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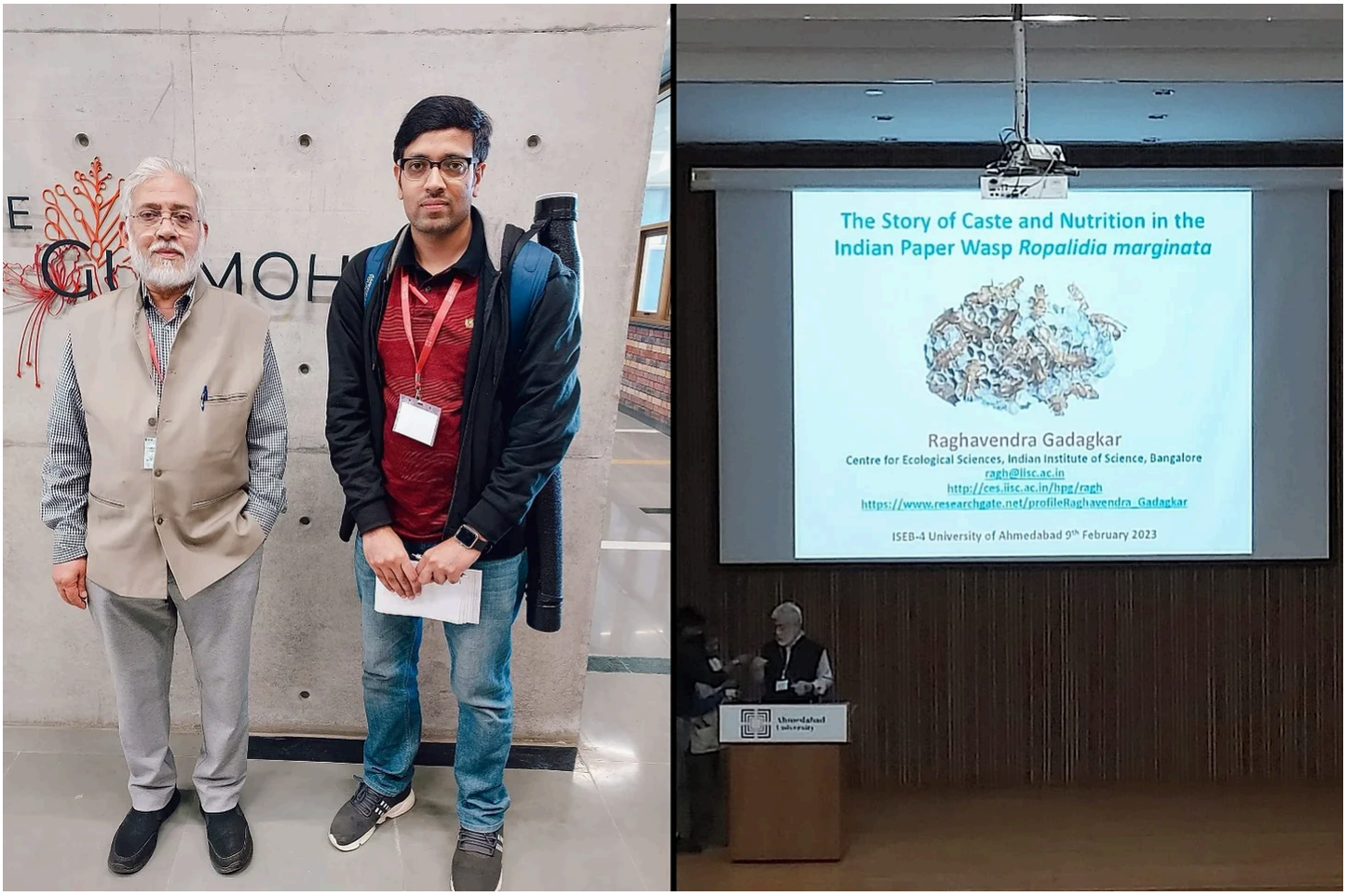
In conversation with “beste-der-besten” of Ethology and Evolution: Professor Raghavendra Gadagkar

By Rahul Kumar

In 1973, history was created when three ethologists Karl von Frisch, Konrad Lorenz, and Nikolaas Tinbergen were awarded Nobel prize in Physiology or Medicine for their discoveries about the organization and elicitation of individual and social behavior patterns. It was the first time that someone received a Nobel Prize for studying animal behaviour. They mostly published in German. Textbooks on animal behaviour got flooded with German jargons, for example, terms like *Prägung*, *Rundtanz*, *Schwänzeltanz, Ausdrucksbewegungen, jugunruhe*, etc. are still in use. Their discoveries were globally recognized for establishing ethology as a formal scientific discipline and postulating its basic principles, a discipline which was there in existence for a long time but never considered an independent scientific discipline. It was intrinsic in Darwin’s writings, Bates’s observations, Wallace’s explorations, and many other observational studies associated with animal behaviour for centuries without any formal name. This field was given a name and association of other disciplines like molecular biology and evolution with this area opened a wonderful universe of scientific research and discourse. Not only human beings, but other animals also observe and learn from other animal’s behaviour in their own way for their benefit and survival. For example, predators learn behavioural patterns of the preys and *vice versa*. According to mythology, there was a King named Solomon who wore a magical ring that allowed him to communicate with the animals in their own language. Konrad Lorenz, in his book which he named after King Solomon, King Solomon’s Ring, talks about the secret world of animals based on his observations in completely mesmerizing way through illustrative storytelling. This book teleports the reader to a completely new magical world. Powerful storytelling coupled with strong observational skills of the author, makes this book a real masterpiece. From the fascinating work on ants by legendary E.O. Wilson aka “Modern Darwin” to captivating BBC documentaries with narrations of fabulous David Attenborough, the fascinating field of animal behaviour has come a long way in the West.

In 1997, a masterpiece work was published by an Indian scientist in the form of a book by the title “Survival Strategies: Cooperation and Conflict in Animal Societies.” The author of this widely acclaimed book is none other than Professor Raghavendra Gadagkar, whose seminal work on the evolution of social behaviour using eusocial insect model *Ropalidia marginata*, the Indian Paper Wasp, achieved a global fame. Prof. Gadagkar is the DST Year of Science Chair Professor at the Centre for Ecological Sciences (CES), Indian Institute of Science (IISc), Bangalore and Honorary Professor, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore. He has recently been appointed as a Fellow of the American Association for the Advancement of Science (AAAS). The American Association for the Advancement of Science (AAAS) is the world's biggest general scientific association and the publisher of the Science series of journals including the “Science” journal. Prof. Gadagkar has served on about 30 different prestigious academic and administrative positions in India and abroad. He has about 47 national awards, fellowships, and honours to his name. He has published more than 400 scientific articles and three books. He is the founding president of the Indian Society of Evolutionary Biologists. Last year, while attending Fourth Conference of the Indian

Society of Evolutionary Biologists (ISEB4) at Ahmedabad University, I got an opportunity to interact with Professor Raghavendra Gadagkar. I asked him for an interview for IE, and he happily agreed. Here is an account of this conversation.



Professor Raghavendra Gadagkar (towards left in the left image) at ISEB-4 and his presentation on his seminal work on the social behaviour of Indian Paper Wasp (right image)

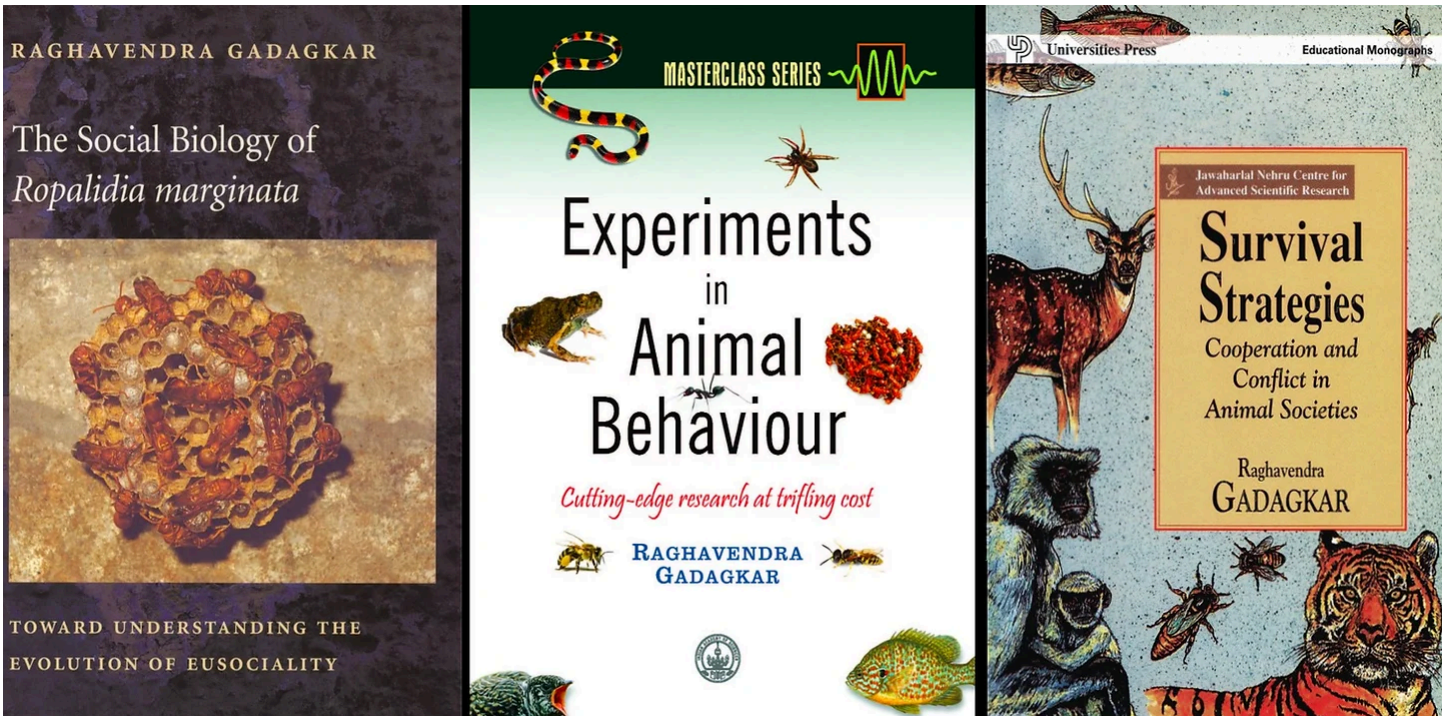
Rahul: How was your childhood? Is there anyone from your school days who inspired you to pursue Science as career? What are the memorable experiences from your school and college days? What fascinates you the most?

Prof. Gadagkar: I was born in Kanpur, Uttar Pradesh. My father was an employee of the Indian Air Force and my formal school education started a bit late. But those moments were moments of absolute joy for me. It was an opportunity to dream, to think, to roam in nature. I learnt sincerity and importance of discipline in life. He had a transferrable job and we shifted to Chennai afterwards. During that time I was old enough for class 3 but school wanted me to be admitted in class 1. But I was allowed to study in class 2 as a compromise on some conditions. Later I was given double promotions for doing well in examinations. I enjoyed all subjects. When I was in class 7, I was confused whether should I go for humanities or science as I liked studying all these subjects but these streams were bifurcated in high school and one was supposed to choose one of these. My Hindi teacher influenced me to pursue Hindi literature as I liked Hindi but another teacher Mr. Chako allowed me to participate in an inter-school science exhibition which was meant only for high school (class 8-10) students. It was a highly inspiring factor which motivated me to pursue science further. I did B.Sc. and M.Sc. in Zoology from Bangalore University and Ph.D. from IISc. Every window of my college has a colony of a particular wasp. To watch them was absolutely fascinating for me. Later this fascination turned into a hobby. I like watching them forage, fight, engage in other conflicts, taking

care of larvae, etc. After having worked on these for a long time, I found them to be an important model to study the evolution of social life in animals. In his book the Origin of Species, Charles Darwin recognized a fundamental paradox about social insects. Natural selection favours survival of the fittest, the one with the largest number of offspring, who are naturally fast reproducing. But a large part of ant, wasp and honey bee population doesn’t reproduce. Instead they help one or a small number of queens to reproduce. *Prima facie* they should not be favoured by natural selection and should be eliminated altogether but they are still surviving. It is the paradox that catches attention. Theory should corroborate with reality. In 1960s, a new theory was put forward to address this paradox which states that helping genetically close relatives to reproduce is an indirect way of achieving same evolutionary goals as reproducing itself. Here, two things are considered. The first is benefit and cost, and the other is relatedness. Relatedness is easy to measure whereas cost and benefit measurements are empirical and difficult to measure. I like this difficult part. I like two things very much. First is researching, observing, analyzing data and second is teaching and interacting with young students. Teaching makes us learn more than anything else. What fascinates me a lot is the secret of nature and the remarkable ability of the human mind to unravel them.

Rahul: I have heard that you completed your Ph.D. in molecular biology but afterwards you started working on animal behaviour. You have been enriching the area of animal behaviour for last 40 years. How did this unique transition happen? Which is your favourite discipline out of these two?
Prof. Gadagkar: There are two subjects I fell in love during M.Sc. These are molecular biology and animal behaviour. There was no Ph.D. programme in animal behaviour then. Ph.D. programme in molecular biology was newly launched at IISc and there was only one vacancy. I could manage to secure that seat and decided that I would consider molecular biology as my formal research area and studying animal behaviour as my hobby. Later, I reversed this notion and made animal behaviour my prime area of research. Working on molecular biology provided me with a more reductionist and more analytical perspective on the study of animal behaviour. When I started my research career, molecular biology and animal behaviour were considered two very different fields. Today the situation has changed completely. For our own study, for example, we use molecular techniques to measure genetic relatedness between wasps in a colony, genetic structure in a natural population, evolutionary changes in wasps, etc. Even taxonomy, which is considered the most classical field of biology has started using molecular techniques in a very powerful way.

Rahul: You have got numerous awards. Which award holds special place in your heart? What would be your wildest dream if someone questioned you about it?
Prof. Gadagkar: One should not be working for awards. Award is a minor component. But as an answer to your question, I would like to mention about one award which stands out of all the global recognitions and awards I received. I was a pre-university student then and got National Talent Search Scholarship. It was the happiest moment for me. My wildest dream is to see India as a developed country in my lifetime.



Professor Raghavendra Gadagkar has authored three popular books

Rahul: What is your opinion regarding integration of various disciplines? Do you have any message for the younger generation?

Prof. Gadagkar: We have compartmentalized ourselves so much that we don’t understand or speak to each other. It is becoming a notion that if I don’t understand you then you are nothing. Bringing best minds together and carrying on fruitful discussion is need of the hour. Methodological foundations of different disciplines should be the thread that binds each other. Find an area that is not fashionable today and try to make it fashionable tomorrow. Learn to think on your own. Don’t just accumulate facts. Don’t assume that your teacher is always right. Don’t make distinction between work and play. When you play, incorporate work. When you work, incorporate play. That will change everything!

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