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PESEK LECTURE:
PROMISING NEW APPROACHES IN THE
SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE

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New insights into the possible nature of extraterrestrial intelligent transmissions, coupled to increased financial support for such research and new, powerful, and affordable instrumental capabilities, have encouraged several new approaches to SETI.

Perhaps most dramatic has been the recognition that detectable optical and infrared signals, long shunned as implausible, are plausible after all. This is the consequence of the development of high power pulsed lasers which, in the right circumstances, can produce signals detectable easily with rather inexpensive equipment. This has led to the rapid development of several optical SETI programs that exploit nanosecond response photodetectors and the statistics of photon arrivals to achieve truly remarkable sensitivities for optical signals of short time duration. The usually vexed choice of specific electromagnetic frequencies to observe is not a problem in these systems. They are inexpensive, and extremely robust, being immune to the problems from, for example, defects in the optics of the telescopes used, partial obscuration due to clouds, and telescope pointing errors. They can utilize crude "light buckets" such as are built to observe cosmic ray Cerenkov radiation. They can be used in a shared mode with conventional astronomical observations.

In the radio domain, the most powerful advance has been the availability and funds to build a dedicated telescope for use in SETI, the Allan Array Telescope. This telescope, scheduled to go into operation in 2005, will use a new approach to building large collecting areas, the computer-based interconnection of a large number of small antennas of the order of 6-meters in diameter to achieve a collecting area of one hectare. Not only will this be a very inexpensive telescope of great sensitivity, but also it will allow the formation of a large number of telescope beams simultaneously, greatly speeding up the speed of SETI searches.

On a longer time scale, a goal of SETI designers, and a project now being explored, is the construction of radio telescopes which can observe all of the visible sky on a large range of radio frequencies at all times. This, of course, would enable a search of all visible stars at all radio frequencies, but in addition would provide a capability to detect transient intelligent signals. Such transient signals are quite plausible for a variety of reasons, but present search methods are not really effective for searches for such signals.