either to rational consumer choice or collective political decision making, the arguments favoring publicity over confidentiality assume critical dimensions. The public has the right to know about the illegal actions of the Minister of Health, and breech of confidentiality could be justified, and within this context the press did not need consent to publish this information.

In a country where statutory laws, although they are perfectly legal, but clearly unethical, the press has the right to ignore legal justice. Freedom of speech allows the media to comment on regulations such as the apartheid laws, or issues on abortion. Stimulating debate in the media is necessary to expose human rights violations by the government and to bring about meaningful democratic change in the community. Although the independence of the press is not negotiable, they need to accept full responsibility and accountability for the published material.

A free press helps to limit corruption and to ensure individual rights are not abused. It also allows for investigative reporting on controversial scientific matters, and to expose selective truth telling or omissions of facts. The media are the primary source of information in a democracy, and thus have the obligation to share information as objective as possible.

The mission of journalists is to uncover facts, report on society's institutions, and present a fair and balanced account of the day's intelligence. Ethical journalists should have no cause to promote or axes to grind.

THE ROLE OF EDITORS, NEWS DIRECTORS AND PUBLISHERS

The media gatekeepers such as editors, news directors and publishers play an important role to structure the raw material into "news items" that the public wants. The reporters

and editors need to add explanation, clarification or possible solution to place the news into the correct perspective to enable the public to become educated about why that is important. It is important to know that the media are projecting events through the prism of their editorial standpoint, and therefore they are not necessary reporting truth.

Richard Schickel from *Time* criticized the dramatic TV images of the Rodney King-riots in Los Angeles in 1992: "The basic function of journalism is selection of material that will be of public interest. A news medium with responsible and appropriate reporting earns civic responsibility and achieves public trust" (Schickel, 1992, p.27).

Editors and journalists must know the cultural expectations and values of their readers. The main function of the journalist is to add perspective and depth to scientific reports. The public has little ability to add anything or to correct errors of interpretation or omission. This underlines the enormous responsibility of the news media to tell the truth, without fear or favor. The criticism against TV networks is their preference to present dramatic visual material without analysis leading to superficial reports without proper perspective (Willoughby, 1996, p.8).

The news media must ensure that science will be presented correctly to the public in an understandable format. This will bridge the gap between scientific researchers and the public. Incorrect scientific reporting contributes to the prevalence of pseudoscientific beliefs, pre-scientific myths and metaphysics as opposed to adhering to the results of sound empirical research.

Research done by George Claassen from Stellenbosch on the role of the media in bridging the gap involving more that 1500 scientists and researchers and almost 500 editors and journalists, revealed that better grasp of science is closely dependant competent media coverage of scientific events (Claassen, 2007, p.8).

There is a perception that readers do not care much about science, and above all, that they do not understand it either. However, complexity is no excuse for a failure to report. A

careful writer and discerning editor can make science intriguing, understandable and absorbing. Matters involving health and medicine are of special interest, because it often involves issues of life and death. Readers expect scientific details when stories arise that are important to them. Good graphic designers to complement the text, are invaluable to simplify complex scientific cascades, and appeal to most readers used to visual TV images and interactive representations in scientific exhibitions.

The readily availability of information on the internet, results that many people are remarkable knowledgeable but often misinformed. This is because some of the information posted on internet sites are not peer reviewed and may result in lack of reliable information, and even promote disinformation. It puts information directly into the public domain, unedited, unmediated and free at the point of delivery. The editing function is crucial to the professional ethics of journalism. Without it web browsers cannot know whether what they see has any bearing on the truth.

This is especially true for medical matters. Patients often confront their physicians with a file of information on their condition promising miracle cures or spectacular results resulting from treatment protocols that have not withstand the test of time and do not fulfill the criteria for evidence-based medicine. The treatment options might not be available in South Africa, could be prohibitory expensive, or might not even be appropriate for the specific condition of the patient.

Scientists often have to make decisions on inadequate information because they do not always have definite answers. Journalists should inform the public that their advice is based on preliminary data, so when new studies come out with contradictory advice, they won't feel betrayed and confused. Scientific reporting should strive for honestly presenting what we know and what we do not know. Truth telling is the basis of scientific and intellectual integrity.

Encounters where scientists meet the press may produce distinctly unpredictable results. In spite of a scientist's best intentions, the news article based on an interview may be

inaccurate or sensationalized, the reporter abusive or intrusive. If the subject is controversial, as is often the case, scientists may find themselves locked up in disputes with fellow scientists, disputes that are polarized, acrimonious, and embarrassing.

Scientists are accustomed to controlling the quality and quantity of information circulating within science through peer review and scholarly publication. Antagonism against the press is understandable, because scientists feel ineffective in preventing and correcting the press's failings. It is also a very time-consuming effort for a busy scientist to become involved in a lengthy debate especially where there is controversy among experts.

Airing science's internal disputes, uncertainties, and failings by the press, portray a very negative image of science. True scientists are also wary of the press's emphasis on personalities and personal fame. Professional scientists earn a reputation by publication, not personality, and feel that it is the research and not the researcher that should be evaluated. Intellectual arrogance is unacceptable for most scientists, because the most important quality for a genuine scientist is humility.

In the words of one of the world's most renowned scientists:

"If I have seen further it is by standing on the shoulders of giants"

Isaac Newton (1642 – 1727)

The media have the responsibility to bring science into context of humans and to explain how science affects our lives on a daily basis. They must guard against the trend toward the sensational and away from the substantive that emerged amongst some tabloid publications. This may result in the beginning of a long-term lowering of traditional journalistic standards.

PROFESSIONAL ORGANIZATIONS AS GATEKEEPERS

Health authorities have to make decisions on available scientific findings in order to formulate policy. Treatment guidelines based on misinformation may have devastating results for patients and may cost the country dearly when distributing scarce healthcare resources. There are numerous internet sources of information that provides information not subjected by peer review or editorial verification. These sources often provide inaccurate information, and sometimes promote certain products or management protocols that have not been subjected to rigorous evidence based scrutiny.

Nevertheless, decisions on treatment protocols will have to be made on available, 'adequate' information. Healthcare providers and -sponsors rely heavily on the best available medical evidence when making decisions and formulating treatment protocols to establish benefits for their members.

The medical profession in particular realized the responsibility to provide reliable evidence to health professionals to base decisions on life and death issues. This adds to the burden of medical practitioners to stay abreast of medical science through compulsory continuing professional development programs. The statutory regulatory bodies for the medical profession have to accredit educational material and programs for their members.

There are a few authoritative sources of medical information available in South Africa:

1. Cochrane Collaboration

A good example of compiling a reliable and accredited data base based on meta-analysis of the best available medical evidence to formulate treatment protocols, is the Cochrane Collaboration data base for evidence-based medicine (EBM). The **Cochrane Collaboration** is an international not-for-profit and independent organization, providing up-to-date accurate information about the effects of healthcare readily available worldwide. It produces and disseminates systematic reviews of healthcare interventions

and promotes the search for evidence in the form of clinical trials and other studies of interventions. The Cochrane Collaboration was founded in 1993 and named after the British epidemiologist, Archie Cochrane.

The major product of the Collaboration is the Cochrane Database of Systematic Reviews which is published quarterly as part of *The Cochrane Library*. This database is therefore updated on a regular basis and is subjected to verification by expert teams worldwide.

Those who prepare the reviews are mostly healthcare professionals who volunteer to work in one of the many Cochrane Review Groups, with editorial teams overseeing the preparation and maintenance of the reviews, as well as application of the rigorous quality standards for which Cochrane Reviews have become known (Cochrane, 2007).

2. StellMed Updates

Universities in South Africa also recognized the need for reliable academic information for teaching purposes written in an understandable format written by medical scientists and science journalists for under- and post graduate students. Although the Cochrane Library provides us with systematic reviews of healthcare interventions, it might not be available or applicable for South African conditions. We have unique disease profiles and all the interventions mentioned in die Cochrane reviews are not always available in this sub-continent.

A panel of experts from the Faculty of Health Sciences of the University of Stellenbosch, compiled treatment protocols, the **StellMed Updates,** edited by Dr D P van Velden. This publication is specifically geared towards the needs of health practitioners in South Africa.

StellMed Updates is a continuing professional development supplier to health care practitioners and an electronic academic source for undergraduate and postgraduate students alike. It is a compilation of relevant, recent and scientifically accountable information about health care in South Africa. New articles are regularly added to the database and existing articles are regularly reviewed by the authors. All articles are

subjected to peer evaluation. The e-mail address of authors accompanying their articles enables the subscribers to communicate directly with the authors.

The aim is to establish a remotely accessible continuing professional development source for health professionals and to develop resources for self-tuition for undergraduates and postgraduates in the Faculty of Health Sciences of the University of Stellenbosch. A subscriber to StellMed Updates never needs to leave his or her office or home to earn continuing professional development points (van Velden, 2007).

3. Nutrition Information Centre (NICUS)

The information explosion in the science of food and nutrition very often creates the impression that the available information is contradictory. Confusion reigns and perspective is lacking. Indeed it is no longer easy to distinguish between fact, misinformation and fiction.

In response to this, the **U**niversity of **S**tellenbosch's Department of Human Nutrition has established the **N**utrition **I**nformation **C**entre (NICUS) to act as a reliable and independent source of nutrition information in South Africa. Backed by the University's Faculty of Health Sciences, NICUS provides the public, the media and health professionals with the most up-to-date, authoritative information on nutrition (NICUS, 2007).

This is another example of how the country's tertiary institutions reacted to the need of the public and professionals for accurate information in the developing field of nutrition. Increasingly, universities are also strengthening their public information role by participating in radio and television programs that popularize university research.

4. Radio interviews

Experts from the Faculty of Health Sciences from the University of Stellenbosch, participate regularly in the program "Wat sê die Dokter".

Although interpret individualists have always popularized science, widespread institutional support is newer and indeed promising.

5. EurekAlert (AAAS)

EurekAlert! is an online, global news service operated by AAAS (American Association for the Advancement of Science), the science society, with their prestigious publication *Science*. EurekAlert! provides a central place through which universities, medical centers, journals, government agencies, corporations and other organizations engaged in research can bring their news to the media. EurekAlert! also offers its news and resources to the public, and features news and resources focused on all areas of science, medicine and technology.

The EurekAlert! archives are freely available to the public. No registration is necessary to search the archives, and any user can look up information posted to EurekAlert! Reporters and freelancers may register for access to the embargoed section of EurekAlert!. The embargoed section contains releases that have not yet become public information. Once the embargo date has passed, these releases are rolled into the public archive.

The availability of scientific information peer-reviewed by reputable international organizations provides reliable, up to date information on a wide range of scientific topics free of charge (EurekAlert, 2007).

6. University libraries

The university libraries also make international journals available in electronic format to their users. This is an invaluable service to students and the interested public, because the latest research findings can be obtained at any time, anywhere where there is internet access. Academic information becomes increasingly available in electronic format which leads to the globalization of information.

PSEUDOSCIENCE IN PERSPECTIVE

Scientists are alarmed by the promotion of the uncritical in which pseudoscience is presented by the tabloids, movies and television.

In the USA, a group of distinguished scientists known as the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), investigates this anti-science trend. The organizing members include Paul Kurtz, chairman of CSICOP, Stephen J Gould and Gerald Holton of Harvard University; Sir John Maddox, editor, emeritus, *Nature* magazine, and the editors of *Scientific American,* among others.

This group criticized the mass media of distorting science, and in particular presenting pseudoscience as genuine science. The new genre is labeled "infotainment" or "docudrama", and their values are not in concert with responsible news departments in the media.

One of the main functions of the media is to raise the level of scientific literacy and understanding of the general public. This may only be achieved by responsible science reporting by the media.

Socrates (470-399 BC), the masterly interrogator, established the method of trying to get a truth by persistent questioning. But it was Aristotle who mapped out sciences and formulated logic. Aristotle was the founder of an approach to philosophy that starts from observation and experience, prior to abstract thinking (Magee, 1998, p.32-39). He stated that "All men by nature desire to know", and will be remembered by his comment:

"Better to be unborn than untaught, for ignorance is the root of all misfortune."

Aristotle (384 – 322 BC)

In South Africa we are fortunate that there is also an organization that guard against the promotion of unscientific reporting in the media, Sceptic South Africa (SSA) (Scepticsa,

2007). This is an organization open to anyone who has a skeptical disposition to life, questioning the validity of claims by following the basic scientific methods of observation, independent testing, rational deduction, and verification by means of copious evidence. SSA functions as a non-profit, member-supported structure with annual membership fees used to fund the following activities:

- Sponsoring regular lectures at various scientific institutions in South Africa.
- To provide, through active participation in the public debate, information on controversial claims to the media, schools, teachers and other similar institutions.
- To organize and present an annual scientific conference with a central theme.
- To enhance public awareness of the value of science and to instill an attitude of critical endeavor among its members specifically and the general public at large.
- To publish books on science and scepticism and to make available a data-base of science and sceptical books at a discount price to its members.
- To organize scientific tours for research and educational purposes. To work in alignment with other Sceptical organizations such as The Sceptics Society on America, The British Sceptics, Sceptics of the Netherlands, and others.

SSA's objective is to counter the flight from science and reason that has become common around the world and to enhance knowledge of the benefits proven science holds in stall for developing countries on the African continent.

With regard to claims made by a large variety of unscientific and pseudoscientific propagators (creationists, Intelligent Designers, Holocaust deniers, conspiracy theorists, cults, religions, numerologists, palm- and other bodily parts-readers, witch hunters, life-after-death believers, near-death experiences, alien-abductee theorists, and numerous others), SSA follows the skeptical dictum proposed by the astrophysicist Carl Sagan: *Extraordinary claims need extraordinary evidence.*

Carl Sagan made a plea to stimulate young children to ask questions: "Young children are naturally born scientists, asking very deep questions. The most important thing we can

do is encourage their curiosity and sense of wonder while we develop their critical sensibilities" (Sagan, 1995, January 23).

SCIENCE EDUCATION IN PERSPECTIVE

Scientists and educators alike need to realize that the educated person is not the person who can answer all the questions, but the person who can question the answers. In the age of rapidly changing information, knowing how to distinguish truth from falsity is more important than knowing what was once considered true and false. Science reporting must stimulate the reader to ask fundamental questions and stimulate interest in this wonderful world we are living in. The educational process must start at school level, and this is a serious problem in South Africa because we have an acute shortage of good science teachers.

At university level, we became aware of the low level of science and mathematic education of the first year recruits at the Faculty of Health Sciences. One of the problems identified is that children do not read good books anymore, and spend too much time before the television. Science and mathematic education tends to be of a very low standard at some disadvantaged schools. This trend is extended to the adults who have become passive viewers of TV programs and do not read anymore.

The media need to identify this important educational role they have to play in educating the public in the post school phase, because this remains the only accessible educational medium for the masses that do not have the privilege of tertiary education. Good science reporters and skilled TV presenters can fill this gap by presenting stimulating programs and editorials covering interesting science events relevant today as reflected in the day-to-day life. When a celebrity, for instance, suffers a heart attack, the media must immediate capture this educational opportunity to cover the latest scientific discoveries in cardiovascular disease in understandable format.

Is "Truth Telling" in science really possible?

The Austrian philosopher of science, Karl Popper (1902-94), was naturalized British in 1945, before becoming Professor of Logic and Scientific Method at the London School of Economics. He realized that the centuries of corroboration received by Newtonian science had not proved it to be true, nothing was ever going to prove the truth of a scientific theory. So-called scientific laws were not incorrigible truths about the world after all; they were theories, and as such they were products of the human mind. If they worked well in their practical application then that meant they must approximate to the truth, yet it was always possible, even after hundreds of years of pragmatic success, for someone to come along with a better theory that was closer to whatever the truth was.

"Science is perhaps the only human activity in which errors are systematically critized and,… in time, corrected"

Karl Popper (1902-94)

It means that our approach to things is essentially a problem-solving one, and that we make progress not by adding new certainties to a body of existing ones but by perpetually replacing existing theories with better ones. The search for certainty, which obsessed some of the greatest Western philosophers from Descartes to Russell, has to be given up, because certainty is not available.

However, although no general theory can be proved, it can be disproved, and this means it can be tested. Criticism becomes the chief means by which we do in fact make progress. A statement that no observation would falsify cannot be tested, and therefore cannot count as scientific, because if everything that could possibly happen is compatible with its truth then nothing can be regarded as evidence for it.

Karl Popper will always be remembers by his words:

"All we can do is to search for the falsifiable content of our best theory"

Research results must therefore be falsifiable, and are, by definition, replicable (Magee, 1998, p.222-24).

By its very nature, science takes objectivity as its central premise and therefore lab-based and field researchers make every effort to be unbiased. The scientific method is empirical- which includes observation, hypothesis, testing, theory, measuring, proof, peer review and, finally, publication. This may take months or years to take its course. Scientists have the capability for actually measuring the effects of their work: Successful vaccines cure disease. A spectroscope identifies the classic signature of each natural chemical element. Scientific laws are reduced to mathematical expressions to be predicted with various levels of confidence.

From a journalistic point of view, the end product is something new or different from what was previously reported, that's why the end product is called "news". The cascade for reporting scientific findings includes identify the scientific event, check with sources and files, obtain comment and additional details, check the facts, publish or transmit – a process routinely concluded in less than a working day.

Journalists can seldom know anything with certitude. It is easy to read many different meanings into the same set of data. Journalists whose job it is to explain various scientific claims to their readers and viewers seldom have time to determine credibility by judging the proof on their own. They have to rely on scientists to advise them, but there is a whole range of issues on which scientists seem sharply divided.

In this sense, journalism is a largely subjective enterprise, and often tells readers what they "want" rather than what they "need". Journalism could be seen as the art of interpreting news, and reporting it to their readers or viewers. The longer-term commitment of responsible journalists involved in scientific reporting must be to document fundamental findings in a responsible way preceded by verification by reputable sources.

Paradoxically, because of the empirical nature of science that is based on the premise that all knowledge is gained though experience and observation, scientists tend to view

phenomena that cannot be measured with skepticism. The scientific method might not have the correct measuring instruments to observe the mechanism of an intervention, but may only observe the effect. Because we do not know *how* it works, it does not mean that it does not have the *desired effect*.

Although we do not know for example, how acupuncture works, we cannot ignore the fact that acupuncture does have curative effects for certain medical conditions. The fact that we do not know the mechanism of action, does not mean that it does not work because it cannot be scientifically 'explained'. It is by continuing questioning that we may one day arrive at the explanation – this is the very essence of science.

The controversies over hormone replacement therapy (HRT), mammograms and possible genetic links to breast cancer, for instance, involve issues of life and death. Even amongst scientists, there is a heated debate on the role of estrogen in the prevention of cardiovascular disease and breast cancer. The real confusion arose in the incorrect interpretation of the data, the selective quotes used and where scientists try to read too much into epidemiological studies. For this reason there is a need for reporters to stay up to date on current research, and to be aware of what various kinds of studies can actually show.

Medical scientists need to clarify the reporting of often contradictory evidence in the medical press on contentious issues such as mentioned above. It is often very difficult to formulate a consensus opinion by the best available experts in the field based on conflicting results. It often happens that the 'truth' only emerges later when new explanations become available that explain the apparent confusion caused by preliminary research data. This is another example that scientific research is incremental, and that journalists should be careful not to make invalid conclusions or recommendations based on preliminary research findings. This only serves to confuse the public.

CONTROVERSIES IN MEDICINE

The recent debate about the value of HRT in post menopausal women on the prevention of cardiovascular disease in women, is a good example of how epidemiological evidence was interpreted incorrectly. It was only recently that we realized that we have not as yet proven that HRT will prevent heart disease. The studies have been observational. This means that they observed women who are already on hormones for whatever reason and compared them with women who are not on them.

Although, according to these observational studies, the women who are on hormones have fewer deaths from heart disease, they are of a higher socioeconomic level, more likely to go to the doctor, more likely to exercise, eat a good diet and treat high blood pressure than women who are not on hormones. It is quite possible that it is not that hormones make women healthy, but that healthy women take hormones. Associations should not be interpreted as causations (Brinton, 1997, 1821-23).

In less than 6 years, a landmark publication appeared in the same journal that re-interpreted the data, and proved beyond doubt that estrogen plus progestin does not confer cardiac protection and may increase the risk of coronary heart disease among generally healthy postmenopausal women, especially during the first year after the initiation of hormone use. This means that this treatment should not be prescribed for the prevention of cardiovascular disease. The hypothesis formulated during 1997 was confirmed by sound scientific evidence in 2003 (Manson, 2003, p.523-34).

The available information on breast cancer, for instance, does not allow us to make recommendations for universal treatment for all cancers. At the one extreme are cancers that grow so quickly that they may become lethal within one year, despite any treatment options. At the other extreme some cancers grow so slowly that any treatment beyond simply removing the tumor may be superfluous.

Medical scientists are now studying molecular markers, like aberrant cancer genes, that might indicate a tumor's potential to be lethal This will enable doctors to discover which women need systemic therapy and be able to spare the vast majority of women, who do not need this potential harmful therapy, from having to endure it.

Genetic analysis will revolutionize medicine in the near future. Thousands of scientists across the globe labored for some 15 years to document the complete nucleotide sequence of the human genome. The functional consequences of the wealth of information contained in the sequences remain an open question (Venter, 2001, 1304-51).

COMMERCIALIZING OF JOURNALISM

One of the worst unethical applications of journalism, specific in the field of science reporting, is the so-called *advertorials* or paid editorials used as promotional articles to 'advertise' products or procedures. This is nothing more than the promotion of a product, but presented in such a way that it is difficult to distinguish between editorial material that is news driven and objective, but is in reality nothing more than an advertisement written by a journalist or scientist, and paid by the producer. Of course, the product is always promoted in a positive way. The independence of the journalist is compromised, and this type of material cannot be seen as an independent and balanced view to inform the public on the value of a specific product or procedure.

To recognize advertising is straightforward. Advertising is paid promotion of specific goods or services, sometimes companies and even ideas, by an identified sponsor. Advertising says something is desirable or recommended and then attempts to prescribe certain actions for you. The advertising consumer can choose to take it, or to leave it.

By contrast, *advertorials* are more subtle about communication and presentation. It is the means and industry of influencing public opinion towards an organization, a company and its products or services. It aims to change your awareness, attitudes, understanding, opinions, belief in and goodwill towards the organization and its products and services, but is distinct from advertising as the communication seems not to promote specific

products or services. The reader is presented with a well-written 'scientific' article, ending in a subtle promotion of a product seemingly supported by 'facts'. Food supplements for health promotion often fall into this category.

This unethical reporting is well illustrated in the wine and motorcar industry where it is quite common for manufacturers to pay for promotional material for their specific product. The producers or manufacturers actually pay for editorial material to promote their specific wine or motor vehicle. The reader has no guarantee that the specific product has been objectively evaluated. Of course, negative comments are absent, and this is nothing more than blatant advertisement or *"advertorial."* (Claassen, 2007, November 2).

Promotional articles must clearly be identified by a disclaimer to inform the reader in no uncertain terms that it is nothing more than an advertisement. Scientific articles are sometimes quoted out of context to promote commercially produced dietary supplements for instance.

It is unethical for a newspaper to place a story, by a paid company, into the editorial and feature spaces of the media. Editorial space is more valuable than paid space precisely because it is still presumed to be impartial. Informed readers will spot the correlation between inches of editorial and pages of advertising. A loss of credibility takes a long time to repair for a serious newspaper or television channel.

Bona fide researchers always distance themselves from promotional articles, and it is compulsory to declare any vested interest or conflict of interest in all scientific publications. This can be very difficult, because research funding often have to be generated from private sources because governmental funding for research is inadequate. Unfortunately this is a reality that is accepted by both industry and the government. Research partnerships are formed between the government and the industry, because the private enterprise often needs applied research in addition to basic research in their specific field of production.

There is just not enough state funding for research and development available, and the economic reality is that research can never be segregated from production. The National Research Foundation in South Africa developed the Technology and Human Resources for Industry Program (THRIP) as a partnership program that was established in 1991. It is sponsored by the Department of Trade and Industry (DTI) and managed on their behalf by the National Research foundation (NRF). The program is also designed to foster collaboration among industry, higher educational institutions (HEIs) and government Science, Engineering and Technology Institutions (THRIP, 2007).

All projects funded by THRIP must include human resource development according to certain politically inspired, restrictive, guidelines. Fortunately the choice of technological focus is left to the industrial partners.

The independence of the journalist and scientist is not negotiable, because it is one of the fundamental principles of objective reporting and observation. One of the greatest threats of the integrity of journalism and scientific research, is the pressure from sponsors, advertisers or marketers, be it commercial, political or otherwise, to compromise their independent viewpoint and quality of research.

MISLEADING ADVERTISEMENTS

In order to protect the gullible public from misleading advertisements, the media have an important role to play to investigate claims made by advertisers with no scientific merit. It is also important the media should retrain from accepting *advertorials* containing unsubstantiated claims.

The mere fact that these promotional material gets published might create the idea that the publisher silently ‘supports’ these statements. Paid advertisements promoting pseudoscientific material should be scrutinized carefully by the editor or scientific reporter to ensure that misleading information does not get disseminated through the mainstream media.

The credibility of the publication is at stake here, and responsible media channels have an added responsibility in this regard by careful evaluation of promotional articles or advertisements that could be interpreted as the opinion of the publication or TV producer. The independence of the media to report on the validity of health claims should not be compromised, because this will lead to a mistrust of the public if objective reporting is under suspicion. If a report reflects the opinion of a single person, it must be clearly stated as such.

The medical arena is a prime area for the promotion of unregulated nutritional supplements with hidden health claims misleading a health conscious public under the false belief that there is a pill for any ailment or that adverse lifestyle factors may be offset by a pill. Allopathic medicine's (Western medicine's) successes over the past millennium can partly be attributed to the development of scientifically formulated and clinically tested medicines. These medications were very effective in dealing with acute medical and surgical, potentially life-threatening conditions. The success of modern medicine in dealing with acute medical and surgical emergencies created the false impression that the medical field has an answer to all ailments.

In actual fact, only 20% of medical conditions presenting in the health care system can be effectively treated with drugs and surgical interventions. The vast majority of chronic and degenerative conditions have no cure, and at best the medical profession can only treat the symptoms and signs of these lifestyle related conditions. Cardiovascular disease and cancer are the leading causes of death in modern society, and there is as yet no effective cure for established heart disease and most cancers. Diet and other lifestyle factors such as smoking and inactivity have been implicated in the etiology of some of these destructive conditions.

Pharmaceutical companies are searching for a cure, and recently the emphasis shifted to antioxidant supplementation to prevent free radical damage implicated in the etiology of some of these crippling conditions. Numerous well controlled clinical trials emerged worldwide in the use of antioxidants to prevent cardiovascular disease. A recent meta-analysis of 68 randomized trials with 232 606 participants, alarmed the medical fraternity

when it became apparent that patients supplemented with antioxidants, singly or in combination with other nutrients, given at different doses and duration increase all cause mortality (Bjelakovic, 2007, p. 842-57).

It is of concern that a combination of the vast expansion of knowledge in nutrition, and the inadequate policing of health claims of foods and supplements more often than not impart and/or perpetuate the impression that "if a little of something" is good then " a bit extra" will even be better. In general, the public is uninformed. It is a well-known scientific fact that mega doses of certain vitamins might be toxic for human consumption. Elsabé Brits, science writer of *Die Burger*, compiled an excellent review in this regard (Brits, 2007, June 2).

Despite great advances made in the field of optimum nutrition, publications such as "*The New Optimum Nutrition Bible"* by Patrick Holford, sells by the millions. He qualified in 1976 with a B Sc degree in experimental psychology at the University of New York. His organization, the Institute for of Optimum Nutrition, which he founded in 1984, awarded him in 1995 an honorary diploma in nutrition. He has no formal training in nutrition, and he is certainly not trained as a physician. Holford quote research out of context to support his unscientific statements. The media sometimes play in the hands of these pseudo-scientists by publishing these claims. Some of the health claims may be due to the well known placebo effect of many of these diet supplements (Wallace, 2007, March 10)

Objective journalistic reporting in the field of diet and nutrition is of utmost importance to protect the public from possible harm that may result from unproven dietary practices. Articles must be based on the best available evidence, and it must be acknowledged that there is always uncertainty in science reporting.

Reports must be balanced to state both sides of the story, with emphasis on the opinion based on the best scientific evidence. Side effects must always be highlighted, within the context of the expected positive outcomes. In order to be accepted a valuable medicine, the benefits have to outstrip the potential harmful effects of a specific preparation.

THE SCIENTISIT'S RESPONSIBILITY

Scientists have a responsibility to share their expertise with the general public. The mere fact that scientific research is funded by the government or private enterprise, makes scientists accountable to their sponsors to communicate their findings to a wider audience.

There are barriers in the effective communication of new scientific communication. Scientists as a group are not efficient or effective in explaining their work to a lay audience, primarily because they are orientated and focused on the research itself, and are not trained particularly well to communicate that knowledge to the general public. Their publications tend to be wordy, unnecessary detailed and technically overloaded. Their scientific language is incomprehensible to anyone outside their disciplines.

Journalists on the other hand, are often not familiar with the culture of science, its language and its methods. Editors and producers as gatekeepers determining the amount and type of science and technology news that will ultimately reach the public, can also limit the dissemination of scientific news. Another barrier is of course the viewing and reading public that may not be interested in or prepared to grasp the nuance and significance of scientific developments.

In view of the above mentioned barriers, scientists as agents of the public's curiosity, have an obligation to report back their findings about their discoveries in a language that the average person can understand. To explain difficult technological and scientific detail, it is advisable that the scientist takes up the task him/herself to avoid inaccuracies in the interpretation of the findings by a third party. Scientists need some training in communication and basic journalistic skills to be able to fulfill this task. In conjunction with making new scientific information more user-friendly, scientists must submit a plain English summary of their findings, as well as an abstract. This will make the task of the journalist must easier to report on scientific and technological issues.

Alternatively, well-educated writers and reporters that have taken time to become familiar with the culture of science, its language and its methods, can report on science

and technology, provided that these stories are verified for accuracy from the source before publication or airing. The media need more journalists with technical background, but probably cannot afford them. In view of the shortage of skilled scientific journalists, scientists might have to fill the gap by preparing their manuscripts not only for publication in recognized scientific journals, but also in lay publications to present the details of their discoveries with clarity and contextual perspective. Without putting new discoveries into the greater picture and explaining the contextual significance of the findings to the public, most of the educational value of these science stories will be lost.

CONCLUSION AND RECOMMENDATIONS

It is quite clear that the media play an important role in educating the public in new developments of science and technology. Because much of what is discovered in the world transpires after most people leave school, the media have. This does not hold true for new discoveries only, but also for explaining accepted dogma in simple and understandable terms. The aim must be to popularize science in order to make science and technology interesting and to make the public curious to know to fill the gaps more about this wonderful world we live in.

Jared Diamond explained in clear terms why we need to understand science (Diamond, 1997 May). Everyday we have to make decisions based on scientific facts to acquire accurate information about the world on how to live.

- Some of us might end up as policy-makers in government and business, and decision-makers have to be drawn from a scientifically educated public.
- As voters, we have the ultimate responsibility to select the decision makers who will make good choices when faced with scientific questions.
- A strong scientific enterprise is essential to our economy, educational system, and society. Young people needs to be excited enough by science that they resolve to become professional scientists.
- Scientists should be interested in promoting public understanding of science to secure sufficient funding for research.

Both journalists and scientists must work together to achieve the above mentioned goals, and the media must provide the opportunity to disseminate scientific and technological advances in understandable format to the public at large.

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