

The Vaughn-Jordan Foundation Requests Applications for DNA Genome and RNA Transcriptome Sequencing of The Oldest Living Single Organism - The Bristlecone Pine.



Purpose and Goals: The Vaughn-Jordan Foundation whose mission is “to further botanical and horticultural science” announces a request for grant applications (RFA) to sequence the DNA genome and RNA transcriptome of the oldest specimens of the bristlecone pine (*Pinus longaeva*) known to be the oldest living individual organisms on Earth. This grant will be funded for two years at \$50,000.00 per year for a total of \$100,000.00 or for one year for a total of \$100,000.00. Priority for funding will be given to applications that stimulate innovation and advance understanding of the biochemical mechanisms of longevity through analysis of comparative genomic data with other plant or animal species. Applicants are also encouraged to consider strategies *in silico* or *in vitro* that might test whether the longevity strategies of *Pinus longaeva* might be applicable to human biology and allow strategies for the amelioration of the many human diseases associated with aging. However, the prime objective of the grant proposal should be to sequence the full genome and transcriptome of the *Pinus longaeva* and to utilize tools of comparative genomics to address what unique biological mechanism or metabolism is utilized by the tree to produce extraordinary longevity.

Background: The bristlecone pine (*Pinus longaeva*) is documented to produce the oldest living organisms known to biology. Specimens in the White Mountains of California have been documented to live well over 4,000 years and some are approaching over 5,000 years old. To give some perspective of that age, some trees in these groves were saplings when humanity just began to invent and utilize writing. Specimens of ring growth from living trees and dead trees have been used to monitor climate for the last 7000 years. While most known organisms have an aging clock that diminishes fertility with age, the oldest specimens of *Pinus longaeva* show no evidence of reduction of germination efficiency or gamete production suggesting they have decoupled fertility from a biological aging clock. Two pine genomes have been sequenced to date, the Loblolly and Sugar pine (used in pulp and lumber production respectively). The size of these pine genomes and estimates for the size of *Pinus longaeva* indicate genome sizes about 10X larger than the human genome and typically their genomes have large amounts of repetitive transposon DNA sequences. No areas outside of the White Mountains appear to have bristlecone pines of similar longevity; therefore, it is unknown if the longevity attribute of the White Mountain *Pinus longaeva* is partly due to the unique environment of these mountains or if the long-living specimens represent a subspecies trait of *Pinus longaeva*.

Most diseases causing mortality in adult Americans, such as heart disease, cancer, Alzheimer’s disease, liver and kidney failure, have a common comorbidity factor of advanced aging. Factors involved in aging are common co-requirements for these diseases. Inhibition of aging factors could be a significant common mechanism of disease prevention for most causes of adult deaths. We postulate that *Pinus longaeva* has within its genome of 36 billion nucleotides of DNA a great unconscious knowledge or unconscious “intelligence” that may uniquely repress aging clocks in plants. This grant seeks proposals to help unlock that knowledge and begin the inquiry over whether such knowledge has applications in medicine.

Grant Application: The grant application to this RFA should have the following components listed below.

1). The General Application Form: This form can be found on the Vaughn-Jordan Foundation web site and institutional signatures are required (two pages).

2). Aims Page: A one page summary of Specific Aims, Innovation, and Experimental Approach.

3). Proposal Body: A project description of no more than five pages (excluding references) in three subsections.

a) Background: Include a brief background introducing how the Principle Investigator (PI) views the problem and how his/her background and facilities are well suited to address the research.

b) Innovation: (similar to NIH grant guidelines) Explain how this research may shift current paradigms; describe any novel concepts or methodologies; describe refinements, improvements or new applications of theoretical concepts, methodologies or inventions.

c) Experimental Approach: (similar to NIH grant guidelines) Include any preliminary studies (though specific preliminary *Pinus longaeva* data is not required for this grant). Describe overall strategy, methodology and analyses to be used to accomplish described Specific Aims; discuss potential problems, alternative strategies and benchmarks for success anticipated to complete the project. The PI should include a plan to obtain DNA/RNA samples from the oldest trees in the White Mountains without significant impact on the trees.

d) References: Add all references to the end of the Proposal Body as they are not part of the 5 page limit of the section. They are in addition to the 5 page limit.

4). Facilities: The PI should include a one page summary of available space and instrumentation needed to complete this work.

5). Budget: Provide a basic budget for the project. Include materials and research supplies and personnel efforts.

6). Biographical Information: Provide a Biosketch of the Principle Investigator and key personnel; NIH guidelines may be used or curriculum vitae.

Funding and Submission Date: The Vaughn-Jordan Foundation will fund this project for up to \$100,000.00 paid out as \$50,000.00 per year for two years or alternatively \$100,000.00 paid over one year as \$50,000.00 per six months. In each case a progress report will be required for the final payment. The Foundation does not pay for indirect costs. The first due date for this RFA grant application will be February 5th, 2021.

Eligibility and Review Process: See the Vaughn-Jordan Foundation web site for eligibility. Succinctly all institutions that have 501(c)(3) status can apply. Grants will be reviewed and judged for funding based on the likelihood that the RFA goal can be achieved. Grants are reviewed on a semiannual basis at the Fall or Spring Vaughn-Jordan Foundation trustee meeting. Contact Director Katherine Hetzel through the Vaughn-Jordan Foundation web site for specific dates or any questions regarding this RFA.