Maximum 500 words, double-spaced, type size at least 12 points, do not exceed boundaries. Include statement on anticipated outcomes.

We and others have found evidence that imported fire ants may secrete novel pheromones composed of polypeptides. These pheromones are involved in recognition of queens and larval reproductives. The secreted proteins could act by themselves as pheromones, or they could be precursors of peptide pheromones, or they could be carriers of small molecule pheromones. We propose to determine the sequences of these peptides and proteins and, if applicable, identify the small molecules they carry. We will then test their functions in bioassays.

Antennal glands: We discovered that the antennae of queen fire ants have a number of glands on antennal segments 9 and 10 (the last is 11). These are of interest for several reasons. One is that frequently, when workers execute queens, they remove the distal part of both antennae. The second is that workers kill the queen if the last three antennal segments (9-11) are removed. So, there is something special about the gland. Third, antennal glands in parasitic hymenoptera (discovered by Vinson's lab) are used in courtship and thought to be important in mate recognition. We found that antennal segments with glands contain a low-molecular weight protein which may be specific for the gland secretion. We propose to determine the coding sequence of the protein and place it in an expression vector to obtain sufficient protein to conduct bioassays to allow us to determine its function and effect on a IFA colony.

Odorant-binding proteins: An odorant-binding protein involved in queen recognition, and a chemosensory protein involved in colony identity will be expressed in recombinant bacteria. The ligands which these proteins carry in vivo will be isolated with a patent-pending affinity chromatography method, and they will be tested for their effects on IFA workers.

Queen venom proteins: IFA queens produce a pheromone in the venom gland which induces the workers to kill larval reproductives. The queen venom contains two unique proteins which may be the pheromone or a precursor or a carrier of the pheromone. We will express the venom proteins in recombinant bacteria and test them in larval reproductive execution bioassays.

The goal of this proposal is to isolate peptides that can provide keys to producing or modifying compounds that mimic, inhibit or stimulate certain biochemical processes that could be used to manage the IFA. The isolation of peptides that may be involved in a pheromone function is a new concept with insects. It has a number of important implications. Like other pheromones, they may control behavioral or physiological events through contact. However, based on our experience with parasites, we suspect that they are involved in recognition (like a bar code), and queens lacking the peptide are not recognized and executed. This research could have far-reaching implications (new concepts regarding insect communication and recognition) that would lead to outside funding.