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January 7, 2000

Attention: All Prospective Proposers

Subject: Request for Proposal (RFP) No. JPL-TPF-2000 for the Terrestrial Planet Finder (TPF) Pre-Formulation Phase Architecture Study

Enclosed is the subject RFP for the Terrestrial Planet Finder (TPF) Pre-Formulation Phase Architecture Study. The Jet Propulsion Laboratory (JPL) cordially invites your organization to submit a proposal in conformance with the instructions contained herein.

TPF is under study by JPL as a major component of the NASA Origins program. The Origins program encompasses missions over the next two decades to explore the history of the Universe from the formation of galaxies through the formation of stars and planets and the eventual development of life on our own planet and those around other stars. The Space Infrared Telescope Facility (SIRTF) will observe brown dwarfs, planetary debris disks, and provide infrared images of forming galaxies in the early Universe. Through high-precision astrometry, the Space Interferometry Mission (SIM) will observe the dynamics of stellar systems and individual stars to gain insight into their evolution and determine whether nearby stars are home to planets as small as Earth. The Next Generation Space Telescope (NGST), with its unprecedented sensitivity and resolution, will observe the evolution of galaxies and planetary systems, as well as search for dark matter. TPF will study planets beyond our own Solar System in a variety of ways, from their formation and evolution in the disks of newly forming stars to the properties of planets orbiting the nearest stars; from their number, sizes, and locations to their suitability as abodes for life. The science objectives of TPF include:

- a) TPF will have the sensitivity of a space-borne telescope and the high spatial resolution necessary for the detection and characterization of planetary systems. TPF will be able to distinguish planets from their parent stars by suppressing the starlight by a factor of more than 10^5 and thereby reveal planetary systems as far away as 15 parsecs. In addition to determining the size, temperature, and orbital location of planets as small as the Earth in the habitable zones of distant planetary systems, TPF's spectroscopic capabilities will allow atmospheric chemists and biologists to assess from the relative proportions of gases like carbon dioxide, water, ozone, and methane whether a planet someday could, or even presently does, support life.
- b) TPF will advance our understanding of planet formation by resolving disk structures and planetary systems on the scale of a few tenths of an astronomical unit (AU), allowing us to investigate how gaseous and rocky planets form out of accreting disk material. Current observations show that the disks of forming stars are tens to hundreds of AU across, but almost nothing is known about the inner regions of forming planetary systems where planets are thought to be born. By studying the emission from dust, ices of water and carbon dioxide, and gasses such as carbon monoxide and molecular hydrogen, TPF will investigate whether, as

theory predicts, rocky planets form in warmer regions and gaseous planets in colder regions of a nascent planetary system.

- c) Additionally, TPF will investigate many other astrophysical sources where observations of milliarcsecond structures are critical to understanding the essential physical processes. TPF will offer dramatic gains in spatial resolution and sensitivity compared with other facilities on Earth or in space. At wavelengths longer than 3 μm , TPF will provide a thousand-fold improvement in sensitivity relative to ground-based telescopes by observing above the atmosphere and controlling thermal emission from its optical systems. Combining the sensitivity of the NGST with the capability of milliarcsecond imaging will enable unprecedented studies. The combination of high spatial and spectral resolution (up to 10^5 in selected lines) will probe the dynamics and structures of planet forming disks. The wavelength coverage and spectral imaging capability of TPF will probe gas and dust over a broad range of temperatures and density in a wide variety of galactic and extra-galactic objects. Detailed investigations will be possible of the winds from dying stars that enrich the interstellar medium with heavy elements, and the cores of active galaxies from our own Milky Way to ultra-luminous objects at high redshift.

This RFP is for an 18-month effort to include architectural concept exploration, identification of a technology development plan, and estimation of TPF life cycle cost. It is planned to award up to three (3) study contracts valued at \$1,800,000 each. The contracts will be awarded via the JPL competitive source evaluation and source selection process. Potential offerors are strongly encouraged to form teams including academic and industrial partners.

The goal of this effort is to comprehensively explore innovative TPF architectural concepts and to study their feasibility from a systems engineering approach. This is required to establish a viable technical and programmatic implementation plan for TPF. A broad set of architectures will be explored during the early part of this contract and then a select subset will be studied in further detail during the remaining duration of the contract. We wish to make it abundantly clear that these studies are not to be constrained by previous concept studies of TPF.

It is anticipated that this contract will be followed by an additional pre-Formulation phase effort that will be comprised of two competitively awarded contracts for a duration of two years starting in 2002. TPF is expected to enter Formulation phase in ~2004 with the Implementation phase in 2007/2008 and an expected launch in 2010/2011. The prime contractor for TPF will be selected competitively in ~2005.

As a courtesy to JPL, you are requested to provide to the undersigned, no later than January 14, 2000, a written statement indicating whether or not your organization intends to submit a proposal. Should the choice be not to propose, please include a brief statement addressing the reasons for your decision not to propose.

All questions and correspondence related to this procurement shall be directed only to the undersigned.

Cordially,

Jeff Cornish
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Note: Attachment 1 included

Attachment 1 to RFP Cover Letter

(Refer to paragraph 4.3., Address and Identification., of the General Instructions for use of this label.)

TO: JET PROPULSION LABORATORY 4800 OAK GROVE DRIVE PASADENA CA 91109
Attn: Jeff Cornish Bldg. 201 Rm. 201C JPL RFP No. JPL-TPF-2000

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Note: The yellow label on the top is preferred. In the absence of a color printer, please use the plain upper label and highlight in yellow.