

and many other parts inside the reactor building take the visitors to the world of nuclear power generation.

On the way out, while passing through the containment structures they stop by at each wall – the 4 ft thick primary containment and the 2 ft thick secondary containment that are made up of reinforced pre-stressed concrete – and appreciate the degree of precision that has gone into the construction of the reactor.

They then visit the gigantic turbine floor where the country's first largest single-unit turbine and generator (unit-1 of KKNPP) are functioning. Next they see the 400-kV gas insulated switchgear

that evacuates the power produced from KKNPP to the power grid from where actually it is distributed to the users. Finally, they visit the water intake structure that takes sea water into the plant for cooling purposes. The special fish protection system employed in this structure admits only water into the plant, thus sending the fishes back to the sea without harming them. This is another unique system first introduced in KKNPP.

The visitors come out of the plant with a novel experience and complete contentment. 'It doesn't look like an industry; the surroundings are so green while the inside is so neat,' a visitor expressed.

'Words alone can't make the people understand about such a complex technology. That's why the "visit KKNPP" initiative. The gates of KKNPP are open to people, learners and anyone who wishes to understand nuclear power generation', says R. S. Sawant, Chairman of KKNPP Public Awareness Committee.

With growing interests among scholars and the public, KKNPP has become a place of scientific importance in the region.

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MEETING REPORT

Science writing workshop*

The Current Science Association has introduced Science Writing Workshops for the benefit of students, teachers and researchers to improve their science writing skills. The first such workshop was held in Bengaluru. Inaugurating the workshop, P. Balam (Molecular Biophysics Unit, IISc and former Editor of *Current Science*) gave a brief history of *Current Science*. The journal, founded in 1932 has completed 84 years. He mentioned that punctuality in publication has been a remarkable feature of the journal. Drawing from his experience of writing editorials for the journal, he mentioned that, despite difficulties, he tried to keep up to his commitment so that the journal comes out on the 10th and 25th of every month. This made him appreciate newspaper editorial staff who bring out the newspaper every day without a break. Though one may criticize the language or find spelling mistakes or even misreporting in newspapers, the quality of keeping to deadlines is truly admirable.

Balam reminded participants of the importance of reading which should precede writing. Science writers need to read widely and go beyond known pas-

tures and comfort zones. He mentioned titles of a few books that inspired him. Talking to people who work in diverse fields helps us understand the intricacies of even the most obscure scientific topics.

He explained that the first few pages of *Current Science* target general readers, providing news, correspondence, opinion pieces, etc. while the last part is made up of obituaries, book reviews and so on. The middle part targets readers from narrow disciplines. While research papers go through a rigorous peer-review process, the decisions about the sections that target all readers from diverse disciplines are made by the editors.

Replying to a question from a participant, Balam mentioned that *Current Science* has a bias towards subjects that are specific to India, as our national, geological and biological diversity is not very important to other international journals. But fields such as bioinformatics, nanotechnology, etc. which do not have India-centric content, can be published in any international journal. They do accept such articles but the decision rests on the reviewers and the editorial board.

In the second session, Rohini Godbole (Centre for High Energy Physics, IISc) talked about women in science. She looked back on her career as a researcher in High Energy Particle Physics and was

grateful that she did not experience much gender discrimination. Yet, as she was invited to fora that dealt with women in science, she became aware of such problems. She spelt out the issues and suggested solutions, some of which needed to be tackled by science writers, some that needed lobbying and advocacy. Cultural mindsets and stereotypes need to be addressed by writers, but the task takes time. Lobbying and advocacy for changes in rules and policies are such that they become gender neutral and may take less time, but effort is needed. Despite burdens of childbearing and rearing, women can also be good scientists. Any break in their scientific activity during that time, and entering into scientific research later, needs to be looked into.

She pointed out that while universities and colleges have a better sex ratio, research institutions have a wider gap. She suggested that a minor tweaking of the rule – to take the number of years worked as a scientist rather than age – might help women Ph D holders enter a scientific research career. Providing crèches in research institutions and hiring both husband and wife in the same institution if both are scientists, are steps that can be taken.

In my role as trainer, the present writer made participants aware of the number of fruitless hours spent in English classes. Without decent mastery over the

*A report on the 'Workshop on Science Writing', organized by the Current Science Association, and held on the premises of the Indian Academy of Sciences from 20 to 25 June 2016 in Bengaluru.

language, written output becomes unreadable. I prescribed that they read one poem, short story and an essay each day for 1000 days to improve their language skills. One review article and three research papers each week and one science book every month was also prescribed to keep the participants grounded in science.

School and college have a scattering of many subjects but fail to make connections between subjects apparent. The stress is on remembering and writing in exams to get marks for only the evaluators to read. The issues of creating new knowledge or writing anything new for others to read and enjoy are not even addressed. In order to create new knowledge it is important to ask questions. However, we are not trained to ask questions in school or college; in fact, we are discouraged from asking uncomfortable questions. To overcome this learned inhibition of our curiosity, a space was provided where participants can ask questions. These were examined later in the workshop and the participants realized that some questions are more important and productive than others.

The educational system leaves no time for students to immerse themselves in any specific area, raise relevant questions or inquire on their own. The link between theory and practice is broken due to the exigencies of preparing a timetable and scheduling classes. The five-and-a-half day workshop is designed to overcome the limitations of the traditional system. It demands immersion in science writing to the exclusion of all other personal and academic issues. Theory and practical work are interconnected and are treated as such, in the workshop.

A workshop means work. And the work in this workshop is to write reports on the most recent scientific advances made in India. The work done during the workshop will, on the one hand, prepare participants to write scientific papers more clearly and concisely. On the other, if the reports are good enough, they may also be published in journals like *Current Science* as news reports.

The participants have to read scientific papers, extract the most relevant points and write them in a manner understandable to scientists in other disciplines. It is also important to read the papers critically. The participants were reminded that past scholars had accepted the flat earth theory, and that in the early days of

the scientific revolution, most academics accepted the earth as the centre of the universe. Thus, it is possible that we too might be harbouring notions that have logical contradictions and might disregard evidence that questions our beliefs.

Critical thinking is not taught in schools, colleges or universities. To provoke the need to read critically, some well accepted notions currently in vogue were critically analysed as a demonstration.

In the last session of the first day, the protocol for science news production to be followed in the workshop was explained. The reports published by participants of previous workshops elsewhere were shown to motivate the participants and give them confidence.

On the second day, participants were exposed to the strengths of browsers and search engines that were not utilized by most people. Search settings, advanced search, bookmarking, etc. were demonstrated. The differences in limitations and strengths of searching using *Google*, *Google Scholar*, Directories and Databases were explained and demonstrated. The participants were given time to practice and get acquainted with the new information gained. The need to evaluate and assess the credibility and authenticity of the sites the participants might visit was explained.

The participants were then made to search on the *Web of Science* for entries about research done in India between 25 June and 10 July. They extracted entries on which they would like to report and searched the Net to get hold of the full paper.

And the work started in earnest.

To give them time to practise the principles that were explained, I did not stick to the schedule that was prepared before the workshop. Instead, I focused on providing principles on the basis of the practice, the work the participants were doing.

On the third day, Giridhar Madras (Department of Chemical Engineering, IISc) addressed the participants. He gave participants a methodology to use for writing papers and discussed the most common mistakes that people make when writing papers, such as the use of unnecessary words in the title, repetition of the conclusion in the abstract, etc.

He said that materials and methods should be written first. The results can be written next. The introduction should

contain relevant points from literature search and should clearly define the lacunae and questions that are tackled in the paper. The results and their discussion should not be mixed with conclusions. The conclusion should address the main outcome, the issues raised in the introduction, the limitations, the direction that further research should take and the implications or applications of the present research. He demonstrated his points with examples of reasonably good papers and extracts of papers where this was not done.

The participants raised a large number of questions about the manner in which editors and reviewers examine their papers. Giridhar Madras said that clarity and brevity are the essential features of good papers. The paper can be rejected from the editor's desk, after review and also after plagiarism check.

The participants went through an exercise where they associated the topic of their reports with different target audiences. The need to reformulate the story for different target groups was made clear. The possibility of repurposing the same content for a blog or a radio programme or a TV show was pointed out. It was clear that the exercise made major impact on the attitude of some of the participants who had not earlier given due consideration to their readers and the intentions behind what they write. The exercise did not proceed to the examination of a fourth parameter in the equation, the market for what they write. In the context of *Current Science*, the factor was not too relevant. Moreover, the time was limited.

On the fourth day, I talked about the flow of thought in science writing. Using the metaphor of the flow of water in the linear and nonlinear range as well as the emergence of structures, I stressed the importance of reading widely and creating a nonlinear situation in the stream of consciousness, where structures evolve naturally. The other technique was to create structures consciously by editing and rewriting.

Editing techniques were demonstrated using a badly written paper extracted from the Net, making sure that none of the participants had an earlier understanding of the background of the paper. The participants practised the technique to make the paper less opaque and confusing for the readers. They then applied those principles to their own reports.

Participants were encouraged to make suggestions and comments to improve the reports written by others. It was clear to me that, by this time, all the participants were fully involved in their work. Many were actually working late into the night as evidenced by their presence on the Net, visible on the Google doc where their reports were filed.

Vijay Kumar Sharma (JNCASR) addressed the participants on the fifth day. He interacted with participants and provoked them to raise questions and doubts. He chose to take off from the concerns expressed by the participants.

The first question he asked was about the origins of science. To the answer that it was the curiosity of human beings, he countered: curiosity is a luxury that we can now afford. Even more primitive is fear. Fear of the unknown and the need to make it less so propelled scientific advances in the early days. Think about it, he said in his characteristic manner. He then traced the history of scientific writing to the early days after the Gutenberg revolution. In the *Proceedings of the Royal Society*, authors wrote elaborately, providing large amounts of observational details. Scientific publishing has evolved since, over a long period. The maximum word counts of various sections in *Current Science*, for example, are now well defined.

He stressed that it is important to start writing from the time one is doing experiments. Leaving the writing to the last minute after all experiments are finished, would leave many issues inadequately tackled. He asked the participants about the sequence to be followed while writing a paper. When they started saying Introduction, Materials and Methods, etc.

he responded that it is not necessarily the sequence that the readers may find while reading the paper. Abstracts will be written after the rest of the paper is written. The title and abstracts are the most important parts of a scientific paper as these are what would attract or repel potential readers. He said that these should be finalized last.

He stressed the importance of writing all parts of the paper oneself and warned against the temptation to copy and paste parts of earlier papers. He provided examples of plagiarism and warned participants that it may cause them their career. Sharma spiced up his talk with anecdotes and jokes.

After Sharma's talk, the participants discussed their reports. Reports written by each participant was taken up one by one and critiqued from the point of view of the principles that they learnt during the workshop. Though this took more time than anticipated, it was clear that learning from the workshop was being internalized by the participants.

The reports were then collated and laid out in the format of *Current Science* pages. By the time S. K. Satheesh (Centre for Atmospheric and Oceanic Sciences, IISc) came, the draft reports were ready. He confessed that he is not an expert in the areas of science from which the participants had chosen their topics. He would make comments as a lay reader. As the co-editor of *Current Science*, he pointed out the flaws remaining in their reports. He appreciated the reports but also gave critical comments, pointing out grammatical and spelling mistakes, redundancies, lack of flow of ideas, issues related to lack of a definitive ending...

The participants were asked to edit, rewrite or reformulate their reports according to the feedback received. The next night too, the participants were seen to be working on their stories.

On the last day, Karthik Ramaswamy (Archives & Publications Cell, IISc) gave a presentation about the process of writing. He stressed the importance of planning before starting to write. The flow of ideas comes out better with a little planning. He gave quite a few examples of bad writing and ways to overcome the problems.

In the next session, he focussed on the need to rewrite many times before submitting a paper and gave important points to be considered while rewriting. He started with a brief presentation on essential points in structural grammar. From identifying the different clauses in a sentence, the need to bring together the connection between the subject and the verb, to provide characters and action to move the story forward, he underscored the points he was making with examples that the participants could easily identify.

The presentations were avidly absorbed by the participants who, by now, realized the importance of the points that Karthik was raising.

G. Madhavan (Current Science Association) officiated the closing ceremony. He distributed certificates to participants and thanked them as well as the resource people who had come together for conducting the workshop.

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