Scientists and scribes

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Super scientist shouted: 'You stupid schemer!'
Stupefied scribe bawled: 'You selfish boffin!'

The above descriptions are ascribed during extreme cases – when the scientist is frustrated with unintended misreporting or intended misrepresentation of answers (especially in catchy headlines), or when the science writer is upset with the difficulty in getting responses or clarification from researchers (especially in government institutions related to national security).

J. B. S. Haldane (scientist and science popularizer) believed that the non-scientific audience '… has a right to know what goes on inside the laboratories, for some of which it pays'[1]. This can be brought about either through communication by scientists or by intermediaries (science writers) who try to understand what the scientist is working on and convey this in the language of the non-expert. This prospect is not as easy as it seems. Very few scientists make the effort to explain their research in a manner that those outside their field can comprehend; and few scribes have the capacity to accurately present facts either supplied to them by experts or collected through sources such as the Internet. In many cases writers find it difficult to solicit cooperation from scientists – to verify the accuracy of their reports. Overall, the relationship between scientists and scribes is usually strained.

Some scientists are lost in their own world and find little time or patience in explaining technicalities to journalists. And when they do, some writers do not seem to be able to describe the 'same' points to the readers; they sometimes submit an inadequately researched and inaccurate report due to deadline pressures.

Why do scientists find it difficult to 'communicate' their science? Barrett Anthony Klein (scientist and artist) explains: 'Science is steeped in jargon. Much of this jargon serves a purpose of specificity. "Evolution" and "adaptation" mean very different things to a biologist than to a non-biologist. When communicating an idea to others not versed in these differences, more caution and clarification is required. To a lazy scientist, this caution and clarification can present too great a challenge to be worth the effort ...[2]'. One should also keep in mind the motivations and priorities of scientists. Geoff Hyde comments: 'Most scientists love to watch the world at work, to suggest how it works, and to test those ideas with experiments…Few scientists however get very excited about writing up their research, and some are entirely intimidated by the prospect. Writing is usually seen as a necessary evil, to be got out of the way as quickly as possible, so one can get back to the real science of observation and experimentation'[3]. P. Balaram (scientist and editor) mentions that 'people who popularize science are sometimes viewed as being less than scientists'[4]. Robert Kanigel (writer) declares that it took him 15 years to realize that many scientists viewed the popularization of science as an absurdity, a negativity[4].

Few scientists take the time to convey their research to others. It is more difficult, unappealing and time-consuming for those who do not have a flair for expression through writing. Arnab Rai Choudhuri (scientist) points out that the disassociation of teaching and research in many universities compounds the problem, as scientists do not engage in explaining concepts to students[4]. Klein indicates that 'Some subjects are more easily translated into conversational language than other subjects, but any area of science is based on larger ideas that can be communicated with minimal effort'[2].

Scientists who write are few; writers who deal with science '… are a rare species[5]'. Writers need not be science graduates, but need to be familiar with the topic he/she is writing about. Klein advises: 'An effective communicator of science must have: (i) an intimate comprehension of her/his subject, and (ii) the language to translate this comprehension. If you have (i) without (ii) you can signal information, but that information will not be effectively received or interpreted. If you have (ii) without (i) you risk signalling incorrect information, or just baffling the receiver. Understanding not only the specific components of an experiment, but the larger motivation and context of the experiment will facilitate communicating its significance to others. Having the language to translate jargon into precise, yet clear, terminology can bring a scientist's message to the masses with great effect'[2].

There are insufficient training facilities and career opportunities for budding science writers. Hurdles in the form of inaccessible sources of information and discouraging editors lower their morale. Deadline pressures, inadequate background reading, ignorance, insufficient ability to scrutinize biased opinions and manipulated comments, and pressure from 'higher-ups' lead to faulty articles.

To science communicators Haldane advised: 'You are not trying to show off; nor are you aiming at such accuracy that your readers will be able to carry out some operation. You want to interest or even excite them, but not to give them complete information. You must therefore know a very great deal more about your subject than you put on paper. Out of this you must choose the items which will make a coherent story. This does not mean that you must write for an audience of fools. It means that you must certainly be returning from the unfamiliar facts of science to those of everyday experience … When you have done your article, give it to a friend, if possible a fairly ignorant one. Or put it away for six months and see if you still understand it yourself. You will probably find that some of the sentences which seemed simple when you wrote them, now appear very involved. Here are some hints on combing them out …Can you get in a full stop instead of a comma or a semicolon? If so, get it in. It gives your reader a chance to draw his breath. Can you use an active verb instead of a passive verb or verbal noun?'[1]

Kanigel says that skeptics of science writing have reason for worry – 'it is easy to get it wrong in many ways'[4]. R. Ramachandran (science writer and associate editor) points out that a story is placed somewhere in a triangle, the ver-

tices of which are: (i) space availability in a publication, (ii) the level of scientific accuracy, and (iii) comprehensibility of readers[4].

Reading and research, editing and execution, success and failure, exhilaration and depression, clarity and confusion characterize both scientists and journalists. Dedicated people in both fields strive for accuracy and usually an unselfish motive to help society either through their discoveries or discussions. Understanding and collaboration between scientists and science writers would enable effective and accurate communication of essential scientific discoveries.

1. Mahanti, S., John Burdon Sanderson Haldane: the ideal of a polymath; http://www.vigyanprasar.gov.in/scientists/JBSHaldane.htm
2. E-mail communication with Barrett Anthony Klein in November 2010.
3. Hyde, G., The science of scientific writing; http://communication.ncbs.res.in/ScienceWriting2/
4. Science writing workshop with Robert Kanigel held from 29 to 30 December 2011 at the Indian Academy of Sciences, Bangalore.
5. Balaram, P., *Curr. Sci.*, 2009, **96**(12), 1557–1558.

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Riddle and ridicule of earthquake prediction

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The recent Sikkim earthquake of magnitude 6.8 on 18 September 2011 has caused severe damage in the state. During the last two decades or so there have been a number of destructive earthquakes such as Uttarkashi[1], Latur[2,3], Bhuj[4] Sumatra and Kashmir[5]. Unfortunately, the post-seismic disaster management scenario of successive earthquakes has been 'repeat performance' of the previous events.

After the occurrence of any destructive earthquake, the most favourite and frequently asked question is as follows: 'Is it possible to predict earthquakes?' The answer to this question is highly complex, with real and imaginary solutions. People living in seismically active regions would like to know about earthquake prediction. But most of them feel that earthquakes occur with little notice. However, this misconception needs to be removed. It is the duty of researchers to educate the common man about the seismic precursory indicators.

As the subject of earthquake prediction has not reached any perfection, it is not possible to accurately predict an earthquake with related parameters. It is a fact that the administration is keen to save human lives. But they need some scientific input from researchers. Unfortunately, most of the disaster management activities have been planned for the post-seismic period. Majority of the disaster managers, engineers and some scientists are of the opinion that earthquakes cannot be predicted. As a result, the disaster management scenario has become highly complex with actions and solutions which are useful only during the post-seismic situation. The past experiences at Uttarkashi (1991), Latur (1993), Bhuj (2001), Andaman (2004) and Kashmir (2005) give almost similar pictures. Usually seismic shaking of moderate to large earthquakes lasts for about 35–45 s. If we divide the seismic shaking in three parts each of about 12–15 s, then during the first part, the disaster managers are highly excited to watch the terrain shaking. In the second part, they are awed by collapse of the structures. In the third part they are horrified to see people dying. After this the disaster managers rush to the site with stretchers, medicine, rescue equipment, etc. Unfortunately, help comes too late, as a large number of people would have already died. There is apparently no activity during the pre-seismic and co-seismic periods. Further, there are no funds or limited funding is available for earthquake prediction research.

The subject of earthquake prediction has made good advances since 1990. Pioneering efforts have been made by Chinese researchers[6–8]. Despite this, it has not been possible to accurately predict earthquakes with all related parameters of time, space and magnitude. A number of researchers have been using conventional parameters as precursors. The conventional precursory parameters such as geological, geophysical, magnetic, physical and chemical have not been that much useful to accurately predict earthquakes[9–12]. During the recent decade, utilizing scientific data as obtained from satellites has also been found to be useful[13–15]. These are outgoing long wave radiation (OLR) and total electron content (TEC) in the ionosphere.

However, Freund[16] has observed that earthquake prediction would be possible by non-geologic, non-seismic and non-geodetic methods. He stresses the need to monitor short-duration seismic precursors such as changes in the atmosphere, ionosphere, etc. The Chinese researchers have been claiming accurate prediction of earthquakes in the post-seismic analysis. However, they have been able to correctly predict only one earthquake.

It is a fact that the age-old precursor of abnormal animal behaviour had been reliable. Since the Spitak (Armenia) earthquake of December 1988, abnormal human behaviour has been found to be useful[17]. Just like animals get disturbed about 10–12 h before an earthquake, human beings also get disturbed. Human health gets suddenly disturbed. About a day before the earthquake, an abrupt rise is seen in psychosomatic disorders and diseases such as blood pressure, heart trouble, vomiting, headache, migraine, uneasiness, etc. The number of deliveries and out-patient department (OPD) patients rises by 5–7 times before an earthquake. This observation from Spitak was verified during post-seismic studies at Latur. On an average there were about 3–4 deliveries at the Latur Civil Hospital. But on the penultimate and ultimate days of the earthquake, the figures were 17 and 21. Most seismologists routinely measure the conventional parameters. But it needs to be noted that these