

Priyadarshini Chakrabarti, Ph.D. (Zoology)

Research Associate (Post Doc), Honey Bee Lab, Oregon State University

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Summary of qualifications

- Experienced researcher with a demonstrated history of working in academia.
 - Skilled in various techniques pertaining to insect nutrition and biology, insect neuroethology, molecular ecology, pesticide research, insect toxicology, insect physiology, pollination biology and entomology.
 - Strong research professional with numerous publications in scientific journals, environmental magazines and book chapters.
 - Have demonstrated history of grant funding and have been the recipient of numerous prestigious awards.
 - Adept at working in interdisciplinary research problems and in a multicultural environment.
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Educational qualifications

Research Associate (Post Doc) – Honey bee lab, Oregon State University, Corvallis, Oregon

November 2016 – Present

Principal investigator: Dr. Ramesh Sagili

Research: Assessing the importance of phytosterols and other key nutrients for honey bee health and studying the impacts of pesticides on nurse bees across different cropping systems. I am responsible for developing a research project to understand the roles phytosterols play in honey bee nutrition. I am employing various techniques ranging from apicultural practices, molecular ecology, neuroethology and mass spectrometry to understand the nutritional physiology in honey bees.

Postdoctoral Fellow – Department of Zoology and Centre for Pollination Studies, University of

Calcutta, Kolkata, India

May 2016 – October 2016

Principal Investigators: Prof. Parthiba Basu (Ecology Research Unit) and Prof. Sagartirtha Sarkar (Molecular Cardiology)

Research: Studying the impacts of pesticides on vision in the wild native Indian honey bees. The expressions of apoptotic proteins in native honey bees exposed to pesticides as a part of a larger lab project have also been studied.

Newton Bhaba PhD Placement Fellow – Institute of Neuroscience, Newcastle University, UK

September 2015 – December 2015

Advisor: Prof. Geraldine Wright

Research: Studying the gustatory responses of bumble bees to neonicotinoids. Special training was undertaken on several insect neuroethological techniques. I studied the gustatory responses of bumble

bees to three commonly used neonicotinoids and performed taste assays. I also undertook beginners' training in electrophysiology.

Ph.D. (Zoology) – Department of Zoology, University of Calcutta, Kolkata, India

January 2011 – April 2016

DST-INSPIRE PhD Fellow, funded by Dept. of Science & Technology, Govt. of India, for 5 years

Advisor: Prof. Parthiba Basu (Ecology Research Unit) and Prof. Sagartirtha Sarkar (Molecular Cardiology)

Thesis: Phenotypic traits and genetic heterogeneity in natural honey bee populations along an agricultural intensification gradient in Eastern India.

Research and responsibilities: I studied the pesticide induced impairments in wild native Indian honey bees across agricultural intensification areas. I studied the effects on honey bee physiology, behavior, brain responses and honey bee diversity. I standardized protocols for rearing honey bees in cages for laboratory trials at the Ecology Research Unit, University of Calcutta and also for biochemical assays in honey bees. I helped my supervisor to establish the Centre for Pollination Studies, University of Calcutta (funded by Darwin Initiative, DEFRA, UK). I organized and participated in various farmers' training and awareness programs across three Eastern Indian states as part of the Darwin Initiative team, coordinated the honey bee projects, managed lab finances, documented project expenditures, organized meetings and conferences for the lab. I implemented pilot studies on wild native honey bees and helped expanding the bee lab by participating in grant writing in University of Calcutta. I also collaborated with various eminent scientists across India and UK and across disciplines for successful completion of my experiments.

Research Intern – Department of Zoology, University of Calcutta, Kolkata, India

August 2010 – December 2010

I studied zooplankton diversity and trained myself in various aquatic and terrestrial ecological sampling techniques.

Master of Science in Zoology – Department of Zoology, University of Calcutta, Kolkata, India

July 2010

First Class First (Gold medalist): Secured the highest marks in the examination from the University of Calcutta, 2010.

Bachelor of Science in Zoology (Honors) – Asutosh College, University of Calcutta, Kolkata, India

July 2008

First Class Third: Secured the third highest marks in the examination from the University of Calcutta, 2008.

Personal skills and competences

- **Molecular techniques:** Enzyme assays, Western blot, DNA extraction, isozyme studies on native PAGE, RAPD – PCR, cryosectioning, confocal microscopy, laser capture microdissection, mass spectrometry based proteomics, phytosterol analysis (targeted lipidomics – Liquid Chromatography / Mass spectrometry / Mass spectrometry), metabolomics.
- **Neuroethological techniques:** Honey bee live brain dissection, performing taste assays, electrophysiology and electroantennogram, PER for honey bees, Y-maze for bee vision experiments, basics in sample preparation and tip recording electrophysiology, honey bee antennal sample

preparation for scanning electron microscopy, video recording behavior and analyzing video data using Noldus.

- **Software:** Multiquant, Markerview, Analyst, Peak Viewer, Proteome Discoverer version 2.2, R, Statistica, Noldus, ImageJ, MedCalc, GraphPad Prism, Endnote, Qualtrics, Leica LAS EZ and PopGen. Competent in MS Office. Basic knowledge of MATLAB, SPSS, Windows OS (7, 8, 10) and Photoshop.
 - **Interdisciplinary skills and collaboration:** I am currently collaborating with various departments at the Oregon State University for successful completion of current laboratory projects. During my PhD I worked at the Ecology Research Unit and I successfully collaborated with the Molecular Cardiology Laboratory (University of Calcutta), Game and Wildlife Conservation Trust (UK), Institute of Neuroscience (Newcastle University, UK), Agharkar Research Institute (Pune, India) and Indian Institutes of Science Education and Research (Trivandrum, India).
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Professional trainings undertaken

- Certificated series on teaching by the Center for Teaching and Learning, Oregon State University, 2018
 - Oregon State University e-learning course on R statistical software, 2017
 - Training in neuroethological techniques (which included learning Noldus software, sample preparation and basics in tip recording electrophysiology and performing taste assays on bumble bees) at the Institute of Neuroscience, Newcastle University, UK, 2015
 - Training in honey bee behavior and honey bee rearing in laboratory cages at the Indian Institutes of Science Education and Research (IISER), Trivandrum India, 2012
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Publication list

I. Peer reviewed

1. Sagili, R.R., Metz, B.N., Lucas, H.M., **Chakrabarti, P.** and Breece, C.R. (2018) Honey bees consider larval nutritional status rather than genetic relatedness when selecting larvae for emergency queen rearing. *Scientific Reports* 8, 7679. DOI: 10.1038/s41598-018-25976-7.
2. **Chakrabarti, P.**, Sarkar, S. and Basu, P. (2018) Field Populations of Wild *Apis cerana* Honey Bees Exhibit Increased Genetic Diversity Under Pesticide Stress Along an Agricultural Intensification Gradient in Eastern India. *Journal of Insect Science* 18(3): 1 – 8.
3. Smith, B.M., **Chakrabarti, P.**, Chatterjee, A., Chatterjee, S., Dey, U.K., Dicks, L.V., Giri, B., Laha, S., Majhi, R.K. and Basu, P. (2017) Collating and validating indigenous and local knowledge to apply multiple knowledge systems to an environmental challenge: A case-study of pollinators in India. *Biological Conservation* 211(A), 20 – 28.
4. **Chakrabarti, P.**, Rana, S., Bandopadhyay, S., Naik, D.G., Sarkar, S. and Basu, P. (2015) Field populations of native Indian honey bees from pesticide intensive agricultural landscape show signs of impaired olfaction. *Scientific Reports* 5, 12504. DOI: 10.1038/srep12504.

5. **Chakrabarti, P.**, Rana, S., Smith, B., Sarkar, S. and Basu, P. (2015) Pesticide induced oxidative stress in laboratory and field populations of native honey bees along intensive agricultural landscapes in two Eastern Indian states. *Apidologie* 46(1), 107 – 129.

II. Conference proceedings and Book chapters

1. **Chakrabarti, P.** and Sagili, R.R. (2018) Sterol nutritional physiology in honey bees. Proceedings of the 2018 American Bee Research Conference, Bee World, April 17th 2018.

2. **Chakrabarti, P.** and Sagili, R.R. (2018) 77th Annual Pacific Northwest Insect Management Conference, Section II: Bees and Pollinators, 2018 Research Reports.

3. **Chakrabarti, P.**, Rana, S., Bandopadhyay, S., Naik, D.G., Sarkar, S. and Basu, P. (2018) 77th Annual Pacific Northwest Insect Management Conference, Section II: Bees and Pollinators, Portland, Oregon, USA on January 8th 2018 Research Reports.

4. Basu, P., Bhattacharya, R. and **Chakrabarti, P.** (2017) Pollination crises in the agro-ecosystems of the tropics: challenges and way forward. In G. Poyyamoli (Ed) Agroecology, ecosystems and sustainability in the tropics. Studera Press, New Delhi.

5. Basu, P. and **Chakrabarti, P.** (2015) Sub lethal effects of pesticides on pollinators with special focus on honey bees. In P.A. Sinu and K.R. Shivanna (Eds) Mutualistic interaction between flowering plants and animals. Manipal University Press, Manipal. ISBN: 978-93-82460-26-8. Link: <http://mup.manipal.edu/>

6. Basu, P. and **Chakrabarti, P.** (2015) Pesticides and the Muted Buzz of the Bees. In Biswas, S., Mitra, M.K. and Bar, R. (Eds) Environmental impacts on health: towards a better future. Kolkata Readers Service, Kolkata. ISBN: 9789382623511.

III. Extension publication – single authorship

1. Article entitled “The Many Faces Of Conservation” in Wildlife, October 2017
<http://bsedkolkata.org.in/emagazine/wildlife/38-the-many-faces-of-conservation>

2. Article entitled “Food security in agriculture” in Food Safety, May 2016
<http://bsedkolkata.org.in/emagazine/food-safety/27-food-security-in-agriculture>

3. Article entitled “The vanishing honey bees” in www.livestories.com – an online magazine
<http://livestories.com/2014/06/24/vanishing-honey-bees/>.

4. Article entitled “Story of the vanishing pollinators – honey bees” in Sujalam Sufalam, Issue number 2, April – June, 2013.

5. Article entitled “The invisible world” in Sujalam Sufalam, edition Wildlife Conservation. Issue number 3, October – December, 2013.

IV. In preparation / review

I have currently 5 manuscripts under preparation as of October 2018.

Conference / Meeting / Workshop

I. Invited talks

- Presented a **talk** at the California State Beekeepers' Association 2018 Annual Convention on November 13th, 2018 in California, USA.
- Presented a **talk** at the Oregon State Beekeepers' Association 2018 Fall Conference on October 28th, 2018 in Salem, Oregon, USA.
- Presented a **talk** at the Linn Benton Beekeepers' Association monthly meeting on August 15th, 2018 in Corvallis, Oregon, USA.
- Presented a **talk** at the webinar series for California Master Beekeeper Program on April 9th, 2018.
- Presented a **talk** at the University of Oregon, Eugene, USA, on November 30th, 2017.
- Presented a **talk** at the "Generation Next Focus" meeting hosted by the **British Deputy High Commission** in Kolkata, India on August 24th, 2016.
- Presented a **platform talk** at the honey bee workshop organized by the Okinawa Institute of Science & Technology, Japan in April, 2016.
- **Invited** to "Panel Discussion on Neuroesthetics and Beauty" hosted by the **British Deputy High Commission** in Kolkata, India on February, 9th 2016.
- Presented a **talk** at the Queen Mary University of London, UK, on November 10th, 2015.
- Presented a **platform talk** at the first meeting of the UK – India Initiative in Agroecology by the British Ecological Society and Society for Agroecology, India on 21st February, 2015 at the University of Calcutta, Kolkata, India.

II. Conference / Meetings

- Co-author for **poster** at the 66th Conference on Mass Spectrometry and Allied Topics, San Diego, California, from June 3rd – 7th, 2018.
- Presented a **talk** at the American Bee Research Conference by American Association of Professional Apiculturists, Reno, Nevada, USA from January 10th – 12th, 2018.
- Presented **two talks** at the 77th Annual Pacific Northwest Insect Management Conference, Portland, Oregon, USA on January 8th 2018.
- Participated in the Oregon State Beekeepers Association Fall Conference 2017 Oct 27, 2017 - Oct 29, 2017 in Oregon, USA.
- Presented **two posters** at the "6th Annual Post Doc Research Symposium and Vendor Show" organized by OSU Post Doctoral Association, Oregon State University, USA on October 4th, 2017.
- Participated at the American Bee Research Conference by American Association of Professional Apiculturists, Galveston, Texas, USA in January 2017.
- Presented a **platform talk** at the first meeting of the UK – India Initiative in Agroecology by the British Ecological Society and Society for Agroecology, India on 21st February, 2015 at the University of Calcutta.
- Presented a **poster** at the Joint 2014 Annual Meeting British Ecological Society and Société Française d'Ecologie from 9 – 12 December at Grand Palais, Lille, France.
- Presented a **platform talk** at "Pollinators in Agriculture" conference organized by Association of Applied Biologists at Brussels, Belgium from 01-03 April, 2014.
- Presented a **speed talk** at INTECOL, 2013 held at London, UK, 18th – 23rd August 2013.
- Presented a **poster** at Young Ecologists Talk and Interact (YETI), 5th – 7th October, 2010 at IISc Bangalore, India.

III. Workshop organization

- Helped organize and participated in 3-day workshop "Scientific writing in agroecology" organized by the Indo-Norwegian Cooperation Programme 2014 (INCP) from March 2nd – 4th, 2016.

- Helped organize and participated in 3-day workshop “Action learning in agroecology” organized by the Indo-Norwegian Cooperation Programme 2014 (INCP) from February 24th – 26th, 2015.
- Helped organize and participated in the first meeting of the UK – India Initiative in Agroecology by the British Ecological Society and Society for Agroecology, India from February 21st – 23rd, 2015 at the University of Calcutta.

IV. Seminar

- Presented a **talk** entitled “Phytosterol nutritional physiology in honey bees” at the 2018 Fall Seminar Series, Department of Horticulture, Oregon State University, USA on October 23rd, 2018.
- Presented a **talk** entitled “Impacts of stressors on pollinator health, behavior and nutrition” at the 2017 Fall Seminar Series, Department of Horticulture, Oregon State University, USA on September 26th, 2017.
- Participated in and **hosted** the “Zoology Colloquium – 2016” organized by the Department of Zoology, University of Calcutta from September 15th – 16th, 2016.
- Participated in and **hosted** the “National Level Young Scientists’ Meet 2016 : Hiralal Chaudhuri Commemorative Conference” organized by the Zoological Society Kolkata and Department of Zoology, University of Calcutta from February 4th – 6th, 2016.
- Participated in University Grants Commission’s 1-day seminar on “Advanced Seminar on Research Updates: 2015” organized by Department of Zoology, University of Calcutta, on March 31st, 2015 at Kolkata, India.
- Presented a **talk** at (and successfully awarded) Sudev Bhushan Ghosh Young Scientist Award held on February 28th, 2014.
- Participated at the seminar on Research Updates, 2014 organized by and held at Dept. Of Zoology, University of Calcutta on March 29th, 2014.
- Participated in 1-day seminar on Ecological Modeling & Analyses held at Dept. of Zoology, University of Calcutta on March 1st, 2014.
- Participated in Spring Talks @ CU Zoology 2013, on March 23rd, 2013 organized by and held at Dept. of Zoology, University of Calcutta
- Participated in 100th Indian Science Congress, held at University of Calcutta from January 3rd – 7th, 2013.

V. Workshop participation

- “Intro to Qualtrics - Making Great Surveys” workshop organized by Oregon State University Valley Library on September 26th 2017
- “Statistics Basics with SPSS” workshop organized by Oregon State University Valley Library on October 11th 2017
- “SPSS Intermediate” workshop organized by Oregon State University Valley Library on October 11th 2017
- “Basic and Intermediate Endnote” workshop organized by Oregon State University Valley Library on October 19th 2017
- “Advanced Qualtrics” workshop organized by Oregon State University Valley Library on November 1st 2017
- Participated in the honey bee workshop and the honey bee artificial insemination workshop organized by the Okinawa Institute of Science & Technology, Japan from April 6th – 12th, 2016.
- Participated in 3-day workshop on Application of Statistics in Life Sciences, held on September 25th – 27th, 2013 organized by Zoological Society, Kolkata and Dept. of Zoology, University of Calcutta in collaboration with Indian Association for Productivity, Quality and Reliability.

- Participated in 4-day India - UK scientific seminar held at Trivandrum, Kerala on Biology of Tropical Pollination : From Individuals to Networks organized by DST, India and Royal Society, UK from February 19th – 22nd, 2013.
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Teaching and advising

- **2018**
 - 1. Teaching assistant ENT 322, Oregon State University**

Teaching assistant for the in-class course “Honey Bee Biology & Beekeeping”, Spring Term 2017, Oregon State University. Along with teaching in class, I assisted in grading the examinations and assignments.
 - 2. Certificate course completed**

Tuesday Teaching Talks organized by the Oregon State University Center for Teaching and Learning.
- **2017**
 - 1. Teaching assistant ENT 322, Oregon State University**

Teaching assistant for the online E-campus course on Canvas “Honey Bee Biology & Beekeeping”, Fall Term 2017, Oregon State University. I spent **10 hours every week** throughout the entire term. Along with teaching, I also evaluated student projects and graded the examinations and assignments.
 - 2. FERPA training successfully completed, Oregon State University**
- **2015**

Taught module 4 (Threats to pollinators) at the 6 months certificate course on pollination biology at the Centre for Pollination Studies, University of Calcutta. Along with teaching the module, my responsibilities were to define and develop the lectures and courses for module 4, guide the graduate students in understanding the various threats to pollinators and encourage them in understanding the problems. I also evaluated their course examination answer scripts. I spent **5 hours every week for 6 months**.
- **2014**

Supervised one graduate student intern at the Ecology Research Unit, University of Calcutta. I guided and trained the student in bee behavior and helped develop field skills. I also helped the student to develop ecotoxicological experimental skills. I guided the student into achieving great results in the experiments. The student published with us and is now pursuing PhD in a related field in University of Tennessee (Knoxville). Hours spent **25 hours every week for one year**.
- **2013 – 2015**

Trained three M.Sc. (Zoology) Ecology special paper students each year in honey bee biology and behavior at the Ecology Research Unit, Department of Zoology, University of Calcutta. My responsibilities were to encourage students in understanding the uniqueness of the honey bee model system, develop their skills in insect physiology and behavior, guide them through the experiments and most importantly develop their troubleshooting skills. Four of the five students are pursuing their PhD in related fields now. Hours spent **12 hours every week for 2 years**.

- **August, 2010 – July, 2012**
Guest lecturer in Zoology (Hons.), Asutosh College, University of Calcutta, 92 Shyamaprasad Mukherjee Road, Kolkata 700026, India. My responsibilities were to develop animal behavior course, deliver lectures on subjects pertaining to animal behavior, ecology, developmental biology and ecotoxicology. I communicated with the undergraduate students and helped solve their problems. I also evaluated the examination answer scripts. Classes taught for **8 hours every week for 2 years**.
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Grants

Research grants

- 2018: **Co-PI** for the **grant awarded** by **Project *Apis m.*** 2018 on behalf of the National Honey Board for a total grant amount of **\$80,748**.
- 2018: **PI** for the grant **successfully funded** by **The California State Beekeepers' Association (CSBA)** 2018 season for grant amount of **\$20,052**.
- 2018: Contributed to writing all sections of the grant and conducted pilot studies for the successfully awarded **Agricultural Research Foundation (ARF) Competitive Grants, Oregon State University**, for an award amount of \$12,360 (**reference number ARF#845A**).
- 2016: **Royal Society Newton International Post Doctoral Fellowship** proposal was **successfully funded** in November 2016 (grant reference number **NF160336**) for a total value of **£96,000**. Having already started working at Oregon State University, I declined this.
- 2013: **The Council for Scientific and Industrial Research, Govt. of India**, successfully funded the proposal for a total value of **INR 20,00,000 (~\$32,000)**. Contributed to conducting pilot studies and writing all sections of the grant numbered **37(1616)/13/EMRII** dated 10/07/2013.

Travel grants

- 2016: **Complete funding** for attending workshop and presenting a talk at the **Ecology & Evolution Unit, OIST**, Okinawa, Japan, 2016 (included visa fees, airfares, daily allowance etc.).
- 2015: Travel grant by the **Department of Science & Technology, Govt. of India**, to pursue research at the Institute of Neuroscience, Newcastle University, UK for an amount of **INR 93,000**.
- 2014: **Association of Applied Biologists** special travel grant to present a platform talk at the "Pollinators in Agriculture" conference organized by Association of Applied Biologists at Brussels, Belgium from 01-03 April, 2014 for a total award amount of **£1000**.
- 2014: **Endowment Foreign Scholarships/Fellowships** travel grant by the **University of Calcutta** for the year 2014 for an amount of **INR 75,000**.
- 2013: **Parkyn – Bursary** special focal student award from the **British Ecological Society (BES)** to attend and present a talk at INTECOL, 2013 at London, UK for an amount of **£750**.

- 2013: **University of Calcutta** international travel grant 2013 for an amount of **INR 50,000**.
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Fellowships, awards and distinction

- Nominated as a **Full Member** to **Sigma Xi, The Scientific Research Honor Society**, February 2018.
 - **Royal Society Newton International Post Doctoral Fellowship** November, 2016 (Having already started working at Oregon State University, I declined this). This is a highly competitive and prestigious fellowship. Only 40 researchers are awarded all across the world every year. The award amount was **£96,000 (~\$140,000)**.
 - **Newton – Bhaba PhD Placement Fellowship** for pursuing research at the Newcastle University, UK at the insect neuroethology laboratory from September to December, 2015. **Complete funding** for 3 months which included airfare, visa, travel costs, fellowship, University bench fees, consumables etc. Only 26 Indians were awarded out of a total of 116 finalists in 2014-2015 grant cycle. The award amount was **~£12,000 (~\$17,000)**.
 - **Parkyn-Bursary focal student researcher appreciation** at the INTECOL, 2013 meeting in London, UK by the British Ecological Society.
 - **Sudev Bhushan Ghosh Young Scientist Award** by Zoological Society, Kolkata, 2012-2013.
 - Awarded the prestigious **DST-INSPIRE Fellowship** for pursuing PhD, March 2011, by **Department of Science & Technology (DST), Government of India**. **I received complete funding for 5 years (fellowship and contingency)**. This is a highly competitive fellowship, awarded to only a few selected gold medalists across all the Indian universities. The total award amount was **INR 17,44,000 (~\$30,000)** over five years.
 - **First Class First – Gold medalist – University of Calcutta**, Master of Science (Zoology), 2010. Secured the highest marks in the M.Sc. Zoology examination at the University of Calcutta.
 - **K. C. Ghose Memorial Medal** awarded by the Zoological Society, Kolkata, 2010.
 - **First Class Third – University of Calcutta**, Bachelor of Science, Zoology (Hons.), 2008. Secured the third highest marks in the B.Sc. (Hons.) Zoology examination, University of Calcutta.
 - **Distinction Award** for scoring the highest in the Zoology Department, Asutosh College, 2008 in the Zoology Honours examination, University of Calcutta.
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Service to profession

- 2018 – Present: Membership coordinator, Oregon State University Post Doctoral Association Board.
- 2018 – Present: Reviewer for “Graduate Women In Science” grants (GWIS Fellowships).

- 2017 – Present: Reviewer for international peer reviewed journals – Chemosphere, PLoS ONE, Annals of the Entomological Society of America, Insects, Peer J, Sustainability and Florida Entomologist.
 - 2017 – Present: Post Doc Mentor for graduate students at Oregon State University.
 - 2017 - Present: Member of search committee for various recruitments at the Department of Horticulture, Oregon State University.
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Outreach and Extension

- January, 2017 – Present: Volunteer at various outreach workshops in schools on behalf of the Honey Bee Lab, Oregon State University.
 - June, 2017 – Volunteer for the “National Pollinator's Week”, participated in survey of the native bees of Corvallis. This was a family-friendly event led by some of the Oregon state's top bee biologists from Oregon State University and Oregon Department of Agriculture held in Corvallis, Oregon, USA.
 - October, 2017 – December, 2017: Staff volunteer at the Corvallis Multicultural Literacy Center, Corvallis, Oregon, USA.
 - 2013 – 2015: Helped organize and participated in various farmer awareness programs, beekeeper trainings and farmer training programs across various Eastern states in India. This project comprised of a large team and was funded by the Darwin Initiative Grant, DEFRA, Govt. of UK, and was coordinated by Prof. Parthiba Basu and Dr. Barbara Smith (University of Calcutta, India and Game & Wildlife Conservation Trust, UK collaboration). The stakeholders involved were government organizations, farmers, beekeepers, various agricultural nonprofit organizations, researchers and policy makers.
 - 2012: Interaction at daylong seminars with schoolchildren to spread environmental and pollinator awareness.
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Professional memberships

- Entomological Society of America
 - Full membership – Sigma Xi, The Scientific Research Honor Society
 - American Association of Applied Apiculturists
 - COLOSS Honey Bee Research Association
 - International Union for the study of Social Insects, North American Section
 - British Ecological Society
 - Association of Applied Biologists
 - Zoological Society of Kolkata
 - Indian Science Congress
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References

References will be provided upon request.
