2006: Advancing the Development of Prosthetic Hands

The hand is arguably the most complex and intricate portion of musculoskeletal system in the human body. Sensing, grasping and manipulation of the environment are significant functions of the hand. Loss of a hand, through traumatic or surgical amputation presents significant future challenges to a person, including severe functional disability and lowered self body image, with consequential severe psychological implications.

Prosthetic devices to "replace" hands are available, and range from steel hooks, to grasping claws, to "artificial hands" currently in development. Artificial hands under development include various mechanical, pneumatic, and electronic devices to control movement of the artificial fingers. Some devices are trying to incorporate tactile and thermal sensation.

A new funding opportunity has been announced that seeks to encourage significant advances in the area of prosthetic hands for adults. You see this as a wonderful opportunity to use your talents to advance biomedical engineering, prosthetics, and your career. You are to write proposal in response to this funding opportunity. Include the following in your proposal:

Background and significance:
Provide a general overview of the current state-of-the-art of "artificial hands" and their means of control of motion, and sensing, grasping, and manipulation of the environment. Compare and contrast the biological and mechanical properties of the intact hand with these prostheses.

Specific Aims: Please list the specific aims of your study.

Research Plan:
Describe how you would improve on the design of an artificial hand that would let a recipient of your proposed device type an e-mail letter thanking you for your improved design, and the new features that will make your design "seem like the real thing". Your description should include considerations of the tissue biomechanics (including continuum mechanical considerations), biomaterials, kinematics, and biological properties and attributes of your solution. Your description should also include the experimental approaches of how you would test your proposed solution, including the materials, methods, time-line, instrumentation needed, and proposed budget for the project.

Consortium, Contractual Agreements (Part of Research Plan): With what types of specialists would you seek collaboration for your project?

Expected Outcomes (Part of Research Plan): What are the anticipated outcomes of your proposed experiments and evaluations?

Potential Problems and Alternative Strategies (Part of Research Plan): What problems do you anticipate that you are likely to encounter, and how would you overcome those problems?