Session 3

SEARCH FOR PRIMITIVE LIFE

Two next-generation-technology concepts for orbital telescopes capable of spectroscopic analyses of the atmospheres of planets circling nearby stars were presented. These systems could be used to search for presumptive evidence of primitive life in the form of some non-equilibrium trace gas chemistry that can only be explained by a biological source. Since detecting and directly imaging the planets is a formidable task in itself, it should not be surprising that the more difficult task of assay chemistry requires instrumentation that strains credibility with respect to required positional alignments and absolute surface and figure accuracies over hundreds of hours of on-orbit observation. B. Burke *proposed a multielement interferometer working at optical wavelengths to study extrasolar planetary ozone and oxygen. The system would have an effective collecting area of 10 square meters with apodization of each of the individual elements, whose surface accuracies would require new optical mirror techniques. Three hundred hours of integration time would be required to detect a terrestrial planet at a distance of 10 parsecs and another factor of 10 more hours to detect the oxygen and ozone bands (assuming terrestrial models). Since the most difficult technical spec is the precise measurement and maintenance of all the baselines, this instrument may be more suitable for the Lunar farside, rather than low Earth orbit.* R. Angel *presented a concept for an orbiting monolithic mirror system that works at infrared wavelengths where the planet/star contrast ratio may be more favorable. This system must have a diameter sufficiently large so that the diffraction limit can resolve the planet from the star. It too requires apodization of the primary, but in addition it must be actively cooled. It would be constructed and polished on-orbit, but could suffer rapid degradation if the orbit is too low and filled with debris. Detection of terrestrial planets with this system should be possible, to a distance of 4 parsecs, in less than 1 hour of integration, but any chemical analysis will take much longer.*

Studies need to commence immediately if either or both of these advanced technologies is to be ready in the coming decades. At that time current generation instruments will hopefully have detected larger planets around nearby stars and have pinpointed planetary systems within which terrestrial planets are likely.

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