

Engaging Young Minds to Research and Publishing: Takeaway Points From Recent Interactive Events

Debdeep Sarkar

Research is often succinctly defined as: “creative and systematic work undertaken to increase the stock of knowledge” [1], although obtaining an all-encompassing delineation of the term is an insurmountable task indeed. The key differences and interrelation between basic and applied research are topics that are debated in the scientific community at a great length [2]. In a broad sense, *basic* or *fundamental* research is curiosity driven, aiming at the expansion of the existing knowledge base by systematic (maybe theoretical as well as experimental) investigations. While basic research provides a better or more detailed understanding of a particular phenomenon or subject, its purpose is not to solve specific problems. On the other hand, *applied* research aspires to provide innovative practical solutions to specific real-world problems.

To transform society by innovation and development, it is important that students and young professionals (YPs) stay motivated toward both applied as well as basic research. Naturally, inculcating an effective, solution-centric, and inclusive research culture that caters to the needs of industry and academia is an integral part of the education policies for all governments around the globe [3]. However, for successful implementation of these policies, it is imperative to understand the pulse of young minds,

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EDITOR'S NOTE

In this issue of *IEEE Antennas and Propagation Magazine*, we have an insightful article by Dr. Debdeep Sarkar on engaging young minds in research and publishing. Dr. Sarkar is a member of the IEEE Antennas and Propagation Society (AP-S) Young Professionals Committee as well as the chair of the IEEE Young Professionals Affinity Group, Bangalore Section.

We have many more exciting articles planned for this column in future magazine issues. If you would like to contribute to the “Young Professionals” column or have any suggestions on topics of interest, please contact me at cjreddy@ieee.org. Follow us on LinkedIn at <https://www.linkedin.com/company/ieee-aps-yp> for the latest updates and events that are of interest to AP-S Young Professionals.



CJ Reddy

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particularly by getting answers to questions like:

- What are the feelings of students and YPs regarding the choice of research topics? (Here, one may limit the scope of this question by pinpointing the antennas and propagation domain.)
- What role can IEEE play in cultivating an impactful research culture?
- What are the concerns of students and YPs about filing patents and/

or publishing their research works in IEEE venues (journals, conferences, and so forth)?

The present article aims to provide a summary of some takeaway points along these aforementioned questions, based on the author's participation in some recent events involving students and YPs in diverse stages of their academic/professional careers.

A SUMMARY OF EXPERIENCES AT AN EVENT IN AN UNDERGRADUATE COLLEGE

As a part of the volunteering activities, IEEE members are often invited to deliver talks in various undergraduate colleges in their region. The author was recently invited to the MVJ College of Engineering, Bengaluru, India,

as a guest in the program of National Education Day, India. Commemorating the birthday of Maulana Abul Kalam Azad (the first Union Education Minister of India), National Education Day is observed in the country every year on 11 November. The lecture by the author on the challenges and opportunities of education in the post-COVID-19 era emphasized the salient features of the National Education Policy of the Government of India as well as highlighting the pros and cons of online education through virtual tools [4]. The in-person event had 90 participants, mostly comprising engineering students in the electronics and computer engineering disciplines (Figure 1).

It was evident that the students, suffering from fatigue from prolonged online events, were relieved to come out, attend an in-person program, and interact with their peers. During the post-lecture interactions, the inclination within many students toward solution-oriented start-up culture was worthy of attention. A significant fraction of such students belonged to rural backgrounds, where they have seen certain challenges in their livelihoods and job opportunities. Hence, they were ready to form teams and use their complementary skills across various disciplines to propose useful solutions for agriculture, disaster management, or pollution

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control. One of the students described his team project of taking pictures/videos of agricultural lands and vegetation using cameras on drones [unmanned aerial vehicles (UAVs)], and consequently, transferring the data to the ground station via wireless links.

It was amazing to feel their infectious enthusiasm for several system-level challenges ranging from the integration of different hardware on UAVs bearing small form factors, mechanical integration, power backups, and optimal compression algorithms for efficient data transfer. The inclination of these students toward multidisciplinary projects compared to a fundamental problem (e.g., solving equations to solve for an antenna or a waveguide mode) was pretty evident from the discussions. However, given the underlying potential, there is no reason for these young minds to shy away from the challenges of involved applied electromagnetic problems of

industrial/societal importance if they are motivated properly. Some of the students also expressed their willingness to collaborate with industries and possible funding organizations to pitch their ideas for start-ups.

Overall, it was evident that the students are ready to take up big challenges and build useful systems that can lead to technology transfer and translational research. One reason behind this confidence is definitely the impact of the present-day information technology backbone and ease of access to resources like research papers from IEEE *Xplore* or YouTube videos by subject experts. These students from undergraduate engineering colleges can tremendously benefit from the IEEE global outreach activities (e.g., Special Interest Group on Humanitarian Technology initiatives), which can help them to: 1) obtain funding for their innovative research projects and 2) stay connected with IEEE Members from industry as well as academia, who can guide them properly in their future endeavors.

A SUMMARY OF EXPERIENCES AT AN EVENT IN A RURAL SCHOOL

In the previous section, the aspirations of undergraduate students regarding system-level research and the possible roles of IEEE in empowering them were highlighted. But if we take a step back in terms of academic study level, the scenario changes to a very different one. There are several schools in rural areas of different countries (especially the developing ones) where IEEE members can significantly contribute by complementing the existing government support in systematic ways. Besides arranging for funds targeted at specific infrastructure development, IEEE members can train and motivate the students to carry out exciting and meaningful research in the future.

Recently, the author was a part of one such activity: the inaugural ceremony for the Computer and Do It Yourself (DIY) Lab at Rural High School, Devanahalli, Avathi, Karnataka (Figure 2). The Computer and DIY Lab is set up



FIGURE 1. Some pictures from the event at the MVJ College of Engineering on National Education Day, India, on 11 November 2021.

by the IEEE Antennas and Propagation & Microwave Theory and Techniques (AP/MTT) Bangalore Joint Chapter, based on the support from the IEEE Committee on Promoting Equality [5], [6]. The entire initiative was led by Shri Puneet Mishra (chair of the IEEE AP/MTT Bangalore Chapter, 2022), and supported by executive committee (ExCom) members and student volunteers. This specific school happened to be the school of Dr. Mahesh Appajappa (a faculty member with the R.V. College of Engineering Bangalore, currently an ExCom member of the IEEE AP/MTT Bangalore Chapter). Being the current chair of the IEEE Young Professionals Affinity Group, Bangalore Section, the author also involved the YP team and contributed to the cause by donating study materials (like notebooks) to the needy children.

The interactions and hearty discussions with the students, who spoke innocently about their dreams to become scientists, engineers, doctors, or teachers, struck a different chord indeed. The students were very thrilled to see the computers, display screens, and projectors along with the study materials (e.g., toy models on biology) that were present in the small-scale lab facilities. One could also sense their excitement in meeting and interacting with IEEE members belonging to different spheres of the scientific community like government research labs (e.g., Electronics and Radar Development Establishment-Defence Research and Development Organisation, Government of India and Indian Space Research Organisation) and industries (e.g., Robert Bosch and Honeywell) as well as academic institutions (e.g., the Indian Institute of Science). IEEE members, especially the ones who are conversant with local languages, can train them using such basic labs, instill the idea of research in young brains, and motivate them to grow as scientists and tech leaders of the future generation.

AUTHORSHIP WORKSHOPS AND THE WAY AHEAD

Conducting efficient research at any stage on any engineering subject

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requires literature surveys, followed by detailed analytical, computational, and experimental studies based on the research problem. However, it is equally important to master the techniques to publish the work in the scientific community by confronting the peer-review process [7]. However, acquiring the skillset to write an impactful research paper demands years of thorough practice. From the IEEE side, there are several useful information sources available for authors to hone their expertise in writing research articles (interested readers may visit <https://ieeauthorcenter.ieee.org/>).

However, very often, students and early-career YPs are not aware of these

resources, which necessitates the organization of IEEE Authorship Workshops. The author recently spoke alongside Dr. Ashutosh Kedar in a well-attended virtual IEEE Authorship Workshop chaired by Shri Puneet Mishra and organized by the IEEE AP/MTT Bangalore Chapter and IEEE Bangalore Section (Figure 3). Here, the audience was mostly researchers and faculty members, who engaged in long post-lecture interactions with the speakers.

It was interesting to see one common question being raised: For a conducted research work with a certain outcome, how should one decide about filing a patent out of it or submitting it to journals/conferences? The question that followed was: If a work has been already presented at a conference, can the extended version be submitted to journals? While there is no general answer to these queries, it is logical to conclude that the more such discussions happen, the better it would be for the scientific research community as a whole.



FIGURE 2. Some pictures from the inaugural ceremony for the Computer and Do It Yourself (DIY) Lab at Rural High School, Devanahalli, Avathi, Karnataka, India, on 12 March 2022.

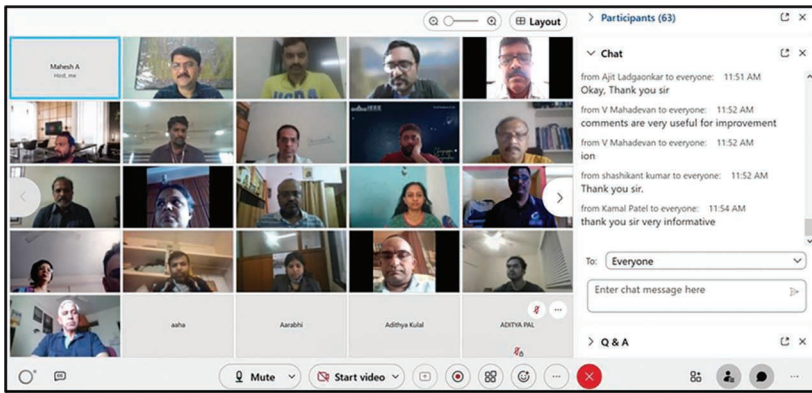


FIGURE 3. A snapshot from the IEEE Authorship Workshop (virtual mode) organized by the IEEE AP/MTT Bangalore Chapter and IEEE Bangalore Section, on 22 January 2022.

Finally, conducting an impartial and thorough peer review of any author-submitted work is extremely crucial to uphold the quality of research. Therefore, it is important that researchers who have gained certain expertise in their subject also learn the fundamentals of reviewing a manuscript [7]. Due to the large volume of submissions in many journals and conferences, a large reviewer pool is required. Therefore, several YPs in their early careers need to be involved in the peer-review process. In that context, IEEE Reviewer Work-

shops can also be organized so that these YPs can benefit from the knowledge dissemination by experienced experts on this subject [7].

AUTHOR INFORMATION

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SHORT COURSES (continued from page 147)

RADAR CROSS SECTION REDUCTION

31 October–2 November 2022, Atlanta, Georgia, United States. Georgia Institute of Technology, Professional Education, P.O. Box 93686, Atlanta, GA 30377-0686, United States. +1 404 385-3500, fax: +1 404 894-8925. <http://www.pe.gatech.edu>.

EMI/EMC IN MILITARY SYSTEMS

1–3 November 2022. ONLINE. Applied Technology Institute, 349 Berkshire Drive, Riva, MD 21140-1433, United States. +1 410 956-8805 or +1 888 501-2100, fax: +1 410 956-5785, email: ati@ATIncourses.com. <http://www.ATIncourses.com>.

RADAR WAVEFORMS: PROPERTIES, ANALYSIS, DESIGN, AND APPLICATION

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FUNDAMENTALS OF SYNTHETIC APERTURE RADARS SIGNAL PROCESSING

14–18 November 2022, Atlanta, Georgia, United States.

BASIC ANTENNA CONCEPTS

15–17 November 2022, Lake Buena Vista, Florida, United States.

BASIC RADAR CONCEPTS

15–17 November 2022, Lake Buena Vista, Florida, United States.

RADAR WARNING RECEIVER SYSTEM DESIGN AND ANALYSIS

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