PROJECT SUMMARY

Wood-decaying *Agaricomycetes* (*Basidiomycota*) include diverse polypores, gilled mushrooms, and crust-like "corticioid" forms. These organisms play important roles in forest ecology and the carbon cycle, and they have potential applications in biodegradation, bioremediation, and biofuel production. Understanding of the higher-level relationships of wood-decaying *Agaricomycetes* has advanced dramatically in recent years, but generic limits and species-level taxonomy remain problematical in many cases. Challenges are greatest in the corticioid fungi, which have been understudied and are morphologically cryptic. This project will perform monographic research and training in two major groups of wood-decaying *Agaricomycetes*, the "Phlebioid clade" of the *Polyporales*, and the *Gloeophyllales*. In the Phlebioid clade, we will seek to document the diversity and relationships of *Phanerochaete*, which is a large genus of corticioid fungi that is now known to be polyphyletic. We will identify all the lineages that include taxa that have been placed in *Phanerochaete* and develop monographs for each group. In the *Gloeophyllales* we will prepare monographs for all included taxa. We will use the web-based Tree of Life Knowledge Information Network (TOLKIN) for data management and project integration, and we will also produce novel phyloinformatics resources for *Polyporales* and *Gloeophyllales*, which could be adapted for other taxa.

The general goals of this project are: **1)** To produce comprehensive modern monographs in the *Gloeophyllales* and the Phlebioid clade; **2)** To train the next generation of taxonomists with expertise in wood-decaying *Agaricomycetes*; **3)** To create and contribute to informatics resources for taxonomy of *Gloeophyllales* and *Polyporales*; and, **4)** To strengthen and promote communication among the international community of taxonomists with interests in wood-decaying *Agaricomycetes*. To accomplish these goals, we have assembled an international team of collaborators, who span several generations and embody much expertise in taxonomy of wood-decaying *Agaricomycetes*, as well as phylogenetics and bioinformatics.

INTELLECTUAL MERIT.
The focal taxa are diverse in fruiting body morphology, anatomical characters, genetics of mating compatibility, and substrate ranges, and they have broad geographic distributions. Phylogenetic trees produced for these groups will permit studies of character evolution, as well as historical biogeography. Recently, it has been shown that some members of the focal taxa may function not only as wood-decayers, but also as endophytes or soil fungi. The sequences and cultural characters produced in this project will enable identification of environmental isolates.

BROADER IMPACTS.
As decayers and pathogens, *Fungi* have profound impacts on human affairs. They also function as beneficial symbionts, provide food, drugs and other useful biochemicals, and serve as model systems for genetics and molecular biology. However, it is estimated that only 5-10% of the extant species of *Fungi* have been described, which means that most of the biodiversity of *Fungi* is not accessible for both applied and basic research. To remedy this situation, this project will train two Ph.D. students in fungal taxonomy. This project will also support visiting students and scholars, and it will include taxonomy and biodiversity informatics workshops for the broader PEET and mycological communities. It will include outreach to teachers, and will develop resources and identification tools that can be used by a wide range of professional mycologists, educators, and students. The focal taxa, *Polyporales* and *Gloeophyllales*, are particularly worthy targets because they include model species for mechanistic studies of decay biology (*Phanerochaete chrysosporium* and *Gloeophyllum sepiarium* and *G. trabeum*), which will be enhanced by a rich, detailed understanding of the biodiversity in each group.