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**[C. W. Woodworth Award](http://www.apace97.org/index.php/apace-news/100-c-w-woodworth-award)**

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At the same Maui meeting, the Society announced the recipient of the C. W. Woodworth Award, which annually recognizes a person in the Pacific Branch of the Entomological Society of America who has made outstanding contributions to entomology during the past decade. The 2005 Woodworth Award went to Dr. Jocelyn Millar of the Department of Entomology, University of California, Riverside, CA.

The following is the abstract for Dr. Millar’s presentation at the Opening Session of the meeting.

DECIPHERING INSECT COMMUNICATION SYSTEMS: A LONG AND WINDING ROAD

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Humans normally think of communication in terms of sound or vision, such as speech and writing. However, for many organisms, exchange of chemical signals constitutes their primary method of communication, and chemical signaling was probably the first type of communication to evolve. For these microbes, plants, and animals, individual chemicals might be viewed as our equivalent of letters or words, that can be combined in various ways to create many different messages. Thus, in the same way that we use an alphabet of 26 letters to make thousands of words, a large number of different chemical signals can be generated by blending a small number of chemicals together in different combinations.

Chemical signals and cues mediate many aspects of insect behavior and life history, including reproduction, feeding and oviposition, and defense. Our research has been focused primarily on the identification, synthesis, and development of practical applications of insect pheromones and related chemicals that mediate insect behaviors. To give an idea of how ubiquitous this type of communication is within the Insecta, in my group alone we have worked on chemical signaling in insects as diverse as moths, flies, mosquitoes, beetles, true bugs, scales, mealybugs, ants, termites, bees, and parasitic wasps. Along the way, our research has gone in some unexpected directions when it has become clear that the organisms under study were using more than one medium for communication, for example, by combining chemical signals with visual or acoustic signals. Other projects have stopped and restarted several times, as new ideas suggested possibilities for further research. Illustrative examples have been taken from three projects.

As a first example, we began identifying pheromones for a series of true bugs in the late 1990's, and that work is still continuing. The pheromones of some species (e.g., mirid bugs in the genus Phytocoris) were straightforward, both in their chemistry and how they worked. However, the pheromones of phytophagous stink bugs were more complicated, and at first, it appeared that they did not work very well at all (although they did attract bug parasites and predators!). However, more careful observation revealed that these bugs were actually using two overlapping sets of signals. That is, pheromones were used to get males and females onto the same plant, but once on the plant, the bugs used substrate-borne vibrational signals to locate each other, and for courtship and recognition once they were in contact. In fact, each species and sex produced its own unique repertoire of 3-5 different types of vibrational signals, for use in different contexts. Overall, use of these vibrational signals appears to be an efficient method of mate location, while simultaneously limiting eavesdropping by predators and parasitoids.

The second example had its genesis in a collaborative project on invasive cerambycid beetles that started in 1989 with Drs. Tim Paine, Larry Hanks, and myself. We wanted to learn about the biology and ecology of Phoracantha punctata, and later Phoracantha recurva, two serious pests of Eucalyptus that had been introduced into California from Australia. We have studied many aspects of the life history and biological control of these beetles, but one of the offshoots from this project was that we became increasingly interested in cerambycid beetles overall, and particularly, their use of chemical signals. This has now blossomed into a longterm, multiparticipant project, from which we hope to develop an overall outline of pheromone occurrence and use in this large insect family, including how the pheromones are used, the types of chemicals that are involved, and how the chemicals are mixed and matched in subsets by different species to generate unique chemical signals.

The third project, on the sex pheromone of navel orangeworm, a major pest of nut crops in California, also began in 1989 but for years we made little progress. In the last couple of years, using a surrogate species as a model we were finally able to prove that there were missing components to the pheromone blend. Now, looking back over data from many years, it is clear that those trace components were there all along, but were missed because they were not where or what we expected them to be. This project served as a salutary lesson in the value of conducting research with an open mind, rather than expecting results to fall into known or predicted patterns.