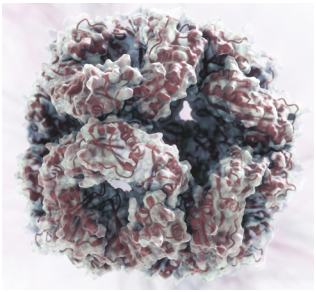
DEFEATING DISEASE AT THE MICRO LEVEL
The UW Institute for Protein Design



Self-assembled nanoparticle designed in the Baker group. Illustration rendered by Vikram Mulligan, Ph.D.

The IPD and the Power of Protein Design
Protein design leverages the power of computing and synthetic biology to make drug discovery faster and more cost effective — an effect we expect to increase over time. IPD breakthroughs are producing a whole new world of synthetic proteins that take us far beyond traditional treatments based on small molecules and antibodies.

Focus areas
Cancer, inflammation, Alzheimer's disease and the neurosciences, malaria, flu, celiac disease, HIV-AIDS, Ebola, diabetes, chronic pain

Metrics
11 patents, 95 patent applications, 5 Seattle-area spinoff companies

Collaborators
Harvard University, Fred Hutchinson Cancer Research Center, Seattle Children's Research Institute, St. Jude Children's Research Hospital, Stanford University and Takeda Pharmaceuticals

Director
David Baker, Ph.D.
B.A., Harvard University (biology); Ph.D., UC Berkeley (biochemistry); UW Professor, Department of Biochemistry

PROTEINS FULFILL THE INSTRUCTIONS OF DNA. They are responsible for digesting food, building tissue, transporting oxygen through the bloodstream, dividing cells, firing neurons and powering muscles. Proteins do nearly every job, at every moment, within the body. Disease results when the proteins that orchestrate human life malfunction. At the same time, proteins — ones designed to thwart disease — hold great promise for the future of medicine.

Researchers at the University of Washington Institute for Protein Design (IPD) marshal deep institutional strengths in biochemistry, genome sciences, biological structure, pharmacology, immunology, computational biology and a host of other disciplines to advance the potential of protein design, all in the effort to defeat disease.

It's an ambitious undertaking, one we are uniquely equipped to manage. And it is an effort that will take significant investment from our community. We invite you to contribute to this vitally important work, highlighted below.

An Amazing Tool in Defeating Disease

In nature, our genes prompt the creation of proteins, which are sequences of intricately folded amino acids. The folds determine both the protein's structure and its function in relation to the body. **In protein design, that process is reversed.** Scientists start with what they want a protein to do, use sophisticated software to predict what folds might help the protein fulfill that function, then create a synthetic gene to make the protein.

So, what do researchers want proteins to do? When it comes to medicine, the sky is the limit. Here are some examples of projects under way at the UW Institute for Protein Design.

Defeating cancer. Cancer is a major health issue, affecting millions of people worldwide. It's also a scientific puzzle; tumors are highly adaptable and unpredictable, and cancer medications are very toxic. The IPD is working to challenge cancer by developing precise drug-delivery nanoparticles and immune system-boosting proteins, among other projects.

Helping the brain. Understanding the workings of the brain is a challenge — and one central to good health, especially as humans age. IPD researchers are attempting to create anti-Alzheimer's proteins, proteins that can leap over the blood-brain barrier to alter neuronal signaling (key to brain cancer and other conditions), and protein-based nanowires that could connect the nervous system directly to electronic devices.

Neutralizing pathogens and creating vaccines. Viruses and bacteria cause many deaths and a great deal of suffering, and the IPD is working on multiple fronts to reduce their impact. For instance, researchers have identified proteins that neutralize certain flu bugs, and they're working on diagnostic and therapeutic solutions for Ebola. With support from the Bill & Melinda Gates Foundation, they're also working on creating next-generation vaccines for HIV and other viruses. These protein-based vaccines are engineered to be easily stored and transported for deployment in the developing world.

And much more. Researchers, postdocs and graduate students at the IPD are also addressing conditions like type 1 diabetes and other autoimmune diseases. And they're helping create low-cost diagnostic tools.

Opportunities to Invest: A High-level Look

Below is a very high-level look at some of the Institute for Protein Design's (IPD's) needs and projects. Since we're planning on a large scale, the investment amounts number in the millions. **It's important to note, however, that every gift matters — and every gift can be directed to the project area or medical discipline that most interests you.**

Opportunities	Investment
Protein Design Research Capability Fund. Improving methods and expanding research capabilities will allow the IPD to scale up its research, reducing the time needed to turn a concept into a real-world solution.	$12.6 million
Director's Fund. Every week, IPD researchers receive offers to collaborate with top biomedical researchers worldwide. Investment will help the IPD hire graduate students and postdoctoral researchers who can commit to exciting new partnerships.	$8.5 million
Translational Investigator Fund. This supports the work of entrepreneurial investigators who translate protein designs into real-world therapies — and commercialize IPD discoveries through Seattle-area spinoff companies.	$7.5 million
Researching Specific Diseases. Funding for protein design for specific medical conditions — such as cancer, Alzheimer's disease, diabetes, infectious diseases, vaccines and others — will ultimately benefit patients.	$2.4 to $3.2 million per project
Research Cores. Computational resources and gene-to-protein manufacturing are central to the IPD's operations. Investment in research cores supports Rosetta software engineering, expands computing resources and enhances wet-lab procedures to speed protein design discoveries.	$2.4 to $3 million per core
Faculty Recruitment and Retention. Recruiting top-notch faculty is essential to our success, and we intend to hire several additional faculty — skilled in different disciplines related to protein design — in the Department of Biochemistry.	$3.25 million
A Major Expansion. The IPD is expanding into a new, adjoining building on the Seattle campus, slated for completion in late 2016. Gifts made to the building fund will underwrite new lab and office facilities, nearly doubling the IPD's footprint and increasing its capacity, and will allow the purchase of wet-lab and computing equipment to support research.	$3 million for lab and office space $1.5 million for equipment
Crowdsourcing Ideas: Foldit. Support for improvements to Foldit, a multi-player online protein design game, will empower citizen-scientists to design proteins. Projects include targeting Ebola, flu, Alzheimer's disease, diabetes and more.	$1 million
Community Computing: Rosetta@home. An investment in Rosetta@home enables the IPD to leverage volunteers who share idle computer time in order to calculate new protein structures.	$1 million
Inspiration and Collaboration. Support for an annual mini-symposia will allow us to recruit speakers internationally recognized for their protein design expertise.	$500,000

For More Information

Protein design is a powerful force in basic research, biotechnology and innovation. For more information on the groundbreaking projects taking place at the UW Institute for Protein Design, please contact Katherine Cardinal, senior director for philanthropy at UW Medicine Advancement, at 206.616.0412 or cardinal@uw.edu. Thank you for your interest in our work.

UW Medicine Advancement

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Feb. 2016