

2. SCIENCE COMMUNICATION WITH THE PUBLIC: A CROSS-CULTURAL EVENT

1. INTRODUCTION

Scientist denies cancer cure quote May 8, 1998.

NEW YORK (AP) Nobel laureate James Watson denies telling a reporter a researcher whose experiments have rid mice of malignant tumors 'is going to cure cancer in two years.'

Watson, co-discoverer of the structure of DNA, was quoted as having made that prediction in a front-page story in Sunday's New York Times...

Watson, in a letter to the editor published in Thursday's Times, said he told Times science writer Gina Kolata at a dinner party six weeks ago that the drugs, endostatin and angiostatin, 'should be in the National Cancer Institute trials by the end of this year and that we would know, about one year after that, whether they were effective.'

Times spokesperson, Lisa Carparelli said, 'We're confident of the story we ran and don't wish to be in a position of quarrelling with a respected source and authority. We're glad we were able to let Dr. Watson further explain his view.'

This miscommunication between Watson and Kolata probably reflects differences between the community of scientists and the community of journalists. Key differences between the two cultures may have been veiled by the fact that both people spoke English, a language in which terms or phrases have multiple meanings and shift their meanings from context to context. Thus, an expression uttered in the context of scientists talking among themselves may have quite a different meaning on the front page of the New York Times. Perhaps both Watson and Kolata overlooked the cultural differences that defined their two communities.

This chapter focuses on the communication between different cultures, particularly between the culture of science and the culture of a public immersed in their everyday lives. Cultural anthropology suggests that science communication with the public is a cross-cultural event. If people do not clearly identify the cultures involved in the act of communicating, people risk the quagmire of miscommunication. A critical analytic understanding of the culture of Western science, and of the cultures of various audiences, is a prerequisite to effective science communication with the public. In the first part of this chapter, I summarise this prerequisite to effective communication, while in the second part, I describe effective communication in terms of culture brokering, illustrated in part by a case study of a recent Canadian science centre exhibit.

2. A CULTURAL PERSPECTIVE ON WESTERN SCIENCE

Before we can think about the cultural aspects of science communication with the public, we first need to clarify what cultures and subcultures are. Then we need to understand how people cross cultural borders to communicate with each other. Last, we need to become conversant with anthropological research into the ease with which people cross cultural borders. In this section, I develop several key anthropological concepts that are applicable to the realm of science communication with the public.

2.1 *Culture*

Cultural anthropologists such as Geertz (1973, p. 5) have defined culture as

an ordered system of meanings and symbols, in terms of which social interaction takes place.

This statement accurately describes the scientific community engaged in research, as scientists develop more accurate and sophisticated systems of meanings (theories, models, laws and principles, often expressed symbolically), and as they publish their manuscripts in journals (formal social interaction) to establish the validity of their ordered system of meanings. In addition to communicating through formal publications, social interactions take place in person, by e-mail, by telephone, at conferences, in the lab, in the field, and in bars or at other informal gatherings. According to Geertz's definition, science can be thought of as a culture with its own language and conventional ways of communicating for the purpose of social interaction within the community of scientists.

In an anthropological study of a high-energy physics community, Traweek (1992) described culture in a more detailed way:

A community is a group of people with a shared past, with ways of recognizing and displaying their differences from other groups, and expectations for a shared future. Their culture is the ways, the strategies they recognize and use and invent for making sense, from common sense to disputes, from teaching to learning, it is also their ways of making things and making use of them (pp. 437-438, italics in the original).

By treating physicists as working within cultural borders, Traweek discovered some fascinating behaviour and bizarre communication by Japanese high-energy physicists as they negotiated between the subculture of their Japanese national physics community and the subculture of the international physics community. Traweek found that risk taking, power, culture, and subjectivity were all intermingled in ways that encouraged Japanese physicists to conform with their Japanese national physics community. This made it difficult for these Japanese physicists to cross the cultural border into the international community of high-energy physics. Japanese physicists were the target of pejorative humour, sarcasm, and cultural reprisals from their Japanese colleagues. Therefore, Japanese high-

energy physicists had to cross into the culture of international physics with great care and subtlety by using humour, selected conformity and politics, so as not to offend their Japanese colleagues in high-energy physics. By recognising the cultural differences between Japanese high-energy physicists and international high-energy physicists, Traweek could better understand the otherwise bizarre communication among some Japanese physicists. Perhaps there is a lesson here for James Watson and Gina Kolata - they should have recognised science as a culture, a culture with borders that must be crossed if outsiders are to understand the communication conventions of that culture, and if insiders are going to communicate effectively with the public.

Consistent with both Geertz's and Traweek's definitions of culture, Phelan, Davidson and Cao (1991) suggested that culture be conceptualised as the

norms, values, beliefs, expectations, and conventional actions of a group. (p. 228)

This cogent definition helps to clarify how science is a cultural phenomenon. Science content can be subsumed under 'beliefs'. The communication conventions of scientists are guided by the norms, values, and expectations of the culture of science, and by the specific norms, values, and expectations of the specialty field of the scientist, that is, the his or her paradigm or scientific subculture. Other definitions of culture have guided research in science communication (for example, Banks, 1988; Bullivant, 1981; Ingle and Turner, 1981; Jordan, 1985; Maddock, 1981; Samovar, Porter and Jain, 1981; and Tharp, 1989). From these works one can establish the following list of attributes of culture: communication (psycho- and socio-linguistic), social structures (authority, participant interactions), customs, attitudes, values, beliefs, worldview, skills (psychomotor and cognitive), behaviour, and technologies (artefacts and know-how). In various studies, different attributes of culture have been selected as a focus on a particular interest in multicultural communication. The definition of Phelan *et al.* (1991) of culture (above) is advantageous because it has relatively few categories and they can be interpreted broadly to encompass all anthropological aspects of culture and subculture.

Just as there are paradigms (subcultures) within the culture of science, there are subgroups in everyday life, most commonly identified by race, language, and ethnicity, but which can also be defined by gender, social class, occupation and religion. Consequently, an individual simultaneously belongs to several subgroups; for instance, an oriental female Muslim physicist or a male middle-class Euro-American journalist. Large numbers and many combinations of subgroups exist due to the associations that naturally form among people in society. Each identifiable subgroup is comprised of people who generally embrace a defining set of norms, values, beliefs, expectations, and conventional actions. In short, each subgroup shares a culture, often called a 'subculture' to convey an identity with a subgroup. One can talk about, for example, the subculture of females, the subculture of the middle class, the subculture of the television media, or the subculture of a particular science museum.

2.2. Border Crossing

An everyday scenario will illustrate the difficulties people can encounter whenever they move between cultures or between subcultures:

George and Gracie Smith flew from North America to Spain, physically crossing political borders, but not crossing cultural borders. After waiting 45 minutes in a restaurant for their dinner bill to arrive, George finally became vocally irate over the waiter's lack of service. The waiter, in turn, became hurtfully perplexed over the fact that his impeccable manners were not appreciated.

Misunderstandings can arise whenever one of the players does not recognise a cultural border that needs to be crossed for effective communication (Aikenhead, 1996).

People often cross cultural borders so easily that they do not realise they are even there - for example, when people move between the subculture of their friends and the subculture of their family home. But for people whose peer culture is vastly different from their home culture, transitions between friends and home can be psychologically hazardous and these transitions need to be negotiated carefully. Similarly problematic are the border crossings between humanist and scientific subcultures of Western society. This problem was identified by C.P. Snow (1964) in his classic *The Two Cultures*, pointing out the inability of people to speak to one another between these two cultures.

For people who feel at ease in both a humanist and scientific culture, however, border crossing is no problem. Border crossing for them is smooth. When people feel at ease like this, cultural borders seem invisible or nonexistent. It is when people begin to feel a degree of psychological discomfort with another subculture that border crossing becomes less smooth, and needs to be managed. Contributing to their discomfort may be some sense of disquiet with cultural differences or their unwillingness to engage in risk-taking social behaviour (depending on the situation, of course). When the self-esteem of people is in jeopardy (for instance, when playing badminton with players much better than they are or when participating in an unusual social occasion such as wearing a Halloween costume), border crossing could easily be hazardous. People may react in various ways to protect their egos. Even worse, if psychological pain is involved, avoidance is the natural response and border crossing becomes impossible. These descriptors of the ease of border crossing - smooth, manageable, hazardous, and impossible - are categories that Phelan *et al.* (1991) derived from their anthropological study of high school students who had to cross cultural borders between their homes and their school. This category system was helpful to Costa (1995) in her study of students' feelings of ease in science classes. The category system will be helpful in this chapter for understanding the role of a science communicator.

Border crossing into the culture of science can be made smoother for the public if science communicators know the culture of the everyday world of the public, and

can contrast that culture with a critical analysis of the culture of science (its norms, values, beliefs, expectations, and conventional actions). But even more, a science communicator must consciously move back and forth between the public's everyday world and the scientists' world - switching norms explicitly, switching values explicitly, switching conceptualisations explicitly, switching expectations explicitly, and switching language conventions explicitly. The role of a science communicator is described in more detail later in this chapter.

2.3. Values and Norms

One principal component of any culture is its values and norms. Values and norms guide scientists whenever they decide between, for example, competing theories or competing experimental methodologies (Chubin, 1981). Values and norms are learned by the apprentice scientist and they become important aspects to his or her paradigm (Hawkins and Pea, 1987; Kuhn, 1970). Longino (1990) refers to this set of discipline-centred values as constitutive values (for example, parsimony, accuracy, open-mindedness, objectivity, etc.) In contrast to constitutive values, she points to the social context outside of science in which scientists live daily. She refers to these cultural values as contextual values. Her research documented cases in which these contextual values (rather than constitutive values) influenced the decisions taken by scientists over what 'facts' to believe. She concluded that science-as-practised (as opposed to science-as-imagined) is not value-neutral. The value-neutrality of science has also been falsified by other studies (Casper, 1980; Graham, 1981; Snow, 1987; Ziman, 1984). Those who believe in the neutrality of science contend that science is free of contextual values, not constitutive values.

Therefore, science communicators must be aware of the values and norms that are potentially inherent in the language conventions of scientists (their discursive practices). For instance, one constitutive value, scientific objectivity, is often communicated to the public through science textbooks. Textbooks, however, camouflage more subtle contextual values, for example, the value 'technoscience fix' (Carlsen et al., 1994; Factor and Kooser, 1981) - the idea that solutions to societal problems (such as water contamination) only require more scientific knowledge and more innovative technologies.

Moreover, when one examines the constitutive values within science, one discovers differences between the constitutive values espoused by scientists, and the constitutive values actually practised by scientists (Mitroff, 1974). For instance, scientists publicly revere objectivity but many rely on subjective hunches in the privacy of their labs. Holton (1978) explained this apparent conflict in values by distinguishing between two types of scientific activity - 'private science' and 'public science'. Each has a different social setting and therefore a different communication audience. Public science is communicated in journals, conference proceedings, textbooks and news releases, while private science is done in labs and communicated in personal notebooks, letters, e-mails, and informal conversations.

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