INTERVIEW OF SCIENTISTS & ITS ANALYSIS

As ideas are preserved and communicated by means of words, it necessarily follows that we cannot improve the language of any science, without at the same time improving the science itself; neither can we, on the other hand, improve a science without improving the language or nomenclature which belongs to it.

— Antoine-Laurent Lavoisier
6.1 INTRODUCTION

The chapter six has been devoted to find out the reasons as to why scientists restrict themselves from popularizing scientific discoveries. The main objective is to find out if the scientists are for or against science popularization.

It is found that researchers publish their research findings in journals out of professional compulsion. It is both to document their research findings and also to share the results with others for both the purposes of scrutiny and verification. The researchers or scientists also publish to create a positive opinion among the peers which will boost support, recognition and funding. There is no such compulsion for researchers to popularize their research findings. In a personal discussion, Dr. Suresh, scientist from CSIR-NCL said that mostly the routine research carried out by scientists around the world increase the sensational knowledge only slowly. Occasionally there will be quantum jumps in terms of new discoveries, invention and concepts. He is of the opinion that new discoveries will be noticed only if they influence or modify the present thinking. Inventions will be noticed only if it has an immediate application which will change the day-to-day life. Many inventions take years to come into use. Sometimes nobody notice the invention because it is much ahead of the times. In these days of wide communication network euphoria around discoveries and inventions are more of a creation of media and more an anticipation of their impact than the actual impact they potentially have. Dr. Suresh further added, human genome sequencing project or producing clones like dolly sheep were something like that. There was a lot of hype about the impact of these discoveries and anticipation about their benefits. However, the consequences and applications of the findings do not happen suddenly. These projects had massive efforts with lot of resources to achieve quick progress with a purpose and culminate in an announcement with wide publicity. Very often the new concepts which revolutionize the contemporary thinking can easily catch the imagination of the people. Dr. Suresh felt that these would eventually become good topics for popular writing. Superconductivity and nanotechnology are such examples. Because of the sensationalism and popularity involved the similar situations can be hijacked intentionally or otherwise by unscrupulous elements or naïve researchers. Examples are cold fusion and ethanol from water. So, true researchers are afraid of the sensationalism and associated higher expectations.
Many a times it is found that popular science is reachable to people. But news from discoveries is few in number compared to the overall research publications submitted to journals. In this context, a few scientists from CSIR-NCL were interviewed through a short series of questions presented in table 6.1. The questions were asked to find out whether it is true that scientists refrain from popularizing science? Whether they prefer to interact with students and help them motivate towards taking up research? Whether scientists dislike speaking to people or is it only a myth?

During the interview session with the scientist it was revealed that Indian audiences need to understand that scientists are human. The efforts that scientists put into their research cannot be compared with their research output. These outputs come with 99% success with chances of one percent failure. When this failure occurs the scientist is pressurized and therefore expects a strong support from people. Therefore, it is the duty of the people to support one percent failure with the thought that one learns from failures and one should not malign the efforts gone into approaching the stage that the development has reached but encourage the researcher to re-research to get the final result. This fear factor is one of the reasons why scientists restrict their work from being popularized.

6.2. ANALYSIS OF THE INTERVIEW

The following Table 6.1 represents the questions put forward to scientists from CSIR-NCL for collecting their views on science popularization.

Table 6.1 QUESTIONS ASKED TO SCIENTISTS FROM CSIR-NCL.
1. Why scientists refrain from popularizing science or if you do not then what encourages you to popularize science?
2. Are you willing to popularize your research output, summarize both yes and no?
3. Do you feel it is important to interact with students, especially college students, to help them broaden their knowledge in terms of what scientists do and motivate them towards research?
4. What efforts will be required to popularize research so as to reach common people and students?
5. If you feel that scientists should not interact or inform about their research, explain yes or no?
6. Factors such as limitations of time, imparting knowledge may confuse students etc. is some of the reasons why a scientist does not intend to participate in popularizing science among common people and students?
7. Is it necessary to popularize, comment and explain?
8. What is your intuition or can you comment on the effect of your communication with the public, whether it will be positive or negative?
9. Would scientists prefer science communicators to help them in popularizing their work and they will they be willing to spare time to brief the communicators?

**Results of discussion on Points 1 and 2 from Table 6.1.**

Most of the scientists are willing to help in popularization of science for school and college level students. They felt that it was an urgent need to communicate to them the importance of science as a career and make them understand how interesting and rewarding it is. Many times, the parents decide what should be taken up by the students for their career. These decisions are based on job and career opportunities that are later available with each of the chosen fields of study. Therefore, scientists feel that parents should also be involved in the science popularization drive. Some of the scientists were skeptical about the purpose of communicating science to the common public. They are of the opinion that common people would be interested only if it is useful to them and if it makes any difference to their daily life in some aspects. Such a type of research is not carried out by all the researchers. For example, if a scientist is working in the area of polymers for solar energy utilization, the scientist feel that the common man will appreciate
only if the scientist is able to get to them this science in the form of a product say a cheaper solar cell which they can put to use. Most of the scientists, due to their inherent self-effacing nature, are not proactive in popularizing their work. However, when contacted by science writers to expound their major achievements or applications of their research (current and/or futuristic), they are quite enthusiastic in discussing. Thus, it is up to science writers from newspapers / magazines to actively meet scientists and discuss their work (published in good peer-reviewed journals). Few of the scientists felt that scientists are normally involved in pursuing high science which is not easy to popularize as it requires certain level of education. Professors from universities are better in popularizing science as they are regularly involved in teaching the graduate /postgraduate students. Some of the newly joined scientist felt that they would like to encourage popularizing science and taking it to the masses. Most of our country men are far away from science, due to which they become easy target and are trapped in various kinds of black-magic, witchcraft and superstition. If the people who understand (at least up to certain level) the logic behind substances, matters and universe, would like to eradicate the out dated belief’s like supernatural powers and superstition etc. one has to take this understanding (of science) and educate our country men. A good example would be western society, where science has reached the masses, hence they do not believe in magic etc. and hence there are no magicians and Baba’s.

Scientist felt that the audience who listen to their research should be understanding and appreciative. They feel that to the common layman, the research that goes on in academic and research labs would appear like waste of tax money, which is not the case. Most often there is no bridge between what scientists do at research labs (fundamental research) and what can be popularized to common man. If these discoveries are going to impact the society in a way, then definitely popularization will work. Some scientists have given their opinion that their research was very specific and therefore, the research output cannot be popularized. However, most of the scientist stated that they were already into popularizing science amongst school and college students. They were delivering talks in the villages as well as in the outreach activity conducted on a Sunday morning once a month at NCL’s Innovation Park. A publication in scientific journal is one way to popularize the research outcome, but that has limited access. Hence, reaching out to a larger community by presenting the work in various meetings, occasions will also be
undertaken. As such, there is no restriction for scientists to popularize science except their own inhibition.

**Results of discussion on Point 3 from Table 6.1.**

According to scientists, the present college students are the next generation potential researchers. The students need to explore and build things on their own. They need to be encouraged to adapt to the ‘out of the box” type thinking. For this, a special type of environment should be created and made available to them.

One of the ways to encourage students towards research maybe to encourage them to explore what is not known. Ideas from them should be encouraged. The students should be motivated to bring out ideas that could benefit the society. By doing this the students will have the exhilarating feeling of seeing their ideas being put to use for general good of society. These students will be motivated to take up science as a career. Scientist feels that a research career is more exciting than the routine mechanical jobs because as a researcher one is constantly learning. There is something exciting to look forward to in the lab each day. No single day is same as the other, as one is in constant touch with young students who are eager to carry out new ideas to work. College principals should take the initiative to arrange regular interactive meets with local scientists. At NCL, Scientists interact with students by giving talks and presentations at colleges and universities. They also guide M.Sc., Mtech project students for 6-12 months to give them a feel for research and guide them for their research. Postgraduate students are in a better position to understand the research the Scientist is performing and get motivated towards research. It is important to motivate the young minds to take up research career. This activity is being carried out in some of the research institutions and including CSIR-NCL. One of the scientists, Dr. Samir Chikkali has been visiting local colleges in Sholapur (MH) district and the University Center, and has delivered talk on, “Opportunities in Indian Science” on many occasions.

**Results of discussion on Point 4 from Table 6.1**

Efforts such as arranging popular talks and lectures by scientists and researchers who believe in their chosen path and who are excited about their work are sure to get across some of the
enthusiasm to the students. Recently the CSIR-NCL conducted experiments in which school students also participated and got a direct feel for research which became successful in conveying the excitement. On the other hand, school and college principals should take the initiative to arrange regular interactive meets with local scientists. All newspapers and general magazines should have special columns on new developments in science & technology, for which they should meet reputed scientists. Popularising research to common people should be through demonstrating innovations which can put an impact on their day to day life and for students through lectures and demonstrations.

Professors from postgraduate centers can popularize research among students. Programs for common people like, lectures and demonstration of improvement in day to day life will no doubt help to generate interest in research. A dedicated and systematic approach from Govt. institutions like, IIT’s, IISER’s, CSIR (AcSIR) and various GoI science and technology departments, is required for popularizing science. Some of them have already started doing this, but more efforts are required to take it to the masses. The universities and local colleges should also take up this challenge and take science to the society.

**Results of discussion on Point 5 from Table 6.1**

All scientists were of the opinion that they should interact and inform about their research. Scientists should interact. Only if the work is not directly having an impact on the society, then it would not be worth popularizing. So only, research or discoveries related to application or product based research that are applicable to common people may be popularized. Common people will get interested in research if it is going to help in day to day requirement and better treatment for the diseases. Scientist should interact with the society and understand their requirements or problems. The best way to popularize science is to solve the common scientific problems of the society, so that society will appreciate the role of science in improving their lifestyle. All scientists have felt that they should popularize science but at the same time felt that every scientist is not capable due to absence of command over vernacular language and oratory skills.

**Results of discussion on Point 6 from Table 6.1**
Though most of the scientists interviewed felt that they were interested to participate in popularizing science to the students and common people, few felt that all scientists did not have the ability to teach. Some of the scientists felt that they were aware of how to make their science easily understandable. Scientists felt that if they want the society to appreciate their research and support their research activities then scientists must find time to return this as a gesture to the society. Above all one should know what is to be popularized and whether it has an appeal to masses. It is also important whether something is for simple popularization or educating people for a purpose related to their life.

Results of discussion on Point 7 from Table 6.1
The scientists have given their positive opinion to this query. Besides gaining knowledge, it is the right of society to know what kind of research is being carried out by spending public money, and how it will benefit the society in the short as well as long run. It will also add to self-esteem and national pride. Popularization of science will definitely help in generating interest of younger students to opt for science/research. Further popularizing science will directly solve many of the social issues that our society is facing presently. Most of the answers of this question are similar to Discussion Point 1. Scientists should interact and inform people about science in a wider sense. These different factors influence various scientists to various extents.

Results of discussion on Point 8 from Table 6.1
Most of the scientist felt that their communication with public will definitely be positive. However, it is important to put communication in the right perspective, and not raise unnecessarily high hopes by over-claiming credentials. Some of the scientists felt that it would be worth communicating with the public depending on the relevance of technology. If a technology or research is directly involved with products or applications relevant to people then this could be shared with the society otherwise it would be meaningless to share knowledge which does not lead to products. The research institution of the researcher or where the research is being carried out should also initiate dialogs with the society by way of publicizing the research in newspapers, non scientific articles, workshops etc. Finally, it is necessary to popularize science for health consciousness, eradicating superstitions and environmental awareness.
Results of discussion on Point 9 from Table 6.1

Scientists felt that science communicators should interact and communicate their research. Seeking the help of science communicators should be done as part of popularizing the research in an organization, not at the individual level. For instance, institutions or laboratories like CSIR-NCL can take the help of science communicators to get across the common public, the type of research that goes on inside the labs. Earlier there was a concept of public days when the general public was allowed to visit the labs in the CSIR organization. Different laboratories used to put up posters explaining their work and models to show their products. One of the scientists was inspired to take up research while visiting a CSIR lab and is today a scientist contributing to this study. Dr. S. K. Asha says in her own words “when I was in college I had visited some of the CSIR labs and seen and wondered with the research in the labs”. The concept of allowing the public to visit and feel free to ask the scientists and students about their research has lots of benefits. The scientists or researchers will when interacted with, have time to talk on their research. Most of the scientist will be happy to interact and popularize science, but at the same time, scientists feel that there are hardly any dedicated science communicators. Science communicators have definitely a great role in science popularization because that is their profession. The major motive of scientists is to do research and report the findings. Science writing for popularization is not just reporting results, but it is much more than that.

6.2 PROBLEMS WITH EXISTING SYSTEM FOR PUBLISHING SCIENTIFIC RESEARCH

The communication between Scientist has been originally disseminated in journals. It is found that peer review journals have been increased tremendously in the last few years. The format of paper submission, peer review, content of article, languages etc. have been worsening over the years. The emergence of new journals lack stringent pattern of article selection. The peer review is many times not commented well and not carefully looked at. Due to the rise in internet users,
scholars prefer to share information through blogs, chat rooms, emails, forums etc. Michael Eisen in ‘wither science publishing’ has commented that ‘if the entire publishing industry disappeared tomorrow, science would be immeasurably better off’. It is important that a new system optimized for science and electronic communication is build in such a manner that it should not retain any of the features of the current system. The contributor’s comments from ‘The Scientist’ magazine on the article ‘wither science publishing’ have been discussed in this section 6.2.

The present system according to Randy Schekman and Mark Patterson fails to take advantage of the technology created in order to advance scientific communication and fasten the pace of discovery. For example, print restricts full-length publication of articles that are rich in content due to limitations of space.

**Problems with the existing peer review system:**

Peer review is sometimes stellar and insightful as remarked by Patrick Taylor in a recent article ‘wither science publishing’. Some of the reviewers take their work seriously and comment critically on the article whereas some of the reviewers do not comment critically for factors such as too many papers are to be reviewed in a short time, compare, validate approaches, data, results and directions etc. The process of peer review is slow and time consuming. It often involves multiple sessions of review and revisions, the reviewer’s requests for additional experiments and frequent rejection and resubmission to multiple journals. According to Michael Eisen, peer review slows down the process of communication of new ideas and discoveries while failing to accomplish most of what it claims to do. Scientific enterprise is all about building of the results of others and this will be possible only if the results of others are upright and not diminishing at the hands of reviewers or suffering due to multiple rounds of peer review.

**6.4 CONCLUSION**

It can be concluded from the interviews of scientists that they are interested in popularizing science and their findings with the students and common people. There is no restriction from scientists to popularize their research except their own inhibition, shyness or lack of motivation.
All the scientists interviewed were very much for science popularization. They felt it will make people more health conscious, not to be carried away by false advertisements, awareness on environmental protection, not to believe in superstitions, learn to enjoy science as a philosophy and pass on the spirit of science to the next generation. Scientists are afraid whether they will be able to convey a finding in its true perspective. The progress of science in terms of its impact on thought is very slow. Unless the idea is revolutionary nobody will care. They fear that the media may bring in some kind of sensationalism which can totally distort the intention. It may create misconceptions and criticism which will not be professional. That is what researchers are afraid of in science popularisation. There is constant fear that their research if not communicated in the right spirit may harm because of misinterpretation.

*******