POSTDOCTORAL RESEARCH SCIENTIST IN STRUCTURAL BIOLOGY

Vierstra Lab: Department of Biology
Washington University in St. Louis, USA

Full Description: A Postdoctoral Research Scientist position is available immediately to study the phytochrome family of photoreceptors at the structural level to understand how they transition between their spectrally and conformationally distinct inactive Pr and active Pfr states. These photoreceptors pervade the microbial and plant worlds and control an assortment of processes important for growth, development, reproduction, motility, pigmentation and pathology. In plants, phytochromes are the dominant photoreceptors capable of triggering a number of critical developmental transitions, including seed germination, seedling growth, chloroplast development, shade avoidance, circadian rhythm entrainment, flowering time and senescence. Thus, understanding how phytochromes signal not only has interest at a basic science level and technology development, but also with respect to crop improvement, the ecology of microbial communities, and disease prevention.

The goals of this newly-funded NIH project is to use an assortment of structure-based approaches to understand: (i) the early conformational events that occur during the milli-second transition between Pr and Pfr using both serial femtosecond crystallography with x-ray free-electron laser sources (XFEL) and temperature scanning crystallography; (ii) the structure of a phytochrome dimer in its Pr and Pfr states using an assortment of x-ray crystallography and cryo-EM approaches; (iii) how Pr and Pfr differ by structural and biochemical methods, thus helping define the conformational changes that distinguish these two states; (iv) how various isoforms of plant phytochromes exploit their physico-chemical differences to enable perception of both light and temperature; and ultimately (v) how signaling by Pfr is transmitted to downstream signaling partners, be it microbial phytochromes that work in two-component kinase cascades, or plant phytochromes that employ reversible binding to a suite of PIF transcriptional repressors that block photomorphogenesis. Importantly, all of the methodologies are in place to express spectrally-active phytochromes recombinantly and study them by cryo-EM and x-ray crystallography with standard synchrotron sources as well as by XFEL, using facilities both at Washington University and through various collaborators. Of particular import is our recent ability to generate diffraction-quality crystals of a phytochrome that retains its ability to transition between the inactive and active states while remaining locked in the crystal lattice. See recent papers by Burgie et al. (2015) PNAS; Burgie et al. (2016) Structure; Legris et al. (2016) Science; Fuller et al., (2017) Nat. Methods; Burgie et al. (2017) Sci. Rep.; and Huang et al., (2019) PNAS (in press), along with a general review on the topic by Burgie and Vierstra (2014) in Plant Cell for more background on the topic and information about experimental approaches. The project not only offers exciting science but also the ability to become proficient in modern 3D structure-based approaches.

Washington University in St. Louis is a center of excellence in all aspects of biology with a special emphasis on plant science, and includes modern facilities and instrumentation necessary for the proposed work. In addition, the Washington University Medical School, the Danforth Plant Science Center and companies such as Bayer Crop Sciences are nearby, making St. Louis an attractive place to do research with an abundance of technical expertise available. St. Louis is a diverse community which boasts an attractive living environment with numerous cultural, sporting and recreational activities close by.

Requirements: Ph.D in biochemistry, genetics, molecular biology, or related areas. Experiences with various structural techniques and a broad background with biochemistry are helpful. A competitive salary (commensurate with experience), fringe benefits including health insurance, and travel support to meetings are available. Funding is for at least 2 years with additional years possible. Washington University in St. Louis is an Equal Opportunity/Affirmative Action Employer.

Application Instructions: Email (rdvierstra@wustl.edu) or send your resume, copies of relevant publications, a cover letter detailing research experience, and a list of three scientists (preferably faculty) that can provide letters of recommendation to:

Dr. Richard D. Vierstra
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Questions about this position and our recent progress can be addressed via email (rdvierstra@wustl.edu) or by phone (608-469-6569, cell). Applications will be accepted until a suitable candidate is hired.