

COURTING SERENDIPITY: THE SEARCH FOR
TRANSIENT RADIO SIGNALS

A Thesis

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by

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ABSTRACT

The transient radio sky remains a frontier of observational astronomy, not for lack of scientific promise, but for practical obstacles: terrestrial radio frequency interference (RFI) and limited computing power. Today, a confluence of new RFI mitigation techniques and computing power makes a thorough census of the radio sky a realistic goal. A complete transient survey could uncover, in addition to entirely new classes of sources, radio sources that have been predicted but never observed. These sources include pulses from primordial black hole explosions and prompt emission associated with gamma ray bursts. A search could also reveal extreme-period pulsars or giant-pulsing extragalactic pulsars. Here we present three transient-seeking algorithms suitable for processing large data sets. General statistics regarding the algorithms' performance on simulated data are presented, as well their performance on data from the Crab Pulsar and the galaxy UGC 2339.

We also present results of a search for cyclotron maser emission from extrasolar planets. Extrasolar planets are likely emitters of non-thermal radio emission analogous to the bursting radio emission observed from all five of our solar system's magnetized planets. Four planetary systems were observed at the Arecibo Observatory. In 15 hours of 327 MHz observations made over the course of nine days in July, 2004, no detections were made.

BIOGRAPHICAL SKETCH

Kate Becker was born in Highland Park, Michigan on May 18, 1979. She grew up in Huntington Woods, Michigan and attended Burton Elementary School, Norup Middle School, and Berkley High School before going on to study physics at Oberlin College in Oberlin, Ohio. Before coming to Cornell, she spent a year as an Americorps*VISTA.

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