

## **Project Summary**

New bioinformatics networks integrated with collaborative data-entry systems provide unprecedented opportunities to capture and display data needed to assess the status of bees, the most important group of pollinators. There is now great concern about a global pollinator crisis and recognition of a pressing need for improved data on the past and present distribution of bees and their interactions with plants. Retrospective capture of bee specimen records is required to establish the historical baseline necessary to detect declines or other changes in pollinator populations. Data from several bee collections are available online, but these data are still too few, too restricted in taxonomic and geographic scope, and too variable in quality to assess reliably the past and present distributions of bee species, much less to predict global risks to bee pollination services from climate change, habitat loss, and other factors. Data from multiple well-curated bee collections must be captured, error-checked, integrated with disparate other data, and made accessible to researchers, policy makers, and the public.

This collaborative research proposal requests three years of support to: 1) capture specimen data from bee specimens in the American Museum of Natural History, UC Riverside, USDA-ARS Bee Biology and Systematics Lab at Utah State University, Cornell University, UC Davis, UC Berkeley, California State Collection of Arthropods, Los Angeles County Natural History Museum, University of Connecticut, and Rutgers University bee collections and 2) integrate these data with the Discover Life global bioinformatics network and other online resources. Development of the Discover Life informatics network for bees will enhance existing species pages for more than 19,000 bee species. This network features images, dynamic maps, and links to species pages for floral hosts and to interactive identification guides for all eastern North American species.

**Intellectual Merit:** The project's immediate focus is not just to capture historical information on bees from collections, but also to integrate new records with existing electronic resources, and newly digitized literature. Longer-term scientific goals include understanding how climate change and other environmental factors are changing plant-pollinator interactions. We ultimately need to analyze the historical data alongside current information. By mobilizing an unprecedented quality and quantity of data on bees we will fulfill an immediate demand, and provide a foundation for future investigations of pollinator diversity. All data we capture will be immediately accessible online and integrated with existing species pages linked to dynamic maps, image databases, interactive distributional and taxonomic checklists, and interactive identification guides; these attractive resources, readily available online, will surely have an immediate and very broad impact. The collaborative databasing approach we will use during the project can be readily extended to additional bee collections and to other taxonomic groups within the collaborating institutions.

**Broader Impacts:** This project will involve mobilizing and integrating data on pollinators of great and immediate interest to policy makers and the public, given the key role of bees as pollinators in agricultural and natural ecosystems and widespread concern about bee declines. Potential uses of such a data set include: species distribution maps of both bees and host plants; phenological analyses of both bees and host plants; GIS and habitat analyses; natural history associations of bees and host plants, including potential identification of plant-pollinator associations (including agricultural pollination); and historical trends (including climate change). The project will also support the training of numerous technicians and undergraduate students and the development of existing outreach programs such as Bee Hunt! and the Great Pollinator Project.