

THIS SSUE

2

Showing the way The role of field assistants in ecology

6

Blowing glass Revisiting a shrinking profession

18

Biochemistry staff A crucial link in the research chain

20 Snapshots A photo essay on IISc staff **34** Treating taste buds Stories of snacking on campus

38 OLSEH The office overseeing lab safety

9

Running CAF The people who look after animals used in research

12 At the aerospace workshop A former technician on working with Satish Dhawan

16 Bringing ideas to life John Doss on his father's time in and outside IISc

24

Illustrating research Former draughtsmen on adapting to changing times

28

Remembering RN A fluid dynamicist on the 'gentle giant' of her field

30 Offering support A student organisation for the LGBTQ+ community **42** Science and Society A case study from a nanoscience lab

Editorial

Research at institutes like IISc is enabled by the contributions of hundreds of people who are not scientists by definition. Although we frequently feature stories about non-academic staff, in this special issue, we pay tribute to these 'hidden figures', whose significant roles in the everyday pursuit of scientific endeavours are often taken for granted.

Read about the people who assist ecologists in the field, and about the daily routines of staff at the Central Animal Facility. A retired technician shares memories from 36 years spent at the Department of Aerospace Engineering. The son of another technician recalls his father's commitment to his work. Staff who worked in biochemistry labs talk about their responsibilities behind the scenes. Two former draughtsmen and a former glassblower talk about their dying professions.

Do look out for an interview with the Chair of the new Office of Laboratory Safety and Environmental Health, a tribute to Roddam Narasimha by a colleague and a book excerpt on the social dimensions of doing science in a lab.

And in times that require more human connection and support, we speak to QUASI, a student organisation for the queer community.

Happy reading!

TEAM CONNECT

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PARTNERS

- Samira Agnihotri

Field assistants are critical yet underappreciated members of the ecological research community

Photo: Sanjeeta Sharma Pokhare

2

Krishna in his element

When Raman Sukumar went to the forests of Mudumalai to study elephants for his PhD in 1978, he wanted a local person familiar with the terrain, and experienced at navigating elephant country to guide him. The forest rangers put him in touch with K Krishna, a Betta Kurumba Adivasi, to whom these forests were home.

In the 43 years that have passed since then, Raman, recently retired as Professor at the Centre for Ecological Sciences (CES) at IISc, has become a noted elephant biologist, and Krishna has assisted dozens of students and researchers on a wide variety of research topics. He has kept them out of harm's way from potentially dangerous animals like elephants, bears and tigers. He is famous for his intricate knowledge of elephant behaviour. His sharp eyes can spot them from a great distance, and he knows exactly where and when to find them in the forest. "But

> he also has a respectful fear of elephants, and knows not to cross the line with them," says Nachiketha Sharma, a visiting researcher in Raman's lab, who has been studying elephants with Krishna since 2011. According to him, Krishna is probably the best elephant tracker in India, and has made an immense contribution to elephant research in the country.

Krishna also knows the botanical names of more than 100 tree species, as well as their Kannada and Tamil names. "Now, everyone who comes here is told, 'Take Krishna along with you'," he says. But Krishna is growing old now, and is not sure how long he will be able to continue helping the researchers. "They ask me, 'After you, who will help with this field work?' I will assist until I can, but I am also training my second son [to take up this work]."

They are unsung heroes in ecology and conservation science

Most ecological research would be impossible without the assistance of people like Krishna. They are unsung heroes in ecology and conservation science. Unlike project trainees and assistants in other departments where field work is involved (such as the Centre for Earth Sciences, the Centre for Atmospheric and Oceanic Studies, and Civil Engineering), field assistants who are involved in ecological research typically do not have a Bachelor's degree, and many of them may not even have finished their school education. Yet they play a role that can be far more important for certain areas of research.

Ecologists often work in unfamiliar areas far from cities. Local people who work as field assistants have

an intimate knowledge of the area, and of the plants and animals there. They also help the ecologists navigate the terrain, and look out for danger. But they are often undervalued.

That is why faculty members at CES sent a letter to the Director in January 2021, requesting that a formal position called "field assistant" – originally established decades ago but defunct in recent years – be reinstated. Among them was Umesh Srinivasan, Assistant Professor at CES, who elaborates, "Field assistants are essential to the very pursuit of ecology. It seems unfair that people who are so critical to this scientific endeavour are neither formally recognised nor have any kind of official status."

Kartik Shanker, Professor at CES, echoes this sentiment. He met his field assistant P Mayavan for the first time in 1992, when he was a PhD student studying rodents in the unique shola-grassland forests of the Nilgiris. The PhD fellowship during those days was Rs 1,800 per month, and the field assistant's salary was Rs 900. "In the 20-plus years that have passed, my salary has gone up by a factor of nearly 150, but his only by 15. Every time I meet Mayavan, this never fails to cross my mind. This is something that is reflected in our society – that we credit formal education and not other types of knowledge." "The problem is that because they don't have degrees, they are not able to get an increase in salaries," adds Rohini Balakrishnan, Professor at CES.



Mayavan

Facing risks in the field

"I think almost every one of us has had our lives saved by field assistants at some point," says Rohini, whose lab conducts research in and around Kudremukh National Park. Sudhakar, a Malekudiya Adivasi who was born and brought up in those forests, has assisted her students since 1999. "He is a built-in GPS, a master tree climber and master improviser – these are invaluable assets. Our research could not have been done without him," says Rohini. Sudhakar says that he has enjoyed working with Rohini and her team for the past 21 years. "Other than insects, students keep coming to study different things – trees, bats and so on. Therefore, I don't get bored," he explains.

Most of the research that Rohini's team carries out is on crickets and bats, which have to be studied at night, and this can often be frightening, and even dangerous. "We would keep starting at strange sounds and ask him what they were and he would simply say, 'Praani' [animal] and go off to sleep!", says Rohini. "He could take us anywhere in the pitch dark, even off the path, and he could always bring us back. To this day, I don't understand how he could navigate in those forests at night."

Sudhakar shrugs it off. "I was born in the forest, so I am not scared of working at night."

Mayavan also recalls how, at one time, along with two researchers, he came extremely close to a tusker elephant while they were out in the forest at night. "It was a new area and we didn't know the tracks. We somehow escaped with torn clothes and lost slippers."

Bridging the cultural gap

People like Mayavan and Sudhakar also act as a bridge between researchers and the locals. "Without the crucial local knowledge of landscapes or seascapes or even social mores or customs, how do you talk about your research to people who are from that area?" says Umesh. Field assistants provide valuable insights that come from a lifetime of experience living or working in an area.



Sudhakar and the bat bhoothasthana that he built

For instance, Rohini's students have been able to study some bat roosts only because they are in the plantations of Sudhakar's friends. In many rural areas, including the villages of Kudremukh, tiled roofs are becoming a thing of the past, and as a result, bats are losing their roosting spots. These villages traditionally had a small tiled building dedicated to a specific deity, known as a bhoothasthana. "These are uncommon now, but they used to be a favourite place for bats to roost," says Sudhakar. With his help, Rohini and her team asked the locals if they could build equivalents of these bhoothasthanas on their lands, and a few people agreed. Sudhakar built the first one with his own hands last year, and nine bats have already made it their home. "We are now encouraged and want to do this on a larger scale," says Rohini. "A lot of things have opened up for us because of his connections in that area."

Like Sudhakar, Manjunath K Reddy has been helping Rohini's students study crickets since 2009. Hailing from Ullodu village in Chikkaballapura district, Manju belongs to a family of farmers. He enjoys working on the land too, but as long as his parents continue to farm, he would rather catch crickets. "This is where my interest lies," he says. "When I first started working with the PhD students, the rest of the village wondered what kind of strange work this was: catching insects. 'What do you get out of that?' they would ask me."

Viraj Torsekar, a former PhD student, says that the lab's relationship with Manju is one that has been treasured across academic batches. "He really took ownership of your project," he says. He recalls an incident from the fourth year of his PhD, when he was panicking as he had not been able to finish his experiments in the field due to circumstances out of his control. The weather was too cold, and the crickets were not very active. They installed heaters on top of the enclosure that was being used for Viraj's experiments, but they needed a long and durable cable to connect the power line to the heaters, which was quite expensive. Manju offered to go home and get a spare one from his village. When Viraj went to the bus stand to meet Manju on his return, he was amazed. "The cable was long and guite heavy! I really got a little emotional at that point about the fact that he was investing so much time and effort into something that wasn't working." When he asked Manju why, the latter replied, "Everyone's project that I have helped with has worked. This too has to work; there is no way that it cannot."

Manju was also responsible for looking after the crickets in the "culture" room, where all the insects used in behavioural experiments are kept. This involves putting food and water every day into hundreds of containers that house the crickets, and making sure that the containers are clean and there are no signs of fungus in them.

At one time, when Manju was watching over a batch of crickets being studied by Rochishnu Dutta, another former PhD student in Rohini's lab, he was perplexed to see that some of the healthy individuals were suddenly dying. He found a small black pellet in the containers of these dead animals. Initially, he thought that it was some kind of dropping and discarded it. But the crickets kept dying and the pellet kept turning up. At his insistence, Rochishnu examined the pellet under the microscope, and to their astonishment, they discovered that it was the pupa of a Tachinid fly - known to be a parasitoid of crickets. While these flies are well studied elsewhere in the world, practically nothing is known about them in India. This was a new discovery that was published in the Journal of Orthoptera Research, a paper on which Manju is also an author. "Manju was critical to this discovery and so I included his name," says Rochishnu, explaining his unconventional decision. "It is my tribute to him. My only regret is that it is not available in Kannada so that Manju can read about his contribution to science."



Maniunath at the cricket enclosure

A unique bond

Although they are considered employees, they often become friends, philosophers and guides to the many researchers they work with. "With every trip to the field, they become closer to you. In fact, I learnt Kannada from Sudhakar and Manju," says Rochishnu.

When Manju's finger was gravely injured in an accident on his farm, students from Rohini's lab pooled in money for the plastic surgery that was required to save his hand. Manju has been to many students' weddings, and the students have, in turn, attended several in his village. He confesses, "Only after starting this work did I realise that city youth can also be friends with rural youth. I have worked with so many students, and now I consider many of them my 'aatma geleyagalu' [soulmates]. No one treated me differently because I was from a village."



Micah Rai with a Long-billed Wren-babbler

Sudhakar also keeps a framed photo of himself with Manjari Jain and H Raghuram, former researchers from Rohini's lab, in his house. "In all these years, I have been closest to them. We worked together like friends. I am in regular touch with Raghuram," he says.

Umesh agrees. "At this point, they are not even field assistants anymore, they're family," he says. His lab studies the effects of climate change and deforestation on bird communities at the Eaglenest Wildlife Sanctuary in Arunachal Pradesh. Umesh has been working with the same crew of six field assistants since 2011. He has no reservations about sending new students there on their own, as he knows that they will be in able hands. Among his crew is Micah Rai, better known as Kami. "When we first started working with Umesh, we just waited for the month to end so that we would get our salary," he admits. Umesh then started handing out prizes to the person that could spot and identify the most number of birds, and that got Kami and the others hooked. "We could perhaps earn more if we went back to farming, but now we really like this work. Every year, when Umesh comes from Bangalore, he explains the findings of his research to us, and that also keeps us interested," he says.

Mayavan also divulges that his interest in field work hasn't dimmed even after so many years, and he is happy to have helped Kartik build his career in academia. "As long as I am able to, I will continue to work with Kartik sir," he says.

For his part, Kartik says, "I've remained Mayavan's employer, but he's also a friend. Whenever I go to the Nilgiris, I like to drive up and visit his family." He points out that field assistants like Mayavan also bring a different perspective to life, to knowledge, and to our engagement with nature and the environment. "The relationship that we end up building with them really enriches our lives. We've gotten so much from them; we have to find a way to give back."

With inputs from Ranjini Raghunath

FROM GLASSBLOWER TO TECHNOLOGIST

- Kavitha Harish

Dwarakanathan R, a former glassblower, has worked at IISc for 47 years. Now officially retired, the 71-year-old self-proclaimed "workaholic" maintains machinery at the Centre for Nano Science and Engineering (CeNSE). In this interview, he talks to **CONNECT** about what it's like to be a glassblower, his love for the artistic possibilities of glasswork, and his fondness for vintage scientific equipment.

What did you do before you came to IISc?

I completed a course in glassblowing at the Government Glass Blowing Training Institute at Guindy, Chennai. I grew interested in glassblowing as my maternal uncle was a Works Manager at Alembic Glass Ltd in Gujarat, and my father, who worked at IISc as a foreman, would get lab equipment made, which sometimes required glassblowing. My father suggested that I work in this field. My first job was in 1968, in Kolar Gold Fields under MGK Menon, who was a professor at TIFR [Tata Institute of Fundamental Research]. My first job involved making equipment for his project on cosmic rays, which was done in collaboration with Japanese scientists. In 1970, I moved to TIFR Bombay, where I spent four years in the Glass Blowing Section making various types of glass apparatus under HLN Murthy. He was close to Homi Bhabha and he was an expert glassblower himself.

What then motivated you to join IISc?

Being a native of Bangalore, I always wanted to come back. My father was employed at the Institute and this place always fascinated me. So, in 1974 when there was an advertisement for a glassblower, I immediately applied and was selected to join the Department of Electrical Communication Engineering (ECE). In addition to working at ECE, after office hours, I would go to the Department of Inorganic and Physical Chemistry (IPC) to help students with their glassblowing requirements.



Glass equipment made for the Department of Electrical Communication Engineering



A draughtsman's diagram of a mercury diffusion pump that Dwarakanathan was required to make for a vacuum system

What did your work involve?

I started my career at the ECE department as a Glassblower under Prof M Satyam and was later promoted to Principal Glassblower. We would make scientific apparatus from pyrex and quartz glass. We would melt the glass using table-top oxygen and butane burners – or hydrogen burners when higher temperatures were required – and blow and reshape it to required specifications. Pyrex is typically used to make apparatus like beakers, while quartz can be used to make tubes for semiconductors in which samples can be heated to around 1000°C, since it has a very high melting point of around 1715°C.

connect.iisc.ac.in 7

Until around 1984 I was doing specialised glassblowing and quartz blowing to make items with hermetic [airtight and watertight] seals and glass-to-metal seals, and equipment such as Dewar flasks [a kind of vacuum flask used to store cryogens like liquid nitrogen], distillation apparatus, oil diffusion pumps and mercury diffusion pumps, and other things used in vacuum systems. In those days, entire vacuum systems were made of glass, so a lot of interesting work used to come our way. I was involved in other glassblowing-related activities for many departments including ECE, Physics, IPC and Aerospace Engineering, as well as other scientific processes such as metallisation and photolithography.

Over a period of time, perhaps after 1985, this work became redundant. I also didn't want to continue as one

reaches saturation point very quickly. Glassblowing is very physical and it can take a toll on your health, especially as you get older.

I was interested in learning more. At ECE, I worked under Prof Satyam, who I consider my guru – he was a very nice person, always laughing – as he encouraged me to study further. I soon went from glassblowing to maintaining semiconductor equipment and solid state devices.

What did you enjoy the most about working with glass?

Glass blowing is an art; one can create such beautiful designs out of various glass materials.



Dwarakanathan (kneeling, left) with colleagues on the occasion of M Satyam's (front row, seventh from left) retirement

Did you enjoy maintaining machines and equipment after you stopped glassblowing?

Yes. I love to work with equipment. I worked with Prof Satyam at the Devices Lab until he retired in 1996. In 1999, Prof Navakanta Bhat joined the Institute and formed the Microelectronics and Photonics lab. I have been a part of it and have worked with him since day one. In early 2004, we built a cleanroom for work on nanotechnology behind the ECE building and in 2012, we moved to a new building and CeNSE was formed. I have been working as a Technologist at CeNSE since its inception.

What would you describe as your technical achievements, and which are the most memorable?

I started working in an era of vacuum tubes and continued into the era of semiconductor devices. After I moved to solid state device processing, I worked in the cleanroom facility. I maintained and operated high vacuum equipment, furnaces, lithography equipment, and many other machines. I made an evaporation tool dedicated to organic materials, and remodelled a thermal evaporator into an electron-beam evaporator. In 2007, I had the opportunity to receive on-site training in Germany at Raith [a company that makes equipment for nanotechnology research] for an electron-beam lithography tool. Today, this is the most sophisticated tool in our cleanroom.

Though we have new equipment as well, we are still maintaining decades-old processing equipment which continues to function wonderfully.

What led you to continue working at IISc even after retiring in 2010?

I like working on machines. Sometimes I have worked till midnight or even till 2 am. I never want to sit still, moving and working is my habit. Continuing to work keeps me healthy. I am interested in upgrading my knowledge in the area I work in – things change every day.

We have many industry collaborations and many students come from INUP [the Indian Nanoelectronics Users' Program] to use the facilities. It is challenging work that interests me a lot.

What did your father do at the Institute – can you tell us more about him?

He was a foreman in the Department of Biochemistry for 12 years starting in 1949. He managed the workshop and laboratory there. He worked under Prof KV Giri and had immense respect for him – he hung up a large portrait of Giri in our house, along with a large photo of IISc's Main Building.

His hobby was photography. He took several pictures at the Institute on many occasions, including during a visit to the Biochemistry Department by C Rajagopalachari [India's first Governor-General after Independence] in 1952. Due to my own interest in photography, I too got a chance to capture photos of the dignitaries who visited our department over time. I have met many eminent professors, two Presidents and a Prime Minister.

If you couldn't come to campus anymore, what would you miss the most?

I would miss the people, and all my equipment! My favourite is the Anelva Sputtering Unit – with which thin films of various materials can be deposited on substrates when a high voltage is applied between two electrodes. It is a Japanese system we have had for over 35 years, it still works so beautifully and we have hardly had to spend on its maintenance.



Dwarakanathan with the Anelva Sputtering Unit at the Department of Electrical Communication Engineering in 1997

Apart from the opportunity to work with machines, I got to work with wonderful people here. All the professors, students and staff here at CeNSE as well as ECE have made this journey very memorable for me. I would like to specially mention Prof Satyam. After him, Prof Navakanta Bhat encouraged and supported me a lot in every task that I did. Even after retirement I continue to work with him. It is because of their motivation that I reached this stature in my career.

I wish to state that all the Chairs of ECE from 1984 to 2007 encouraged me, and apart from my work in the lab, there was also other official work. I was happy to take up any responsibility that was given to me and any type of work. I helped to develop the garden in front of the ECE department, for which everyone encouraged and appreciated me. I took a personal interest in the department and its surroundings, as if it were my home.

IISc is a very nice place to work, there are so many opportunities for advancement here. As soon as I enter campus I feel like I'm in heaven. Of course that may not be the case for everyone – it depends on where you work and the people you work with!

THE FACILITY **THAT RUNS 365 DAYS A YEAR**

- Narmada Khare

^Dhoto: Narmada Khare

A peek into the Central Animal Facility, which supports research in almost 70 labs

Gundappa in full gear with Wistar rat cages

Prashant and his three colleagues set out for work in the small hours of the morning. Gauribidanur, their hometown, is 80 km from Bangalore, and the train ride and the short walk after that to reach the Central Animal Facility (CAF) at IISc can take up to two hours. Once here, they are joined by others including Chikanna, who travels about 25 km from Rajankunte, and Gundappa, who lives on campus. They clean up and change into comfortable lab shoes and fresh uniforms. They don PPE, hair covers, gloves and masks, and pass through an 'air shower' into the inner corridors with animal rooms on both sides.

Gundappa has worked here for 33 years. He is an attender at CAF and, together with his colleagues, is responsible for the upkeep of the living quarters of the 'small animals' (rats, mice, rabbits and hamsters) used for research at the Institute.

Animals such as the ones Gundappa tends to are indispensable to scientists who seek to understand how biological systems work. Vertebrates like mice and rats are similar to humans in many ways, and help scientists in deciphering fundamental processes, from the workings of various organ systems to processes underlying memory and behaviour. These animals are used to understand how our bodies may respond to diseases or environmental stresses. Small animals are also used to test the safety and efficacy of chemicals, drug-delivery systems and implants. Primates, like macaques, are also used nowadays to study brain function.

According to the IISc Annual Reports, laboratory mice have been used for experiments at the Institute since 1951, when MR Sirsi, a faculty member in the Department of Pharmacology, started working on chemotherapy for tuberculosis. In 1965, NR Moudgal, Professor at the Department of Biochemistry, established a Primate Research Lab (PRL) to study reproductive biology using bonnet macaques. By 1971, both small lab animals (such as rodents) and large ones

(such as goats and monkeys) were being used at IISc. The current animal facility was built in front of PRL in 1990. A huge modern building for the facility is currently being constructed next to it.

In IISc, it is not just biologists who use model organisms, but also engineers, chemists and nanoscientists. In the 20 years since the turn of the century, the number of animals used for research has gone up from 336 to almost 19,000. The number of departments using them has also shot up from four to 20. Having a common facility like CAF, where animals can be housed in a clean and controlled environment, is therefore critical.

SG Ramachandra, a veterinarian and Chief Research Scientist, runs CAF along with HA Ravindranath, Principal Research Scientist. There are two other young vets, Rekha and Thirumala, who monitor the health of the animals and assist students with their experiments. Rosa Samuels, a project assistant, supervisor and caretaker, all rolled into one, keeps everything and everybody in line.



The CAF team

Mornings at CAF start with the attenders making rounds of the 50-odd rooms. Each attender is responsible for a different set of animals. They go from room to room, checking the temperature and humidity,

noting down births and deaths of animals on cards hanging from each cage. The animals that are scheduled for a bedding change are moved into clean cages. All cages and materials that need cleaning and autoclaving are brought down to the three huge autoclaves on the ground floor. The attenders spend the rest of the day washing, cleaning, autoclaving and sterilising. Material that needs to be discarded is collected in huge bags, and handed over to the waste disposal van that comes by every alternate day.

The two vets, on their rounds, track the health and behaviour of the animals closely. Some research labs at IISc have their own attenders and vets, but most others require help from the CAF staff. Activity increases once students start coming in for work on their individual projects. All experiments using animals are expected to be conducted at CAF.



Left: Cages are cleaned with water before they get the soap treatment Right: Bedding is replaced and fresh water is provided to animals

The vets also help with surgeries and collection of blood and tissue. Rekha takes care of the 'nude mice', a laboratory strain of mice that have no hair, and are useful for cancer research. They carry a mutation that makes their immune system extremely weak. Strict sterile conditions have to be maintained in the rooms where they are housed. Even their feed is sterilised using gamma radiation. Only designated personnel are allowed to enter these rooms.

At around 4.30 pm, each attender takes a shower, changes into their own clothes, and leaves the uniforms to be washed, sanitised and ironed before they are used again. Lakshmi, the helper, is responsible for taking care of these uniforms.

When the pandemic hit

Work at CAF is complex, but it is run like a well-oiled machine. It provides an essential service to IISc, and is the only section that is fully functional every day of the year, even on weekends and public holidays. So, how did the lockdown at the height of the COVID-19 pandemic affect the facility?

"All experiments stopped. We were running using a skeleton staff," Rosa remembers. "But the animals still had to be watered and fed, and cages had to be cleaned. For close to three months, I cleaned the cages myself with some of the attenders. It was

exhausting physical work, and my respect for the boys who do this every day went up."

One attender also shared his pandemic story: In the early days, he was caught by the police on his way to work. One of the policemen told him, "If you insist on going to work, be prepared to go to jail." The man, who had already travelled for two hours, was not going to be dissuaded so easily. He apologised, but as soon as the policeman was out of sight, he slipped into the bylanes of Mathikere and reached CAF through one of the back gates. Soon after this incident, security passes were arranged for all of them by the facility.

Involvement in research activities

About 180 new students will use the facility this year. Every user, even faculty members, must pass the 'Standard Operating Procedure' exam to be allowed to work with animals, the cut-off for which is 90%. The veterinarians at CAF train new students to handle the animals humanely. With growing awareness about animal rights and ethics, regulations on experiments using animals have become more stringent. The Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) was formed by the Government of India under the Prevention of Cruelty to Animals Act of 1960. CPCSEA, together with the Institutional Ethics Committee, evaluates each project that uses animals every three to four months.

CPCSEA constitutes representatives from 16 departments of the government, and Ramachandra represents the Ministry of Education (MoE) on this committee. He helps evaluate the 1,700 animal facilities in the country. When asked what sets CAF apart, he says, "Every year, I submit a report on our contribution for the IISc Annual Reports. While CAF staff rarely get authorships, they are often acknowledged based on their contribution. I comb through PubMed for entries from IISc. Every year, some 70 to 80 papers come out of IISc that have used CAF for their work."

The effectiveness of the facility depends on the efficiency of its staff. Sathees Raghavan, Professor at the Department of Biochemistry, took over as the Chair of CAF in October 2020. Some of his first actions were toward making the working conditions of the staff more comfortable. He acquired new PPE and lab shoes, and introduced a 'Work Appreciation Award'. In addition, during the lockdown, when the eateries on campus were shut, he made sure that coffee was available for the staff at the facility itself.

Raghavan believes that having a facility like CAF on campus is a great boon. He says that he wants to make it world-class by introducing modern methods of staff training and improved professionalism. "With so many new users joining each year, and with the new building coming up," he adds, "CAF is well on its way to becoming the largest animal facility in the country."

HOW I BECAME PART OF THE

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Photo: Karthik Ramaswamy

Ramiah at the open circuit wind tunnel

DHAWAN FAMILY

- B Ramiah

Eighty-five-year-old Ramiah, or Ramu to those who know him well, worked in IISc for 44 years. Thirty six of these were spent in the Department of Aerospace Engineering. In this article, he recounts his long association with the Institute and his close relationship with former Director Satish Dhawan I was born on 15 February 1935 in a village called Kalludevanahalli in Mandya district of Karnataka. It was a small village with only about 20 houses. We grew mostly ragi (finger millet) and huruli kalu (horse gram) on our little piece of land, but irrigation was poor. Often there was not enough food to eat, and we were a large family. So, when I was 14, my older brothers who lived in Bangalore brought me to the city to find work.

Both these brothers were working in the Department of Biochemistry in IISc at that time and one of them was in the lab of SS De, a professor in the department. "Look here," he told me, "Prof De is looking for someone to help in his house." So he took me to De's house on 18th cross in Malleswaram – the house stands even now – where he lived with his wife and two children. It was soon decided that I would work for them. I started doing many household chores, including cooking. I also looked after the children, dropping and picking them up from Cluny Convent School, where they studied. Two years passed, and the family decided to move to Calcutta (now Kolkata). They even asked me if I wanted to go with them, but I said no. Once they left, I was without a job.

At that time, in 1951, there was a lot of construction going on in IISc as new engineering departments were coming up. I soon found work at one of the construction sites. For the first few weeks that I worked in IISc, I helped transport construction material. Putta Jois, a supervisor, noticed my work. He asked if I could do some clerical work in the store – to keep track of construction material and manage the workers. I was a hard-working smart kid with a lot of willpower. I agreed and ended up doing this work for three years until the construction ended. During this period, I stayed with my brothers in Subedarpalya. Jawre Gowda, my friend who was then working for HR Cama, a professor in the Department of Biochemistry, suggested that I meet with this person called Satish Dhawan, who was then a Scientific Officer in the Department of Aerospace Engineering (Dhawan went on to head the department and later also the Institute). "He now eats in the mess," said Gowda, "and is looking for someone to help at home. I have spoken to him about you. Go meet him at 6 pm in his quarters near the Department of Electrical Communication Engineering." I didn't know Dhawan personally then, but I had seen him driving his red Morris convertible around campus.



Ramiah during his early years at the Aerospace Engineering Department

Meeting Satish Dhawan

As soon as I met him, he asked me to come and work in his house - to help with cleaning and cooking. He said I could also eat and stay at his place. Soon after this, he became an assistant professor and he moved to a house opposite the Director's bungalow. He stayed on the first floor, while Brahm Prakash, a professor in the Department of Metallurgy [now called Materials Engineering] lived on the ground floor. After he moved there, Dhawan's mother visited him for a month or two. She was a very nice person. I used to go shopping with her to Malleswaram, Chickpet and other places. She taught me how to cook several dishes. She told me that if I looked after her son well, he would treat me as his own brother. I followed her advice.

Aerospace Engineering

In January 1959, Dhawan got me a job in the Department of Aerospace Engineering as a lab helper for a salary of Rs 70 per month. I kept learning and growing in the department – I was given tests regularly and if I passed them, I was promoted. I eventually retired as a Model Shop Supervisor in 1995 after working here for 36 years. During my time at the department, my work primarily involved building models of aircrafts and other structures along with my team based on drawings that were given to us by B Noronha, our supervisor. Professors like Dhawan or SP Govindaraju (also a faculty member in the department) would explain what they wanted and Noronha would make the drawings for us. The models that we built used to be tested in the wind tunnel. Besides carpentry (these models were made using wood), we had other responsibilities as well. We were also involved in the education and training of students at times. Our team made wind tunnel models – 36 feet long with a 2 feet x 2 feet glass platform for the testing object – that were

> shipped to IITs and other institutions for their students to experiment and learn. I once went to Sardar Vallabhbhai Regional College of Engineering and Technology (now Sardar Vallabhbhai National Institute of Technology) in Surat along with a colleague of mine where we taught students using a model we had built.

> In 1982, I also had a chance to visit Baghdad, Iraq. Iraq had bought a big machine from India. The components had to be carried there and reassembled. I took a leave of absence and stayed there for two months.

> I have not had much formal education, but I did learn how to read and write. Over the years, I also learnt how to speak a few

languages besides my mother tongue Kannada. I speak Tamil, Hindi, Telugu, Malayalam and English.

When I worked at IISc, I saw many Indian and world leaders. During the Golden Jubilee Year in 1959, the Maharaja of Mysore and Pandit Jawaharlal Nehru came here. I have also seen Nikita Krushchev, the Premier of the former Soviet Union, and President Gamal Abdel Nasser of Egypt at IISc.

Back then, all the professors I worked with had a sense of discipline and were caring. They often organised parties for students and staff at Hotel Woodlands.



Ramiah with a model of the Jawaharlal Nehru Stadium that was being built for the 1982 Asian Games in Delhi. It is one of the many models that were made by him and his team for testing in the wind tunnel

Photo courtesy: Pushpa R

Relationship with the Dhawans

I grew very close to Satish and Nalini Dhawan over the years. Nalini was also a wonderful person. In 1956, when Dhawan went to Shimla to get married, he took me with him. I stayed with their family for three months.

Later, when they spent a year in Delhi, they took me along to look after Vivek, their son, who was very young.

In 1962, my wife and I had a son. He became unwell a few months after he was born. I informed Nalini Dhawan. Immediately, Satish Dhawan came to my parents-in-laws' place. He took our child to KC General Hospital. The doctor there was the wife of a faculty member in IISc. When the treatment did not work, Dhawan himself drove the child to Vanivilas Hospital, stood in a line and got him admitted. In spite of all the medical help, our child did not survive. When he died, Dhawan hugged me. "Be brave. Not everything is in our hands," he told me.



Satish and Nalini Dhawan at Ramiah's daughter Pushpa's wedding in 1999

Again when my son Ramesh was born, Nalini Dhawan took my wife in the middle of the night to St Martha's hospital.

Satish Dhawan was responsible for bringing me to this position. He was like my Godfather

Dhawan always encouraged me to learn. He urged me to go to the night school at IISc. He constantly encouraged me and gave me many ideas. "Ramu, why don't you make a stool for yourself to sit on?" he would ask. He would then tell me how to go about making it from scratch. Just as Dhawan's mother had promised me, her son treated me as his own brother. I am grateful for all that he has bestowed on me. I have seen him up close and imbibed many of his qualities. He was responsible for bringing me to this position. He was like my Godfather. I think about him a lot even now. Whenever I get a chance, I try to meet his daughters, Jyotsna and Amrita. "Ramu, when I see you, it feels like seeing my father," they tell me. "It makes me very happy."



Ramiah and his wife Jayalakshmi in 1961, two years after their wedding

Life outside work

I used to love watching movies on Sundays, especially movies of MG Ramachandran and Sivaji Ganesan. In those days, there were more Tamil films being made. But I've also watched many Rajkumar movies like *Bedara Kannappa, Bhakta Kumbara, Bangarada Manushya*, and *Kasturi Nivasa*, and Telugu films with NT Rama Rao, Nageswar Rao and Savitri. Now, I don't watch many movies, but I listen to old songs.

I also liked to watch cricket and football matches at the IISc Gymkhana grounds. Then I started watching cricket on TV from the late 1980s.

I got married to Jayalakshmi in March 1959, a couple of months after I got the job at the Aerospace Engineering Department. I have three daughters and one son. My daughters are all in Bangalore. My oldest daughter Geetha works in the Pollution Control Board. My second daughter Latha is a homemaker and my youngest daughter Pushpa works in the Indian Academy of Sciences. My son Ramesh is an engineer with SpaceX in Texas, USA.

(As told to Karthik Ramaswamy, with input from Pushpa R)

MY FATHER, JOSEPH

- John Doss

A contemporary of B Ramiah, Joseph Aroikiaswamy Doss was also a technician at the Department of Aerospace Engineering for many decades. Here, his son John remembers his father's work ethic and his <u>commitment</u> to family and faith

My favourite memories of my father are from the time when I was a young boy – I was the youngest in the family. I would eagerly await his return from work every evening, and when he did, even before he changed, I would sit down right in front of him. And every evening, without fail, he had a story for me from the Institute. These stories were mostly about mynas, bandicoots, and crows. "I gave them my rotis and would have only one left for myself!" he would say.

My father was born into a large family in the Cantonment area of Bangalore in 1926. Being his parents' oldest son, he had to find work early in life to support his younger siblings. So immediately after his matriculation, he took up a job in a button factory to support their upbringing and education.

Photo courtesy: Doss fami

My father (fourth from left) being paid a visit by Satish Dhawan (first from left) when he was on deputation in the UK In 1943, when my father was still only 17, a family friend called Devanesam took my father to IISc and helped secure a job for him as an apprentice in the Department of Aerospace Engineering (then Aeronautical Engineering). He worked under the guidance of a foreman called Natesh Mudaliar.

In his early years at the department, he had an accident. His ring finger was severed when he was working with a machine. He was taken to the hospital by OG Tietjens, who was then the head of the department. The doctors tried but couldn't save his finger.

In spite of a missing finger, my father became a skilled carpenter. He was also familiar with all the machines in the workshop. His main job was that of a technician. He used to help all the researchers by implementing their ideas. Sometimes, I felt that he could have been a scientist himself if he had the right qualifications. He even learnt to do machine drawing (he went to Vellore, where he wrote and cleared an exam on the subject).

My father was also very hardworking. He was promoted several times in his career at IISc. From an apprenticeship employee, he rose to become a wind tunnel technician, supersonic project assistant and draughtsman. He retired as a research technician in 1987. But his service was extended because he was very good at what he did. He continued as a part-time employee for a few more years, during which time he worked on several projects.

He got a lot of appreciation from the people he worked for. One of his friends, a faculty member in the department called AV Krishnamurthy, told my father, "We'll start a small-scale industry. I'll do the investment, you run it." But my father did not want to take the risk.

Krishnamurthy thought highly of my father. At the time of interviews (to select candidates for the department staff positions), he would ask my dad to sit in on them even though he was not a faculty member.

In 1965, he was sent to a UK university on deputation to work with Tietjens, who by then had moved on from IISc. My father worked there for three years, though I'm unable to recollect the name of the university. We were all very proud of him for this. He used to write letters to us regularly when he was there.

I also recall that he had an excellent rapport with two extraordinary scientists of IISc and also of India: Satish Dhawan (Chair of the Department of Aerospace Engineering and later Director of IISc and ISRO) and Roddam Narasimha (who also served as the Chair of the Department of Aerospace Engineering and Director of the National Aerospace Laboratories). Dhawan has visited our house twice. Once when he and my father were both still working, and once after they had both retired. Dhawan also met him when he was in the UK. My father married my mother, Mercy Celestine, in 1954. The date of their wedding – 10 November 1954 – is etched in my mother's mangalsutra. My mother, now in her 80s, was born and raised in Ooty (Udagamandalam). She was trained to be a teacher. But once she got married, she stayed at home to look after her children and the house.

My father was never fussy about anything. He would speak when spoken to (other than for the time he told me stories from IISc) and eat whatever my mother served him. He never cared for fancy things. He rode his bicycle to work every day.



My parents on their 60th wedding anniversary in 2014

the coconut trees in our yard, something she would not have been able to do in IISc. She and my father lived in this house along with their nine children: six sons and three daughters. Being a religious man, my father did not like the idea of family planning.

My father had a brain tumour in the early 1990s for which he was operated upon. It returned in 2007 and once again it was successfully removed. But sadly in early 2017, he succumbed to a heart attack at the age of 91.

My father was a very spiritual and god-fearing man. He never had any bad habits like smoking or drinking. But he did drink a lot of coffee and tea, which kept him active all the time. He was hardworking, honest, sincere, punctual, loyal to his family, and was always up for a challenge. I try to follow these values in my own life.

(As told to Karthik Ramaswamy, with input from Mercy Celestine Doss)

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Bangalore (also in
the Cantonment
area). Even when
Dhawan offered to
provide my father
with quarters on
IISc's campus, he
did not leave
because my mother
refused to move
from her house
(she also insisted
on not going with
my father to the
UK). She was not
keen on moving to
a place where she
thought she might
be lonely. She was
happy in her house.
Besides, she raised
dogs and chickens,
and looked after
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Our house was in

Frazer Town in

It takes a VILL AGE -Narmada Khare

Lab techs and project assistants, toolmakers and maintenance crew make invaluable contributions to research projects

RS Harikumar

Sandeep Eswarappa, an assistant professor in the Department of Biochemistry in IISc, works with small, almost microscopic animals called tardigrades. As a young investigator setting up a new lab with an unfamiliar model system, he needed all the help he could get. Harikumar RS, a project assistant, provided exactly what was required. "Hari was hardworking and passionate about science, and took ownership of the tasks he accepted," Eswarappa says. "He worked with utmost sincerity, and established tardigrade cultures from scratch in our lab."

Apart from the Principal Investigator (PI), graduate students and postdoctoral researchers, most labs in IISc and other institutions have support staff like Harikumar. There are also lab technicians (called lab techs informally), tool makers and other backstage crew who contribute significantly to research. They spend hours standardising protocols, training graduate students, keeping a tab on reagents and equipment, or re-doing experiments with newly calibrated machines. A respectable research story is rarely the work of a single human. It takes a village.

Let us consider the work of a typical lab tech from a biology lab. She will have to keep the lab stocked with disposables and consumables, make sure the equipment is in working condition, and even train new students. She will need to have tricks up her sleeves to make super-efficient competent cells (cells that can take up foreign DNA from their environment), and dissect out ovaries from a fruit fly in a jiffy. She will need to know every lab safety rule, and what to do in times of crises. She will have the contact numbers of all the vendors ... including that Thai take-out place round the corner. Lab techs and other support staff are often the backbone of the lab. Pls go to great lengths to find, train and nurture academic relationships with these skilled workers. Each is as cherished as an intuitive surgical nurse by a surgeon, or a physiotherapist with a magical touch by a team of athletes. The reminiscences shared by Mary Nirmala Sarkar and SK Aswathamegowda on the occasion of the centenary celebrations of the Department of Biochemistry illustrate how crucial support staff are to the pursuit of research.

Sarkar, who retired recently, joined the department as a project assistant in her twenties. "Here's where I was introduced to tissue culture, animal handling, and raising antibodies," she recalls, "and here I am today, almost four decades later, still blessed to be working among the most ingenious minds, doing what I love most."



Mary Sarkar working with tissue culture

During her time at the department, Sarkar also witnessed many changes in the responsibilities of a project assistant over the years. "We did not have the luxury of disposable pipettes and bottles. Plugging the pipettes, putting them in different cones and autoclaving was an enormous task. I recall getting the glass tubing from the stores and getting them cut from the glass blowing section to make Pasteur pipettes. Distilling water and ethanol was a routine process."

However, in the 21st century, with the explosion of companies providing glassware and plasticware and experts who maintain the equipment only a phone call away, many responsibilities of a lab tech have become redundant. Even carpenters are not needed, now that modular furniture is the norm. Still, project assistants like Sarkar are crucial. They take care of logistics, and provide technical expertise and continuity in the lab with a constant turnover of students and postdocs.

Aswathamegowda, who worked as a mechanic in the department workshop from 1972 to 2005, provided another kind of support to the labs. "[We had] one small lathe and a drilling machine. We worked sheet metal to make test-tube racks and metal trays," he writes, describing his work in the early years.

Aswathamegowda recalls with guileless pride, "I had the responsibility of shifting heavy imported instruments like centrifuges. With the help of our supporting staff, I took them up the stairs from the ground floor to the first and second floor labs. It was very tough and risky work. By God's grace, no instruments got damaged, and no one was injured."



Aswathamegowda when he joined the Department

Encouraged by the researchers in the department, Aswathamegowda soon learnt to fabricate gel boxes, gel combs and apparatuses to conduct routine biochemical investigations like running DNA gels and SDS pages. His skills were noticed, and he started getting orders from other research institutes. He later even started his own fabrication company.

While the stories of Sarkar and Aswathamegowda are heartening, the contributions of support staff to research is not always acknowledged. Some PIs, however, find ways to recognise their efforts by giving them authorship in research publications. These publications, with their well-defined questions, logical succession of experiments, clean results and neat graphs, do not always reflect the sweat and tears of the support staff. Eswarappa, for instance, ensured that Harikumar is an author on multiple research papers from his lab.

In 1996, in an unprecedented move, the Department of Biological Sciences at the Tata Institute of Fundamental Research (TIFR), Mumbai, conferred honorary PhD degrees on two of their lab techs. This gesture was an expression of appreciation, a show of respect for their many years of 'behind-the-scenes' participation in every research project, and their meticulous lab management.

It is hard to overestimate just how invaluable these lab techs and support staff are to their PIs. Ask young faculty members whom they would bring back from their postdoctoral research days to work in their new labs, and almost all of them would likely answer, "my lab technician."

BEHIND THE SCENES

- Gouri Patil

A photo story on the people that provide crucial services to the IISc community







Girigowda PS has been a security guard for four years. Prior to that he worked at a garment factory, and moved here at his family members' insistence. Some of them work here as well. Manjula has been part of the housekeeping staff at IISc's residences since 2018.





Chikkagangamma has worked with the womens' hostel security team since 2018.



Manjunath NS joined IISc in 2015 and works as a secretarial assistant at the Centre for Nano Science and Engineering (CeNSE) where he assists students and faculty members with administrative work.



Anaxee Barman has been assisting students and professors in handling the animals at the Central Animal Facility. In the five and a half years she's been at the Facility, never has a mouse escaped from her hands!



Dr S Sudhanthiramani is a veterinarian and for the past four years has been helping students in the Central Animal Facility.





For nine years now, G Vijayalakshmi has been taking care of *Drosophila* (a type of fruit fly) cultures in the undergraduate laboratory.



Shilpa Mary has been assisting students in the undergraduate chemistry labs for seven years.

Pramod K has been working in the Finance and Accounts section since 2010 and handles billing and reimbursements for faculty and students.



Chemical structures that Sathyanarayana drew by hand for CNR Rao

Before computers and CAD design, depicting scientific concepts and results in graphs and sketches was challenging. CONNECT spoke to two retired draughtsmen from IISc, Sathyanarayana and Ramesh Babu, who translated these into detailed hand drawings.

How did you come to join IISc?

Sathyanarayana: I was an apprenticeship trainee in Bharat Electronics Limited (BEL) and was trained in the tool design section before joining IISc. While at BEL, I applied for the post of draughtsman in SSCU [Solid State and Structural Chemistry Unit] which was advertised in the local newspaper. I got the appointment order a week before my training was completed. I joined the Institute on 30 November 1981 at the age of 22. It was my first interview and my first and last [job] appointment. The position was only up to 1985. I met Prof CNR Rao, the then Chairman of SSCU. His first question was, "Have you applied anywhere else?" I said, "Yes." He asked me why. I pointed out that the job was only up to March 1985. He told me not to worry, and that it was a permanent position. In September 1985, I got confirmation of the same.

Ramesh Babu: My father was working in the Army. When he moved to Bangalore for a job in CIL [now the Controllerate of Quality Assurance (Electronics), Ministry of Defense], I undertook industrial training at the Jayaram Technical institute as a draughtsman between 1975 and 1977. I was offered a job at GARK enterprises, which made PCB [Printed Circuit Boards] for ISRO. Later, I joined a company called MAGAMI at Whitefield where I practiced manufacturing drawing. Then, I joined the 515 Army base workshop as a tracer. My first job was to draw three views of an army truck in A0 size. I completed it in less than two days.

At the same time, I got a call for an interview from IISc for a practical test. In those days, I used to get interview calls frequently and it was necessary to carry all the drawing implements. But for the IISc interview, I didn't carry any, hoping that they would be provided. KR Reddy from the Department of Aeronautical [now Aerospace] Engineering conducted the interview. He suggested that I borrow tools from another candidate to complete my test. I was in a hurry to go home and so I borrowed the tools and finished the test early. Later, I was selected for an oral interview and within a few months, I got an appointment order and joined IISc.

At IISc, what departments did you work for, and what did your job involve?

Sathyanarayana: I worked in SSCU until superannuation. My job involved mainly preparing graphs and sketches for research papers for both

students and faculty members for publication in national and international journals. I have drawn circuit diagrams for the electronics laboratory, and a number of mechanical drawings for the fabrication of various instruments given for machining in the unit workshop as well as the central workshop. I have also prepared display boards which are displayed in the department corridors and posters for students and faculty members to display in seminars and symposia. From July 2000 until superannuation, I worked in the electron microscope lab. I was operating the microscope, analysing samples using EDAX, and helping students in preparing samples for microscopic studies.

Ramesh Babu: There was a demand for drawings and tracing related to research and journal publications from several students and faculty members at IISc. Draughtsmen were given permission to work after office hours at IISc. Due to the extended hours, I was able to complete the drawings even when the demand was high.

Discussing with a draughtsman symbolically meant that the student was completing their PhD

On a lighter note, in those days, when a student would find another student discussing with me, they would ask the latter, "Are you writing your thesis?" Discussing with a draughtsman symbolically meant that they were completing their PhD. I completed thesis drawings for many students who are now well placed all around the world. When I was studying at the evening college in BMS, I heard that several heads of the department and the Chief Principal were former IISc students, whose theses had my drawings.

Sathyanarayana

Although I have worked with students and faculty members from all departments, I was associated more frequently with people from mechanical engineering, physics, ecological sciences, atmospheric and oceanic sciences, and theoretical physics, as well as KSCST [Karnataka State Council for Science and Technology].

A few of the drawings which I am proud of include about 150 A0 size drawings of a large water tunnel design for Prof Vijay Arakeri in the Department of Mechanical Engineering, drawings of birds and other species in ecological sciences, and the structure of benzene in chemistry. I have also been involved in the preparation of design drawings for the wind and water tunnels, meteorology drawings for handbooks (for Prof Anna Mani), Wipro circuit drawings, and projects on rainwater harvesting, solar panel design and more for KSCST.

What were the challenges that you faced?

Sathyanarayana: When I joined SSCU, the nature of work was different from what I was trained in and doing at BEL. Engineering drawing, for which we were trained, contains straight lines, circles and arcs. Here, on the other hand, the drawings contain spectras and graphs. I was struggling to do them; I thought that they would fire me after some time. But Prof Rao was kind and told his students and the others, "We will give him some time." After a few days, I had a chance to meet a draughtsman in the neighbouring department. Soon, I picked up [the skills] and started preparing good drawings.

The real challenge came after the introduction of computers. Students started preparing drawings themselves

The real challenge came after the introduction of computers around 1994-95. Students started preparing the drawings themselves using computers and printers. My work was slowly getting reduced. I did learn some graphic software. I also asked students for their data so that I can draw for them, but they refused to share and said that they are more comfortable doing it by themselves. Then, I approached some other departments to get a transfer but the response was not encouraging. This happened to all draughtsmen in IISc. However, most of them were on the verge of retirement and some of them were given other jobs such as taking care of the library and so on.

SSCU was one of the departments having the highest number of publications. After being constantly busy, suddenly, my work was reduced to a great extent. At that time, in the year 2000, the department got a Scanning Electron Microscope (SEM). Prof MS Hegde, the then Chairman, suggested that I work in the electron microscope lab. At first, I was hesitant because in the neighbouring department (Materials Research Centre), it was generally operated by highly qualified personnel. But Prof Hegde and Prof DD Sharma, who was in charge of the instrument, encouraged me. I worked with Mr Kannan, who was a Senior Scientific Officer, and with the support of these three, I was able to operate the SEM.

I had written many letters to the Institute authorities, with the support of the department and the chairs, who recommended changing my designation from draughtsman to JSA (Junior Scientific Assistant) since I had the necessary qualifications, but it didn't happen and I remained a draughtsman.

Ramesh Babu: Initially, everybody depended on manual drawing, on people who had the skill. I used to work for 18 hours each day. Some students would call at night saying that a page number was missing and had to be added, and that they had to submit their thesis or fly out the next day. Later, with computerised drawings ... my job was reduced enormously. There was a "null" period.

The transition [from hand drawings to computerised drawings] was challenging. How much can you learn in AutoCAD? It is saturating. New software is introduced every year and you have to keep updating yourself. It was very difficult to keep up.

When I joined IISc, I was well aware that there was no growth [from draughtsman to a scientific position]. Nevertheless, I was always keen on widening my knowledge, and was able finish my diploma and subsequently BE, to my immense satisfaction.

Are there any memorable events from your time at the Institute? Any eminent personalities you met or interacted with?

Sathyanarayana: I have not only met but also worked for Prof CNR Rao. Most of his papers from after 1982 until 1995 had my drawings. One of the drawings I had made was a graph sent by him for publication which the journal sent back for correction. It was very difficult to say at that stage where the mistake happened. He could have shouted at me: instead he told me. "Sathyanarayana, sorry, I should have corrected this before sending. Please correct it." This was one of the memorable events. Another eminent person whom I met once at the Institute was [novelist] Dr SL Byrappa. I was a fan and had read almost all his novels. I saw him near the Director's bungalow while taking a walk, and had the opportunity to talk to him for a few minutes. When I joined the Institute, I was very young. Most of the students until 1995 were two or three years older than me, and in the later batches, two to four years vounger than me. Age was the common factor among us, and so most of them became my close friends. Many of them are eminent personalities today.

Ramesh Babu: The planning for SERC started in my drawing room. Prof Roddam Narasimha (RN) and Prof Balakrishnan wrote the proposal and made the schematic diagram.

In the 1980s, my first drawing was a map of our campus. Prof RN took me around and explained the necessary features to be incorporated. He told me that the big rectangular part opposite to the Main Building, which extends to the Director's quarters, was planted with trees to make it appear like a British flag in aerial view. This work was for the First Congress of Fluid Mechanics. More than 400 visitors from all around the world attended the conference. Prof RN invited me in 2019 for the same conference as a delegate. This was a proud moment for me. the Gymkhana even in the night. As part of the Nature Club activities, I have been on several trekking trips. I learned skiing as well.

In 2005, Prof KPJ Reddy gave me an opportunity to design a dump tank for a free-piston shock tunnel. Then begin another chapter, where I started developing designing skills. Later, I got the designs manufactured and commissioned. I volunteered to assist students while conducting experiments and learnt a lot in the process. A pleasant surprise for me was the opportunity to present a paper in a conference at Wisconsin, USA. Although I assisted the students in the experiment, I was not expecting to present. I was extremely elated after that conference presentation and also got many conference opportunities later.

How are you spending retired life? Any future plans?

Sathyanarayana: I like travelling. Due to COVID-19, I could not go anywhere in the last year. I stay close to the Institute and come for a walk there daily and practise a little yoga in the evening at home. If there is any volunteer service allowed, I am ready to work for four hours a day at the Institute.

Ramesh Babu: I will be starting a Master's degree shortly. When I joined the department, I asked myself if I was doing a trivial job. When I confronted Prof RN about this, he explained to me in a simple manner the role of an ITI-qualified person and why drawings are important. He elaborated on the importance of 3D drawings in any

field. He cited the example of a 3D coordinate system used in astronomy. This gave me a whole new perspective on the role of a draughtsman. He also wanted to write a book about research graphs with my help. It is no exaggeration if I say that Prof RN played a pivotal role in my life.

I am actually enjoying doing these calculations now. I am able to understand the mathematics behind the drawings. That's the reason I am pursuing further studies now. After finishing this, I would like to conduct experiments and write code for Computational Fluid Dynamics in aerospace engineering. If everything goes well, I will definitely do a PhD.



Ramesh Babu presenting a poster at a conference

Our lab [in the Department of Aerospace Engineering] welcomed Prince Charles in the early 1980s. Former President Dr Abdul Kalam also visited our lab twice in the early 1990s. He allocated funds for building a CFD [Computational Fluid Dynamics] lab facility. During his tenure as President, he inaugurated the office for the Centre of Excellence in High Speed Aerodynamics, for which I happened to give him the scissors to cut the ribbon.

I have spent quality time with many students who work late nights in the lab. I learnt the basics of how to play the violin with a student; he is now a well-known professor in our department. I used to play badminton and table tennis with students and faculty members at

RODDAM NARASIMHA: A Tribute

- Rama Govindarajan

An eminent fluid dynamicist reminisces about her mentor's many distinguishing qualities

> Roddam Narasimha at the first Asian Congress of Fluid Mechanics in 1980, which he helped initiate. L-R: KS Yajnik, Itiro Tani, MA Ramaswamy, Roddam Narasimha, Satish Dhawan

On a bus journey long ago, I fell into a chance conversation with the enthusiastic high school student sitting next to me. She confided her dreams in me: she dearly wished to be a pilot. If this didn't happen, she had a priority list she would go down until something worked out: become an academic researcher in aeronautical engineering, work as cabin crew, air-traffic controller, aeroplane mechanic, airport ground staff, and travel agency employee. This was the craziest future plan I'd ever heard, so I told Roddam Narasimha about it. RN's face lit up in the most excited way and he literally screamed, "Where is she? Bring her to see me. Such people are precious!" He was disappointed that I had not got her contact details. When he was very young, he had been similarly enthralled with aircraft and anything to do with them.

RN made immense contributions to science and to various national missions, and was a builder of institutions. Much has been written about these, so this tribute focuses instead on the unique person he was. He has left a big void in the science world and huge voids in the hearts of large numbers of students, colleagues and friends. He leaves behind his wife, Dr Neelima Narasimha, a doctor, and his daughter, Prof Maithreyi Narasimha of the Tata Institute of Fundamental Research (TIFR). How the boundary layer in a flow past a solid body (like an aircraft wing) transitions from laminar to turbulent is a crucial question that is not fully resolved. The picture here tells the story of a single-author paper RN wrote at the age of 24 (On the Distribution of Intermittency in the Transition Region of a Boundary Layer, *Journal of the Aeronautical Sciences*, 24, 711-712, 1957), which completely changed the way this process was understood. This is a top view of a flat plate over which wind blows at a speed *U*, creating a growing boundary layer. The words at the bottom are in his own hand.

Image courtesy: Rama Govindarajan

Until then it was believed that downstream of a particular location, which he here calls $x_{t'}$ turbulent spots were born randomly in space, growing bigger in a self-similar manner by destabilising the neighbourhood as they got convected, until asymptotically taking the boundary layer to fully developed turbulence far downstream. RN realised that this was not consistent with experimental findings. He proposed a 'concentrated breakdown' near x_t . Upon incorporating this into the model, the ensuing intermittency (fraction of time for which the flow is turbulent) was a universal function of the streamwise coordinate x when suitably scaled. It agreed very well with a host of experiments. A concentrated breakdown is also on sounder theoretical footing than random breakdown.

The fluid dynamics of clouds was in its infancy when RN started working on it. If a rising cloud, effectively a wet plume, behaved like other plumes, it would dilute itself into annihilation. RN showed, by using an ingenious cloud-in-the-lab, simulations and scaling arguments, that heating due to condensation along its way is key to reducing entrainment, and indeed to the existence of a cloud. RN and his student KR Sreenivasan in the seventies showed that turbulent flow can relaminarise, and that acceleration in the flow provided a mechanism. These are just a few examples showing that he set trends rather than followed them. I had the privilege of being RN's PhD student in the Department of Aerospace Engineering at the Indian Institute of Science as an external student. I was working then at the National Aerospace Laboratories where RN was Director. Later, I was his colleague in the Fluid Dynamics Unit, which he founded, in the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR). To me and to all his students, RN was a mentor par excellence. His style was to encourage us to define our own problems and research areas, which meant that he mentored students on a range of topics: nonlinear dynamics, mathematical aspects of fluid dynamics, aerospace, atmospheric sciences and the Indian monsoon. He would nudge us to turn our question into something bigger and better, and force us to think about the big picture, and about the connections of our work to questions in other areas. And then allow us to sort it out. He thus raised our standards hugely, while appearing to only mentor from the sidelines.

He was so busy in those days that I met him for an average of five minutes a few times a year, but was blown away by his insight every time. On boundary layer stability, I was trying to obtain first order corrections to the answer in a small parameter called epsilon. He saw that the effects I was getting were much bigger than O (epsilon), and opined that I had a singular perturbation problem on my hands. Armed with this knowledge, I could derive the correct lowest-order equations for boundary-layer stability, and develop code to predict transition to turbulence over aircraft wings in a few seconds on a PC which were hitherto done on a large mainframe over days. Boeing Aerospace acquired our code and found it useful.

In the 1980s and 1990s, RN taught a famous fluid mechanics course for several hours every Sunday in IISc, which had no textbook, no stipulated syllabus, no credits and no exams. A crowd would attend, and would benefit from his unique perspective and mastery over fluid mechanics. He fielded every question with utmost patience.

I would like to best remember him from the tea-table conversations at JNCASR. His original thoughts and detailed investigations, whether on Saki's writings, on Tipu Sultan's rockets, on the dynamics of societies which perceive themselves at risk and a whole host of other topics, were discussed over snacks and several cups of tea, and are testimonies of his brilliant mind, his penchant for reading, and his deep understanding of areas outside fluid mechanics.

One of RN's colleagues termed him a "gentle giant" and I hope the reader has understood why.

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This article was originally written for an ICTS News Special Issue in memory of Roddam Narasimha.

Making ISC more inclusive

- Anoushka Dasgupta

A group called Queer and Straight Allies at IISc is working to support LGBTQ+ students

"I had read about IISc having a queer group before I came here," says Anwesha, an MTech student. "I was excited to meet people whom I could relate to as I didn't have any queer friends before that." Anwesha says that it can be demotivating not to have friends you can openly share experiences with. "There was also some apprehension because I hadn't been so open about my sexual orientation before this, and I was a bit scared to come out to so many people." But her fears were put aside when she became a member of a student initiative called Queer and Straight Allies at IISc (QUASI). "QUASI gave me a platform to express myself without judgement from outsiders," she says.

Like Satrangi at IISER Pune, Saathi at IIT Bombay and Queerious at BITS, Goa, QUASI is one of several support groups at educational institutes in India which came to the forefront after the Supreme Court decriminalised homosexuality in 2018. Although there had been an unofficial group exclusively for queer students called QueerIISc for several years, and a version of QUASI had been around since 2015, QUASI was able to gain visibility only after 2018. It now advocates on a broader platform for students who identify as queer or LGBTQ+ (lesbian, gay, bisexual, transgender, gueer, and the '+' stands for other identities within this umbrella including intersex and asexual). QUASI's stated vision is to "make the campus an amiable and inclusive space for the whole queer community by acting as a platform for raising awareness about sexual and gender diversity." Its membership is also open to students of the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), the National Institute of Advanced Studies (NIAS) and the National Centre for Biological Sciences (NCBS).

One of the people who worked to make QUASI visible is PhD student Ezaz Ahmad Siddique, who was also a member of the Empaths – a student peer support group for mental health. "During this time, I came across queer students who felt like they didn't fit in anywhere. They craved a space where they could meet people with similar experiences and be themselves," he says. This prompted him and a group of friends to think about popularising QUASI, which at that time was in the form of a Facebook group and a mailing list.

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The group conducted surveys among the students of IISc in 2018 to find out how many gueer people there were on campus and how comfortable they felt talking about this aspect of their identity on campus - 108 people replied. More than half of them said they were LGBTQ+ individuals, and of this number, 60 percent said they did not find the campus to be queer-friendly. A similar number said they were wary of 'coming out' (revealing that they were queer) to others on campus and in their workplace. Siddique highlights several anecdotes he has heard about bullying on the basis of people's sexual orientation. He says, "We also wanted there to be a body which queer students could approach if they were being harassed on campus." All these factors convinced this group of students to approach the Students' Council and step up QUASI's activities, so that they could engage both queer and straight allies in order to provide a support system for LGBTQ+ people on campus.

Image courtesy: QUASI

Why do queer students need support?

Some queer students that *CONNECT* spoke to mentioned that they faced discrimination in different forms, sometimes as homophobic remarks about their behaviour, characteristics or even something as simple as the length of their hair, and whether or not they were open about their identity. "In the past, students and teachers have mocked the way I speak or walk. One of the professors even told me to 'stop doing Bharatanatyam' when I spoke. This made me extremely conscious about the way I spoke or walked, and I started focusing on that while making presentations or during meetings," Siddique elaborates.

Sometimes, the discrimination goes beyond mockery – in 2015, an IISc student was targeted by a blackmailer who threatened to 'out' him as gay to his peers and supposedly ruin his career if he didn't pay up Rs 5,000. When the student didn't pay, the blackmailer followed through with the threat, posting abusive notices about his sexuality on the hostel notice board.

While discussing the problems faced by gueer students on campus, Dr Vyjayanthi Subramanian, consulting psychiatrist at IISc's Health Centre and former Associate Professor at MS Ramaiah Medical College, says, "IISc [has] students on campus as young as 18 years old, which is around the age a lot of gueer individuals discover their sexual orientation." She adds that discovering one's sexual identity has been daunting for a large number of the queer students that she has interacted with, many of whom come from conservative family backgrounds. "This discovery often clashes with their cultural background and leads to a crisis situation, and they find it difficult to come to terms with it." She has also observed a number of mental health issues, like anxiety and panic disorders and occasional self-harm, crop up among queer students due to social isolation and the prolonged stress of discrimination and bullying.

However, she says that in the last six years that she has worked at IISc, she has observed a change for the better. She believes that queer people at IISc have more of a support system now than in the past, and credits QUASI for this.

Arnav*, a queer undergraduate student, agrees that QUASI provides strong support. He says a few of his batchmates made homophobic jokes and comments in person and on a WhatsApp group, which left him feeling hurt. After Arnav discovered QUASI at a film screening on campus that they organised, he was able to tell them about the problems he was facing with his batch and they helped him deal with it, he says. "Senior members of QUASI even stepped in and contacted the admins of the WhatsApp group to ensure that this did not happen again."

Gourav Tarafdar, a former member of QUASI who completed his PhD from IISc in 2019, also says he has seen positive changes over the years that he was at the Institute. He explains this with an example, "It often happens that a queer person may be at the canteen with his colleagues, when one of them uses a homophobic slur. It's not always easy for a single individual to stand up and fight with their labmates or peers. But QUASI coming to the forefront has helped to negate those effects, since people are speaking about the LBGTQ+ community and standing up to homophobia more openly. You get to see that not just queer friends, but also many straight allies support you, and this has been a good change in the last few years."

Building a community

Tarafdar says he wasn't completely 'out' about his sexual orientation when he joined IISc, but at the end of five years, QUASI helped him come out of his shell. "You get to see other students who are queer and comfortable in their skin, and to a person newly joining the campus, it acts as a support group, especially for someone new to the city." The opportunities for interaction come with events organised by QUASI such as screenings of movies, short films and documentaries that tell stories of the queer community. They also organise talks by members of the queer community, such as one held in 2018 with Saniya Sood, a transgender woman who was the runner-up at Miss Transqueen India 2018, as the speaker.

Such events have set many conversations about gender and sexuality in motion, and have helped straight as well as queer students learn more about the queer community. "By hearing about shared experiences of being sidelined and the trauma that others in the queer community face, I realised that I wasn't alone. I also got to know about the experiences of queer women, which I wasn't aware of earlier," says Nikhil*, an undergraduate student. Arnav adds, "I learned a lot about the spectrum of sexuality and about the spectrum of gender. I was living in a bubble when it came to gender, but QUASI opened my eyes to the various aspects of it."

Straight allies are also learning how to help create a more comfortable environment for their queer peers. Some say that they have learnt to be more empathetic and supportive of queer students. One student said that she tried to educate labmates who claimed that

homosexuality is 'against tradition', by explaining how deeply intertwined the spectrum of sexuality and gender is with Indian culture.

QUASI's presence is only growing - in 2019, they were given permission to introduce themselves at the orientation for students at IISc. This was a big step for them as it was their first formal introduction to new students. Gaurav Solra, who was the General Secretary of the Students' Council in 2018, says, "New students approached us to say that they feel comfortable and safe on campus. It is good to know that QUASI is creating a good support system for the new students."

QueerIISc, which is a group under QUASI's banner and only for people who are queer, also acts as a safe space for them on campus. Before the COVID-19 pandemic hit, this group used to meet regularly every Sunday, and since the beginning of the pandemic, they have online meetings where they play games, talk about their week and any events of significance. "Apart from sharing experiences about facing discrimination and other problems, we also had fun playing games and talking about happier stories, right down to our childhood crushes," laughs Nikhil.

Unfortunately, the pandemic and subsequent lockdowns have hit several queer students hard. "All the students were sent home due to the lockdown, and we have received a large number of SOS calls from many of [the queer students that she was in contact with] because some families wanted to subject them to 'conversion procedures' using 'black magic', poojas, and in some cases, even medication. This led to a lot of anxiety for many of [them], which was very worrisome," says Dr Subramanian. She adds, "Almost all the queer students I've spoken to mention that they miss the camaraderie and sense of family and belonging that they feel on campus that has been created by QUASI. It acts like an oasis of comfort for them."

Like QueerIISc, QUASI has had to adapt to the pandemic. Since organising in-person outreach activities is now difficult, QUASI has started an initiative called the 'Coming Out Diaries' on their social media pages where people share their experiences of revealing their queer identity to others. "[These stories] have struck a chord among the queer community at IISc and helped to let them know that they aren't alone," says Siddique.

In addition to organising events and functioning as a support group, the website and social media platforms of QUASI direct people to resources like the iCASH committee to address sexual harassment complaints, and the IISc Wellness Centre and YourDOST for mental well-being.

Institutional change

Some queer students and alumni say that there is still a long way to go to make IISc a safe space for the community, which is why sustained conversations remain necessary. Bittu KR, who studied at IISc from 2010 to 2013 and is currently Associate Professor of Biology and Psychology at Ashoka University, says that when he joined, there was only one other person who was openly queer. But by the time he left, as a result of QueerIISc encouraging conversations and supporting the queer community, around 10-15 people were 'out'. Bittu, who is a transgender man, points out that without conversations about gender and sexuality, the default narrative is heteronormative. Bittu also says that queerphobia in the country largely revolves around the pressure on people to not talk about these things. Dr Subramanian agrees, "People have a 'conformity bias' and tend to presume that non-conformity threatens cohesion of a group. Since heterosexuality is considered to be the norm, many LGBT individuals are subjected to emotional abuse for not conforming to the norm." Bittu adds, "The main idea behind encouraging conversations about gender and sexuality [in an educational institute or work environment] is that when there are conversations about how one's life intersects with one's work, one shouldn't feel any barrier towards talking about the particularities of one's life." He also emphasises that conversations about gender and sexuality are important to implement necessary changes in policies at educational institutes against all forms of discrimination. "Without it, it makes places that only privileged people can comfortably inhabit. This is something that needs to change," he says.

Bittu calls attention to the need for making educational institutes a safe space for transgender people as well. He says that if and when transgender students come out to the university, they should be provided with housing in hostels that correspond to their gender, safe access to gender neutral washrooms or those that are allocated to the gender they identify with. "While a student transitions, it is important that they can operate in a framework where past and current publications, certificates and other documentation are accepted as belonging to the same person, and should be issued in their name of choice and their gender identity," he highlights. "Trans people aren't safe in most spaces, so there must be explicit inclusions for trans people in comprehensive policies around gender and sexuality that every university needs to have in place."

QUASI aims to bring about this inclusivity at IISc. They are currently in talks with the administration to seek official recognition in ways such as being mentioned on the IISc website. They hope that such visibility can spread awareness within the Institute and lead to measures that ensure the comfort and safety of queer students at IISc, so that they do not face any discrimination. Anwesha says wistfully, "Maybe someday in the near future, I'd like to walk down the IISc roads holding hands with my partner without anyone judging us."

*Name changed to preserve anonymity

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- Joel P Joseph

Owners, students and faculty share their stories of IISc's eateries

L: Prakruthi Veg, a campus favourite. R: After it was demolished recently

Anindo Roy stood aghast as the excavator pulled down Prakruthi Veg, considered by many an iconic canteen in the campus. "It didn't feel good. It was like the main building suddenly disappeared," the PhD student of Materials Engineering says. "All the alumni I speak to ask about Prakruthi. It was a landmark." Roy is not alone. Many students in IISc echo his sentiments.

In a research institution, where life can get pretty hectic and sometimes monotonous between taking courses, performing experiments, discussing projects, writing papers and applying for grants and fellowships, one thing that adds flavour to life is a place to speak your mind while treating your taste buds. The eateries in IISc provide just the right ambience for such a union.

From sipping coffee on a rooftop while discussing a project to laughing over a plate of pakoras till your stomach hurts, the cafés and restaurants on campus offer a range of experiences and choices. These eateries are also spread out across the campus, making it easier for people in different parts of the campus to catch up.

On the south-western side of the campus is the Sarvam complex, which has a bakery, a vegetarian café, a juice centre, and a restaurant. On the north-western side are tea stalls located in different buildings – CeNSE, Biological Sciences and Physics – and a canteen near the Department of Aerospace Engineering. A few yards

east from these is a newly constructed building which currently houses a supermarket, a bakery, a tea stall and a restaurant. The newest addition to the campus is the IDC mobile canteen located at the southern end of the campus.

Just like how these eateries are located in different parts of the campus, different people have their own go-to place for a quick escape from their lab work or to unwind after a hectic day. These are also great places to share thoughts, discuss ideas, foster collaborations and troubleshoot experiments.

Apart from being places to socialise, these eateries have also provided a space for discussions that have helped fix the problems they faced in their experiments

Many students whom *CONNECT* spoke to agreed that apart from being places to socialise, these eateries have also provided a space for discussions that have helped fix problems they faced in their experiments.

A PhD student in chemistry explained that just talking about experiments in a non-work setting can provide a different perspective. "Many times, the solutions click as you articulate the problem, even without others' help," the student adds. "Interactions over chai or coffee have been crucial in building a good rapport with the lab members," says Mohit Kumar Jolly, Assistant Professor at the Centre for BioSystems Science and Engineering. "It also provides a much-needed mental break."

Dipankar Nandi, Professor at the Department of Biochemistry, concurs. "I prefer such settings, as lab members and colleagues are more comfortable discussing non-science matters outside the lab – it can be revealing as well as therapeutic," he says.

Yadla Shree Chaitranjali, an integrated PhD student in the Division of Biological Sciences, says that these eateries are "the only sociable places for our socially challenged community." With COVID-19 and the lockdown forcing many of the eateries to shut shop, she points out how the pandemic has taken away even these social experiences.

People behind the places

Before COVID-19 forced many places shut and turned the campus into a quieter place, it had many eateries. While most of these cafés and restaurants are run by individuals or families, some of them are units of corporations. The people and the organisations behind these eateries are also quite diverse.

The Sarvam complex, which opened in 2019, is now the largest food hub in the campus with four eateries spread across a food court overlooking a lush green space canopied by trees. This is now the place where most students come to unwind. It helps that it is located close to the hostels.

While SAANVI Star – the veg and non-veg restaurant in the complex – is an outlet of a corporate chain of restaurants and catering services, Sai South Grand – the veg café located just a few steps away – is an entrepreneurial venture. When Ramesh T, who was working with SAANVI Star in Mumbai, decided to move to Bangalore, the restaurant's director asked him to run the operations in the city. Currently, the only branch is the outlet in IISc. Ramesh comes to the campus at 8 am and leaves after closing the restaurant at 10 pm. The restaurant serves delicious vegetarian and non-vegetarian dishes from North Indian and Chinese cuisines.

T: Sai South Grand in the Sarvam complex, B: Bun world bakery

"Most of our clients are corporate companies and banks," Ramesh says. "IISc and IIT Bombay are the only educational institutions where we have a presence now."

A few steps away from here is Sai South Grand – a new venture run by Parikshith MS, a corporate employee-turned-businessman. "I must say that I am blessed to be able to open a café in IISc," he says. "As my first venture in the food business, this has been a place of learning for me: interacting with customers and delivering what they need." In contrast to his mundane life in the corporate world, Parikshith now has his hands full running this café and two other canteens that he later opened in a neighbouring institution. His morning routine involves visiting the kitchen in IISc before the café opens at 7.30 am, then going around to the other canteens and seeing if the operations are smooth, and returning to IISc to shut shop at night. At his cafe, ginger tea and masala dosa are the favourites, he says.

He is all praise for the campus community. "The customers in IISc are a class apart," he says. "The students are prompt. They never fail to pay for the services. Even if, for any reason, they are unable to complete the payment on a given day, they come back and ensure that they complete it the next time they visit the café." Parikshith also says he feels proud to be of service to some of the "unsung heroes" of the country – scientists who are stalwarts in their fields – who walk into the café for a cup of chai or a snack.

On the other side of campus, in the first floor of the new building housing the supermarket, is Bun World bakery – part of a chain of bakeries in Bangalore. Sheshadri, a 77-year-old who has been in the bakery business for a long time, started this branch three years ago. "All my children are settled and well-to-do. I run the bakery here to keep me occupied in my retired life," Sheshadri says. He resides in the campus with his son and family. This is one of the few places that was permitted to reopen early on after the lockdown was relaxed.

For Sheshadri, customers are like family, friends and well-wishers. "I don't run the bakery just as a revenue generating business," he says. "I care for the people who come here and I think they care for me too." Echoing Parikshith's thoughts, he is all praise for the members of the community for their promptness with the payments.

Along with Sheshadri works Kumar, a helper at the bakery who greets customers with his broad smile and brightens their day with chai or snacks. He has been working with the bakery chain for nearly 20 years now.

Hit by the pandemic

Just above the Bun World bakery, on the second floor, is Tattvah – a restaurant run by Abdul Khalid and Shakun Rakheja since 2018. "Back then, we were the only restaurant on campus apart from Prakruthi (Nesara was shut for renovation at the time), and business was good," Khalid says. But as several other eateries opened up, life became difficult for them. The business initially started taking a hit, but the conferences and seminars that were organised on campus kept them afloat. Besides, they would manage with profits from their catering services outside the campus.

"Then, COVID-19 came along and we were asked to shut down. And now that has taken our lives back by about 15 years," Khalid says. They hope that they will get permission to reopen soon and, when they do, some support from the institution in the form of a discount on rent or increasing the cap on the menu prices.

COVID-19 came along and we were asked to shut down. And now that has taken our lives back by about 15 years

A short walk from this building, next to the Department of Aerospace Engineering, is a canteen run by Venkatesh. "I used to work in a company that was catering for different events in IISc. So, I have been associated with IISc since 1997," he says. Eventually, he started his own venture, and two years ago, the aerospace canteen. "Although it is difficult to run the canteen paying the kind of rent while keeping a cap on the menu prices, the catering services during seminars and conferences are really helpful," he says.

The canteen seems to have been a hit among the students in this part of the campus until it was forced to shut down due to the pandemic. The aloo paratha and mini meals were the best sellers. "We used to discuss problems related to turbulence there," a PhD student of Aerospace Engineering says. Venkatesh, too, hopes that he will be able to reopen the canteen soon.

Another eatery that has suffered because of the pandemic is the tea stall in the Biological Sciences building run by CB Veeresh, who has a long association with the campus – about 18 years – and his wife Jyothi CB.

He came to IISc as a helper at Janata Bazar bakers. Shortly after, he started his own venture when he was asked to set up the Tata Nandini Milk House, where he delivered milk from door to door and served tea and coffee at the shop. Then he got married to Jyothi, who hails from Byadagi, and together they expanded their business over time.

When the new Biological Sciences building opened, Veeresh and Jyothi saw the opportunity to expand further. "We saw that many students relied on snacks for breakfast, and even lunch sometimes, and we started to prepare some food at home and bring it over," Jyothi says. The unseen hands that prepare the delicious idlis, paddus, tamarind rice and pulao are those of 'Ajji' (Jyothi's acquaintance). These dishes are a lifeline for those who have skipped breakfast to attend to experiments in the morning or couldn't pack lunch for the day because of a hectic morning schedule.

The patio where their cart is set up also seems perfect for the students in the building to catch up and discuss their work. "Before the lockdown, we used to have long discussions about our projects over a few cups of tea or coffee," Upasana Gupta, a visiting PhD student in Biological Sciences, says. "It was much easier to get in touch with people who could help us out in our project, especially during peak tea-times when many students from different labs were out. Just a 'hello' and small talk could set the ball rolling."

But with the lockdown forcing them out of business, Veeresh and Jyothi headed back to their hometown and long to return and resume their business.

"Life was good in IISc," Veeresh says. "Aadre Corona bandu yella haalaagi hoythu [But then, coronavirus came and everything got ruined]." To make things worse, their son had to undergo an expensive surgery in November last year. Thanks to some well-wishers who shared their burden, they could get the surgery done and return to their village.

Memories of old eateries

Even before the lockdown forced people like Veeresh and Jyothi to close down, the number of places to eat on campus was already dwindling. Students who have been in IISc long enough will tell you of a campus with more vibrant canteens and great food. They miss the old places - Nisarga, Kabini, Prakruthi and the Gym café, all of which are now completely shut down. Many favoured Kabini for the budget-friendly food that wouldn't drill a hole in your pocket if you missed a meal in the mess.

"I remember my initial days at IISc when places like Kabini and Nisarga were still functional. Catching up with lab mates over a meal was like an icebreaker. Being outside the lab, especially over an hour-long lunch break, somehow brought out the casual sides of even the most reserved of us," Gupta says.

The two places that top this chart are Prakruthi and Gym café. "The first thing that comes to mind when you think of Gym café is the birthday bangs," says

Chaitranjali. "It used to be 'the spot' for cake cuttings. Besides, its location was ideal to feed all the hungry souls coming from the gymkhana and the adjacent grounds, especially for those who would indulge in extra play time and miss out on mess dinner."

Many students also miss the Gym café mainly because it was the only eatery that would be open past midnight to satiate the late-night cravings of tea-lovers. The ambience was also quite lively with students singing and playing guitars, and the occasional game nights, while enjoying the food from the café.

The old Kabini canteen

"It was also the place where our campus 'Romeos' invited their crushes for a casual late dinner before they could gather some courage to ask them out," Chaitranjali says.

Sushma Indrakumar, a PhD student in the Department of Materials Engineering, recalls how they were the 'lucky department' that was placed right next to Prakruthi. "I have had the fondest of memories there; from dragging friends for a break to striking deals over coffee, it was 'the place' to be," Indrakumar says. "Now that Prakruthi is gone, this is something I miss so much ... having a place that truly serves the purpose and a place that we call our 'adda."

Making Sale of the second seco

- Vaishalli Chandra

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The Office of Laboratory Safety and Environmental Health (OLSEH) at IISc, barely three years old, is on a mission to bring the 111-year-old Institute's safety practices up to global standards. CONNECT caught up with the Chair of OLSEH, Sushobhan Avasthi, Associate Professor at the Centre for Nano Science and Engineering, who spoke about the setting up of the office, teething troubles they faced, learnings from the 2019 accident, COVID-19 and more.

What prompted the setting-up of OLSEH?

It was a realisation that safety was an issue. It was highlighted in several ways, the starkest was the accident that happened a few years ago when employees of a start-up company were injured and there was a fatality.

A lot of foreign collaborators, especially students, also mentioned the lack of safety standards as one of the deterrents for visiting IISc. These systemic issues needed to be addressed.

What caused the explosion? What are the lessons learnt?

The Institute formed a committee under the leadership of Prof Vikram Jayaram [to investigate]. The short version is that there was a cylinder with a mixture of oxygen and hydrogen that exploded. There were several oversights.

An important lesson that the Institute learnt was that policy is important. Until then, IISc did not have a safety policy. If something is being done in an unsafe manner, who is responsible? Where does the buck stop? What are the rights and responsibilities of the student who is doing the experiment? What are the rights and responsibilities of the faculty member, the Institute and the administration? Now, there is a safety policy. It also provides authority to OLSEH to prevent unsafe practices.

Secondly, safety was not part of experiment design. At best, it was just an afterthought. There were issues at the department level also. For example, certain departments did not have any safety equipment, fire alarms and fire detectors. There are some newer buildings that have these systems, but nobody was identified to maintain the equipment. Several of these lacunae have been addressed.

What were the challenges that the office faced while it was being set up and what continues to be a challenge now?

No such office existed in any other academic institution in the country, at least not with such a wide scope. There was no blueprint per se, for setting up OLSEH and for what its structure should look like, what its methodology should be. We didn't even have a clear idea of how many safety officers we would need. We started with three.

We had to hire people who had worked in the industry. The problem is that industry safety standards and related issues are very different from that of an academic campus. For a business, the possibility of an accident is built into their business plan. An industrial workplace is known to be a risky environment. As an academic institution, our risk appetite is much lower because we are dealing with students. When people seek admission in IISc, they don't expect any risk.

Once the office was set up, we had to figure out the Standard Operating Procedures (SOP). For a 111-year-old institute that has not looked at safety very closely, there was a lot to do. Where do you start? Everything you pick up can be its own thing. So, we had to prioritise.

One of the more successful initial efforts were the self-audits. The faculty members were required to submit a checklist of what labs they have, what are the various hazards in these labs, whether these hazards were addressed or not, and what it will take to address them. This data was collected, and we realised that we have a little over 600 labs on campus with more than 400 Principal Investigators (PIs), each with multiple issues.

The self-audits highlighted the two biggest challenges we had. One is fire safety and the second is gas cylinders. Those two became the priority items and we started from there.

Does the office conduct department or lab audits? How often?

We have started doing comprehensive division-wise audits. These are organised by OLSEH but done by an external agency. We hired a company called Luxa Control. They have audited the divisions of Biological Sciences, Interdisciplinary Sciences and Electrical, Electronics and Computer Sciences. We are going to start with the Division of Mechanical Sciences soon.

We also do internal audits where the safety officers themselves conduct spot inspections of various labs. We adopted a targeted approach where we identify the priority – say, gas cylinder safety – and we audit that. We go across the entire campus. We did this exercise over one and a half months and fixed all the major issues regarding gas safety. Then, we do the same thing with chemical safety. In that manner, we pick a mission, as we call it, every month and we focus on it for a month. As the office grows and the number of hazards comes down to a manageable level, we will conduct an OLSEH audit every six months to a year, and an external audit once a year.

What were some of the findings of these audits? Were there any patterns that emerged – similar things that most departments did or didn't do?

There were many fire safety violations. We have 8-11 fire hydrant systems and out of those only two or three are functional. All the rest have issues, are completely defunct or in various stages of disrepair. The fire panels, which connect to fire detectors, were functional only in one or two departments. Individual faculty members had sometimes taken the initiative to do ad-hoc things in their own labs, but at the building level there was only one functioning system.

The second pattern is gas safety. For instance, if I ask a community member, "how many cylinders does your lab have?" in general, people underestimate that number. Six months ago, it was very common to find gas cylinders not chained or restrained as they are supposed to be. I am happy to say that when we now visit labs, 80-90% of the cylinders are restrained and labelled. Gas cylinder safety has improved significantly.

The other thing we realised is that personal protective equipment (PPE) – safety glasses, goggles, face shields, gloves, and so on – are invariably underutilised. We are trying to fix this by educating people about the importance of PPE.

The safety policy currently states that the PI of the lab is responsible for safety in that lab. He or she establishes a rule and students are supposed to follow the rule. While this is clearly mentioned in the safety policy, I don't believe that the community has digested that completely. There is a school of thought that safety should not be the responsibility of the PI but of OLSEH or the Institute at large.

How often does the office conduct safety training/awareness sessions and safety/fire drills?

Right now, we organise a safety lecture every time new students come in. However, once per student is clearly not enough.

We are in the process of starting an online safety test. Currently it is in the pilot stage; you can find it on our website. This safety test will be required for anyone who wants to enter a lab. It will have different modules depending on what hazard you expect in the lab.

Fire drills are an important part; they are currently not being conducted because there is no infrastructure. We are trying to create that infrastructure. Once it is in place, we will conduct fire safety drills more actively.

EHS officer Masoodur Rahman conducting COVID-19 awareness training for IISc security team

As a research institute, IISc is likely generating a large amount of research-related waste each day. How does the Institute ensure that this waste is disposed of responsibly?

Before OLSEH got involved, the waste management system was completely ad-hoc. In the new system that we have implemented, the waste is only sent to vendors who have a certificate from the Karnataka State Pollution Control Board (KSPCB). That is how we ensure that it is disposed of responsibly and does not harm anyone down the line.

At IISc, there is a heterogeneity of waste. It is not easy to find a vendor who is qualified to manage all types of waste. So, we have to collect over multiple trips. Some waste, like radioactive waste, is not easy to dispose of. Thankfully, we have a very good system in place for it. It is collected on a dedicated landfill. We make sure it has gone beyond its half-life and is not active anymore and then it is disposed of.

Photo courtesy: OLSEH team

There is waste we cannot dispose of responsibly, for example, toxic gas cylinders. Apparently, we can get toxic gases in cylinders, but there is nobody in India capable of disposing empty cylinders carrying toxic gases.

What role has OLSEH played in helping the IISc community deal with the COVID-19 pandemic?

The Security Office and OLSEH are the two executive arms of the Institute to implement things on the ground. There is a COVID-19 committee that comes up with the policy and framework, but somebody has to be on the ground to implement them. For quarantine facilities, a lot of the procedures for collecting and disposing of their waste were written by OLSEH. Similarly, for labs, the initial drafts outlining the requirement for how many people can be there in a lab, what should be the social distancing norm, and so on, were done by OLSEH. OLSEH conducts spot inspections for quarantine facilities. One of the safety officers regularly goes to these facilities and makes sure that things are being done according to policy.

Training of the people in those facilities itself was challenging. We had to teach people the protocol for going into such a facility – how to wear PPE, and where to dispose of used PPE. We also gave training to security personnel on how to manage their personal safety while they are dealing with COVID-19.

OLSEH was also involved with the COVID-19 testing centre at CIDR (Centre for Infectious Diseases Research). We do weekly audits. The safety officer goes there to make sure that CIDR is working in a manner consistent with the protocols.

> If the problem is beyond your capacity to contain, just get out safely and inform the Security on the emergency number 5555

What new plans are the office working towards?

A lot of problems have accumulated over many, many years and the only way to resolve them is to tackle them one at a time.

We are developing a protocol for emergency response; it will take some time because there are several levels to it. All the fire infrastructure is now the responsibility of OLSEH. Everything will be under a maintenance contract so that they are functional and well-maintained.

With waste management, we are almost there – about 80% of the way. We will have centralised waste sheds. We will soon have a streamlined SOP for hydrostatic test of gas cylinders. We are also coming up with a definition of high-risk labs. After defining them, we will come up with procedures for these labs and audit them frequently.

Safety Officer Dharmendra Kumar Singh demonstrating how to handle a fire extinguisher

What should one do in case of a major fire or a lab incident?

Assess the severity. If the problem is beyond your capacity to contain, just get out safely and inform the Security on the emergency number 5555 [080-22935555]. This connects you to the control room of the Security Office. Else, contact a security guard, they will inform the central control room. The control room will react and if needed, call an ambulance and fire truck.

Emergency response is something that we are in the process of improving, on a priority. OLSEH coordinates with two other offices: Health Centre and Security. We have recently started informing the Health Centre about the hazards on campus so that they can stock the requisite first aid. Independently, the Health Centre has hired a new fully featured ambulance: "ICU-on-wheels". The ambulance has a trained paramedic who can assess the situation, provide immediate medical intervention, and if needed, directly go to a trauma centre. The Health Centre has also drafted a new SOP to manage medical emergencies. We are assessing if more equipment or infrastructure is needed. Special thanks to Dr Satish and Dr Neethi for helping us in this effort.

The Security Office is also part of the emergency response. Initially, department guards had no way to communicate with the Security Office. They now have access to walkie-talkies and phones. We didn't have an emergency number, now, we have one. Next week we shall visit the local Fire Station with Mr Jayaraj, Assistant Registrar (Security), to discuss responses from the Fire Department. We shall soon conduct training for basic emergency procedures, like CPR. We will also draft an emergency response team from the personnel in the Security Office.

The SOCial dimension of science

- Pankaj Sekhsaria

Pankaj Sekhsaria is an associate professor at the Centre for Technology Alternatives for Rural Areas at IIT Bombay. In October 2020, he gave a talk based on his book Nanoscale: Society's Deep Impact on Science, Technology and Innovation in India as part of Paraspar, a lecture series organised by the Office of Communications at IISc. The following essay is an edited excerpt from his book.

I first met Dr M Javed Ali, an eye cancer specialist at Hyderabad's famed LV Prasad Eye Institute (LVPEI), in August 2010. It was early in my PhD research project as part of which I was studying scientists and their research work in Indian nanoscience and technology (NS&T) laboratories with the explicit aim to understand what the idea of innovation meant to them. I had managed access to LVPEI and to Ali through a common friend and had come to discuss one particular project he and his team were working on then. This was their attempt to use nanotechnology to help in drug delivery for the treatment of retinoblastoma, a cancer of the eye that affects young children.

Many things he told me that day were interesting and insightful, just as they were in the interviews with other scientists that I conducted in over half a dozen labs across the country as part of my research. It is this first interview with Ali, however, that remains deeply etched in my mind as it went straight to the heart of the challenges on hand, and was central to the story that would eventually emerge. Nano[technology] in the case of retinoblastoma, Ali noted, could help prevent removal of the child's eye, because after a point the only option to save the child was to remove the eye with the malignancy. Vision would be lost, he explained, but the eye itself would be saved.

"Nano would alter the rate of removal of the eyes, because after some time when it is not responding, the only option is to remove the eye (...) With nano, those eyes [can be] saved. It has a big implication even if vision is not there. It has tremendous social implications because in this country, if a girl child has an eye removed, (...) she cannot marry anybody who has two eyes, or two hands, or two legs. For a girl child, to remove the eye which we do (...) quite often in such situations, has enormous social implications – for her own life, her trauma of facing society and the trauma of her knowing that her parents cannot face this society."

This was a clinician involved in a nanotechnology-related research project in the laboratory, the 'clinician-scientist', and yet, as he spoke (and as the quote reveals), he sounded very much the social worker, even a social activist, dealing with the complex Indian reality of the girl child and of gender discrimination. It was almost as if he was seeking to change a social reality and not just the fate of one unfortunate individual. Ali gave me a number of examples during this and subsequent interactions where he had seen religious beliefs, medical malpractices, poverty of families and many such factors becoming impediments in the treatment of retinoblastoma in both boys and girls. What stood out, of course, was how the girl child was discriminated against. In a bad scenario, as he pointed out, the eye infected with retinoblastoma would be removed completely. The child would be left one-eyed, but there would be no more threat to her life. This, Ali told me, parents would not allow in many cases and especially if the child was a girl. They could not have a one-eyed girl because no one would marry her when she was of marriageable age. They would rather let her die.

The details of what Ali told me were heart-rending at best and grotesque at worst. I myself had a little boy who was only a few months old then and it took only a moment for the mind to swap places, to realise that I could well have been sitting in Ali's clinic in a completely different capacity. What an ordeal that would have been. I was struck immediately by both – the content of what Ali was saying as also the intensity of his emotion. Together, they took me quickly into a completely unexpected domain – a valuable lesson that clinical practice, scientific research and innovation do not happen just in clinics and laboratories; that their footprints are much larger, their complexities far more subtle and multi-layered.

It was an early reminder that an intervention, even if directed explicitly at a particular point, has other manifestations and implications. It suggested, as a corollary, that chances of success would be greater if those innovating and intervening were aware of and engaged with the many-layered realities of the situation. If the parents refused to bring the girl child for treatment, what was the use of a technology and a cure that a clinic or a lab might have to offer? Was the clinician dealing with a malignant eye or with a complex social and historical reality? How could one be separated from the other? The problem, it seemed, was as much social as it was technical; the solution lay as much in the clinic as it did in the laboratory and in the domains of law, culture, society and politics. Innovation, Ali was telling me through the experience and the intimacy of his own practice, has to be multi-nodal, multi-layered and multiscalar; indeed, multi-many things!

Image courtesy: AuthorsUpFront

It was not an insight I understood immediately, but it was something I kept going back to during the entire course of my research project. I saw repeatedly, albeit in differing ways, the deep influence of the cultural, social and political contexts of the labs on the scientific research, technological choices and innovation practices within the labs. The dominant current day narrative of innovation as patenting, commercialising and producing useful and monetisable technology stood challenged, even exposed. As I navigated through the spaces that create new scientific knowledge and the raw material for new technology, a huge mismatch was visible between policy formulations and visions of science and technology (S&T) on the one hand and the reality of the scientific institutions and the labs these policies were supposed to be about, on the other. The two appeared almost as if they led parallel lives on two different planets. The labs emerged, to use a more academic phrase, as hugely 'encultured' spaces that bore significant imprints of the society in which they were located. Indeed, the impact of the severely marginalised girl child's reality went far beyond finding a cure for retinoblastoma in Ali's case. This was a scheme of mutual influence and iteration that I saw repeating itself in unique and often unexpected ways in all the labs I researched.

Together, they took me quickly into a completely unexpected domain – a valuable lesson that clinical practice, scientific research and innovation do not happen just in clinics and laboratories; that their footprints are much larger, their complexities far more subtle and multi-layered

I saw innovation happening in the laboratory at different levels depending on the specific mandates and intentions of the research. Some research is indeed remote from the immediate needs and concerns of the society within which it is located. There is other research in the lab that is specifically mandated towards intervention in society. In both situations, I found convincing evidence that what happens outside significantly influences what happens inside. In the latter case, however, there is an additional demand and an added layer of complexity: it is not enough merely to innovate inside the laboratory – culture and society need to be simultaneously engaged with and innovated if the desired outcomes are to be achieved.

During my research project I studied a total of five nanoscience and nanotechnology labs in the cities of Hyderabad, Pune and Chennai. What I learnt was that the publicly visible and dominant discourse around S&T – funding, publications, citations, patents, even new technology possibilities – were all only one dimension of that world. It is, one could argue, a numericalised, cleaned-up, objective account, which is actually quite distant from the micro-realities and day-to-day challenges of what happens inside the places where S&T research and innovation actually happens.

The specific reference here is to the laboratory. In one, taken-for-granted way, the laboratory is an integral part of our lives, certainly of the imagination of the modern world. Yet, we know so little of what happens inside. We know little of this world beyond funding allocations that the government makes, patents issued that we barely understand, scientific papers that we hardly ever read, technologies that promise huge windfalls, or awards for scientific breakthroughs that the media occasionally tells us about. We know almost nothing of the nuts and bolts of doing science inside these laboratories.

What would happen then if we were to enter the laboratories and the institutions where this S&T happens, where the money the government makes available has been used or should have been spent, where the NS&T is being researched and developed and where an important part of the innovation process is located?

Who are these scientists who do all this research? Where do they come from and where do they intend to go? What are they thinking? What are they actually doing? What are the pressures and pulls that they face? What influences them? What do they seek their influence to be?

The laboratory is indeed the one blackbox in plain sight that we have passed by completely. Access is not easy, but what would happen if we managed somehow to get that access? What would we see? What would we be shown? What would we hear, smell and taste? How would life inside the laboratory be revealed to us? What, in turn, would the laboratory reveal to us about life inside S&T and indeed, of the world outside of it?

I can't make a claim on the specifics of what will emerge, but a decade now of entering these spaces and processes of science, and looking at them with tools and lenses that are sociological, historical and ethnographic has convinced me of one thing. What will emerge will surprise us. It will be challenging and counter-intuitive. It will be interesting and deeply, deeply insightful. Quite likely, also, the worlds of science and technology and the worlds within which this science and technology happens will not look anymore like what they have seemed like till now.

ABSTRACTS IISc Photography Club

