

**Steven R. Sawyer Memorial Research Award
Summer 2008**

Project Title: Isolation and Complete DNA Sequencing of the *Arabidopsis thaliana* S-Locus Containing the *ySRKc* Gene.

Project Mentor: Kathleen G. Dwyer, PhD; Professor of Biology

Eligible Applicants: Pre-medical, pre-dental or pre-veterinarian students in the classes of 2009 and 2010; should be active members of the Health Professions Organization

Application due: April 4, 2008

Submit to Michele Langan, Biology Department Office, Loyola 115

Research stipend: \$3,500.00

Goal: Isolation and determination of the DNA sequence of the *A. thaliana* S-locus containing the *ψSRK_C* gene

Background: *Arabidopsis lyrata* plants are self-incompatible (SI), that is, they have the ability to recognize and reject their own pollen during sexual reproduction. This promotes out-breeding, generating more genetic variability for these little weeds. Self-pollen recognition is accomplished by two genes; one encoding the SCR (*S* locus cysteine-rich) ligand protein acting as the male determinant and the other encoding the SRK (*S* locus receptor kinase) protein acting as the female determinant. If specific binding of these two proteins occurs when the pollen contacts the papillar cells of the stigma, a signal transduction process initiates that results in pollen rejection. Both genes are polymorphic, that is, they exist as dozens of variant alleles, which must be inherited as a matched pair (*S*-haplotype) closely linked on the same chromosome (a 20-50kb region designated the *S*-locus) to confer the SI trait.

Arabidopsis thaliana, a close relative of *A. lyrata*, is self-fertile. Research to date suggests that existing *A. thaliana* populations were derived over the course of evolution from three different *A. lyrata* *S*-haplotypes. The *A. thaliana* SRK pseudogenes representative of these three lineages are referred to as *ψSRK_A*, *ψSRK_B*, and *ψSRK_C*, respectively. *A. thaliana* *S*-loci containing the *ψSRK_A* or *ψSRK_B* genes have recently been isolated and sequenced. Isolation and determination of the DNA sequence of the *A. thaliana* *S*-locus containing the *ψSRK_C* gene is needed to complement these studies. The resulting data will clarify greatly the chromosomal changes occurring during the

evolution of *A. lyrata* and *A. thaliana* that resulted in the transition from self-incompatibility to self-compatibility.

Research: A genomic library (in lambda phage) has already been generated from the appropriate *A. thaliana* plants. In the proposed summer research several 100,000 clones of the library must be screened for *S*-locus sequences using the ψ *SRK_C* probe, as well as *B80* and *ARK3* gene probes demarcating the borders of the *S* locus. The lambda clones selected and purified must then be analyzed (via their areas of overlap) to determine if together they encompass the DNA sequences of the entire *S*-locus. There may be gaps in this assembly. If so, the gaps will be filled by rescreening of the lambda genomic library; this time with probes taken from areas of the newly selected clones nearest the gaps (chromosomal walking). Finally, all of the *S*-locus DNA will be mapped by restriction enzyme digestion. DNA fragments of a size suitable for DNA sequencing will be prepared by subcloning into plasmid vectors. Nucleotide sequencing will be done at Cornell University.

Schedule: This research will require the student award recipient to devote 35-40 hours/week to the project during 8-10 weeks of the summer of 2008. In addition to the experiments outlined above, the student will also be involved in the assembly, annotation and evolutionary analysis of the resulting DNA sequences.

Qualifications: Interested students should have a strong academic record, good technique in the lab, good computer skills, and possess the ability to work independently.

Student Application

Name _____

Address _____

Phone _____ email: _____

Major(s) _____ GPA _____

Other Curricular Programs in which you take part (e.g. Honors, SJLA, FSRP) _____

Expected Graduation Date _____

Biology/Chemistry/Laboratories/Honors Tutorial Courses Completed (please indicate grade received in parentheses) or In Progress _____

Brief Description of Involvement with/Contribution to the Health Professions Organization

Brief Description of Volunteer Activities

Research Experience (please briefly describe the project, the duration of your participation, and your progress to date) _____

What is your interest in participating in *this* summer research project? _____

Describe your course and/or research experience that is most relevant to this research project.

Are there any special circumstances that would make this research award particularly helpful to you? _____

Goals/Plans for the future _____

Other Comments _____
