Doug George

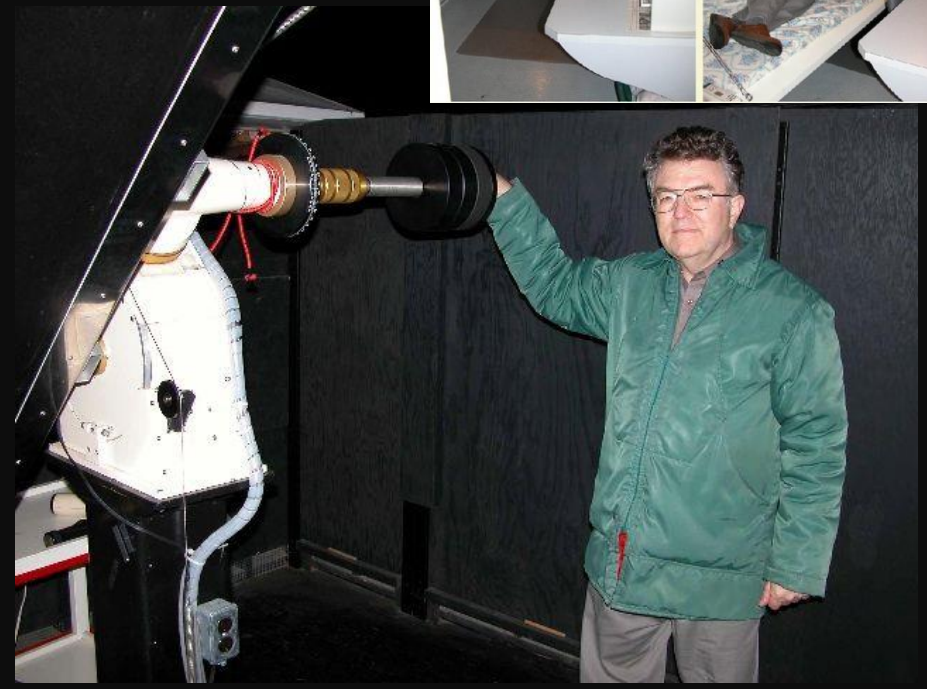
Paul Boltwood:
An Astronomer Like No Other

Paul Boltwood 1943-2017

- Good friend to many long-time members
- Smart, determined, and the ultimate perfectionist
- Excelled in building things:
  - Observatory
  - Telescope
  - CCD Camera
  - Software
- Put all the above to very good use!

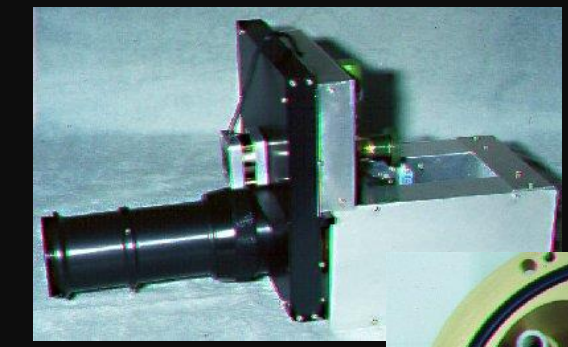
Observatory

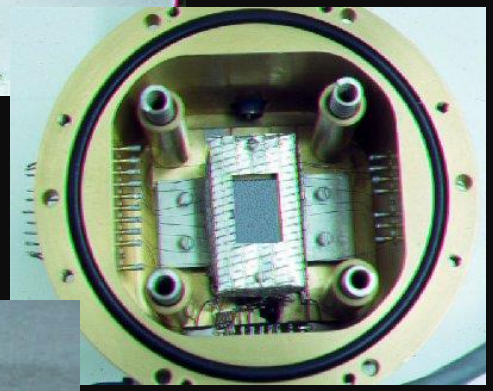
- Project started 1989, completed 1992 – including all equipment
- Extremely well thought-out design
- Attention to small details:
  - Ventilation through the walls
  - Tarp attaches to roof and rolls off
  - Integrated warm room with cot
- 7” Starfire Refractor
- Later he built a 16” Netwonian

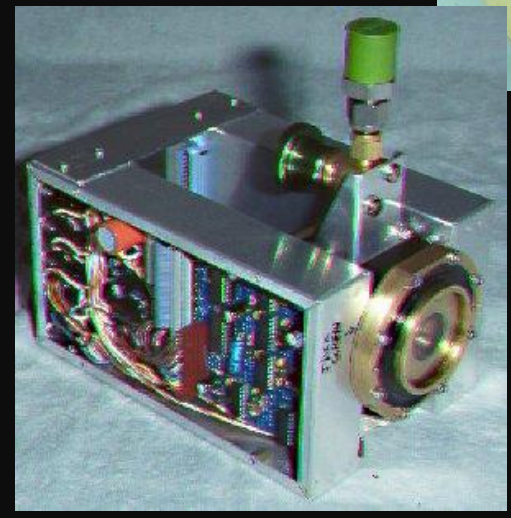


CCD Camera

- Pioneer in CCD imaging
- Incredibly ambitious for the day
  - Thomson TH7883 chip
  - Vacuum chamber
  - TEC cooling nearly 100C
  - Operated at -72C year-round
  - Filter wheel, shutter wheel, focuser
  - Optical interfaces
- Later switched to Apogee AP7



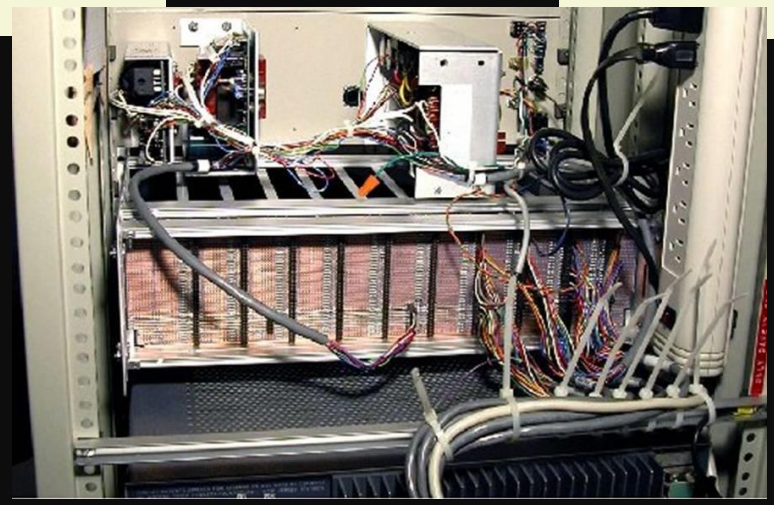




Electronics

- power and switch panel
- rack of microprocessor boards
- flat fielder power supply
- modular
- use Microchip PIC microcontrollers, one per function
- complex stepping motor control firmware in 4 of them
- all time critical functions are done in the microcontrollers
- almost electronics all are in equipment room to ease repairs and reduce thermal wear & tear

- control of telescope fans & heaters, button box sound, temp. readouts
- RA & DEC stepping motor drives, button box
- filter wheel & focuser motor drives
- serial backplane controller with parallel port interface to PC

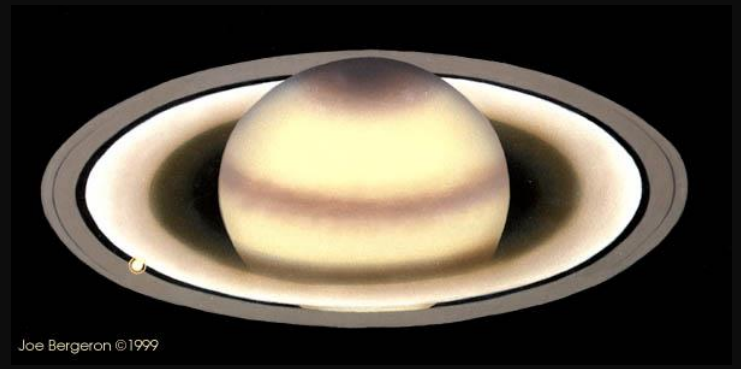


Software

- Paul built his own acquisition and data reduction software
- Incredibly powerful, able to handle large amounts of data
- Implemented a package to read/write FITS file format standard
- That software later became an important part of MaxIm DL

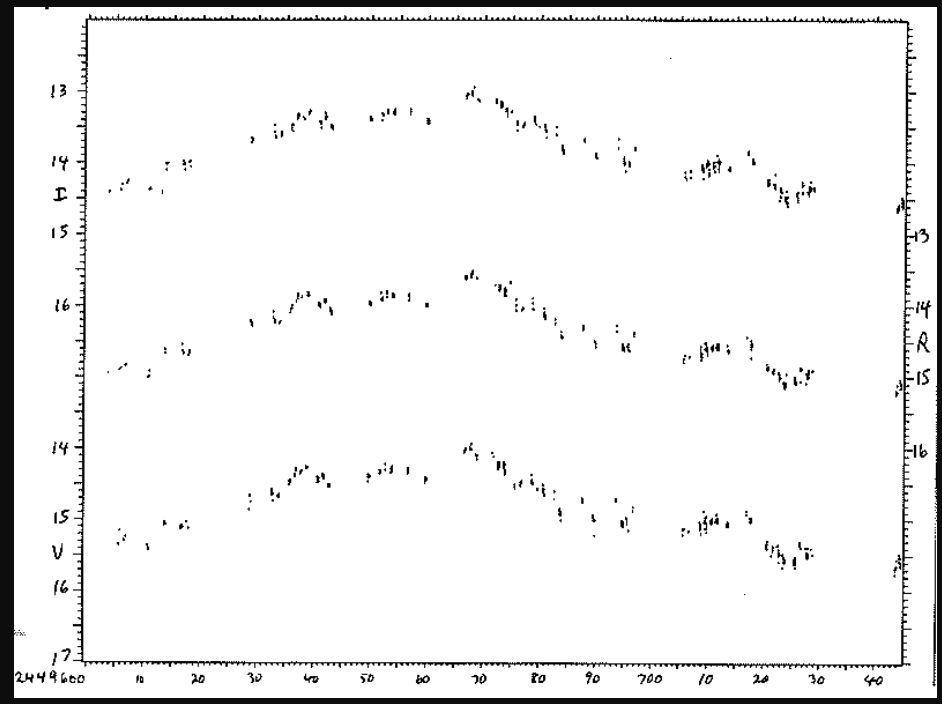
Observations

- July 3, 1989 Paul and Rob Dick videotaped 28 SGR being occulted by Saturn's rings
- Paul wrote custom software to reduce observations
- Spectacular results
- Unfortunately he could not interest professional astronomers in his data



Blazars and Seyfert Galaxies

- Paul was eventually able to join professional collaborations
- Paul did extensive data collection on OJ 287 and 3C 66A
- Of > 100,000 images, about 60,000 were photometric observations
- He did his own data reduction for blazars



OJ 287

- OJ 94 collaboration with 40 professional astronomers
- He produced more observations than the rest of the team
- Featured in a book: Cosmological Enigmas: Pulsars, Quasars, and Other Deep-Space Questions by Mark Kidger

observe OJ287 in great detail around the time of its next outburst. Over the next few months, additional team members were recruited in different countries. The most important of these new team members was an amateur astronomer from Ottawa, Canada. Over the next three years Paul Boltwood demonstrated a phenomenal level of professionalism and dedication. He had bought a 12.5-centimeter refractor, put it in a dome in his backyard, and had built and mounted his own CCD camera on it.[20] Despite living in a suburb of Ottawa and being surrounded by street lights, he obtained huge amounts of high-quality data with this setup, automating his telescope and the reduction of the observations.[21] Throughout the project, the words "Boltwood Observatory" became synonymous with reliability.

History records that the first observation of the campaign was taken by Paul Boltwood on September 20, 1993; more than 3,000 observations were to be taken just in the V filter (and more than 8,000 in total in all the visible filters) by the time the project ended in spring 1995. As the project advanced, many observatories pooled their data, with the result that over the course of the project observations were carried out in a total of 25 different filters or ranges of frequency from the radio to gamma rays.

On September 8 the amazing Paul Boltwood recovered OJ287 low in the dawn sky in Canada—far too low for any professional telescope to observe. There was some consternation when we realized that it was much fainter than it had been in June. Over the next three weeks it brightened constantly and, by the end of September, it was obvious that something interesting was happening. Through October, OJ287 continued to brighten until, lo and behold, on November 11, 2004, it broke fractionally through magnitude 14 for a few hours before fading rapidly again. What was more, the maximum was the faintest that had ever been seen, with the possible exception of 1924 when the data were very poor.

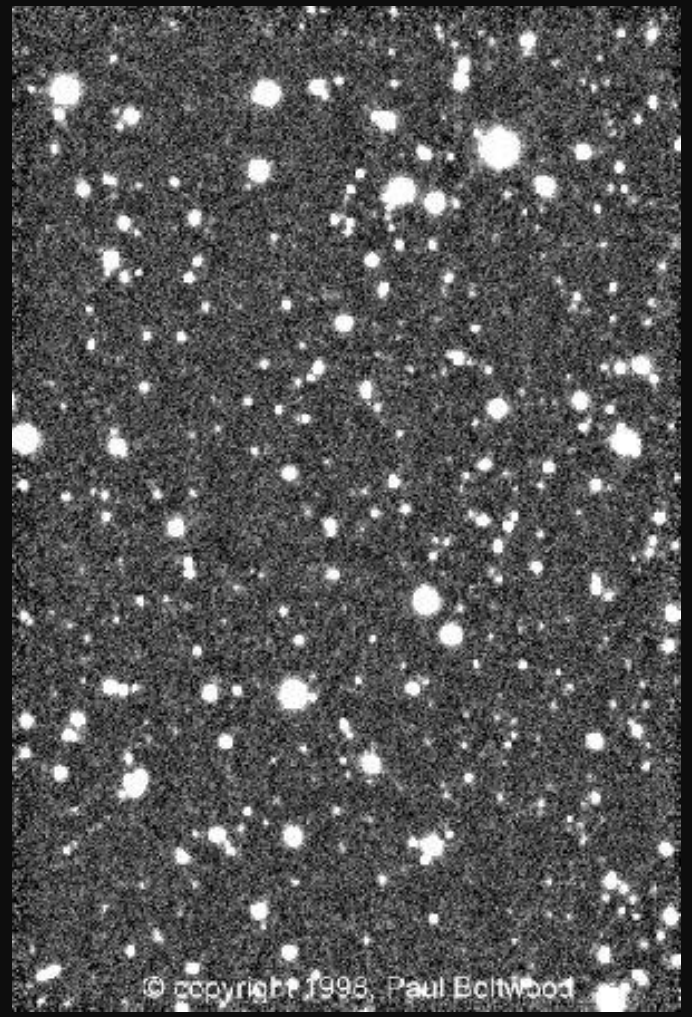
It seemed that the predictions of the binary black hole model had been amply confirmed. If the second outburst happened late in 2005, we would be overjoyed.

Comet Hyakutake

- Paul’s work was featured in the 1997 video Comet Odyssey
- Comet Odyssey was produced by Peter Ceravolo, Jon Buchanan, and myself

Sky & Telescope Deep Field Challenge

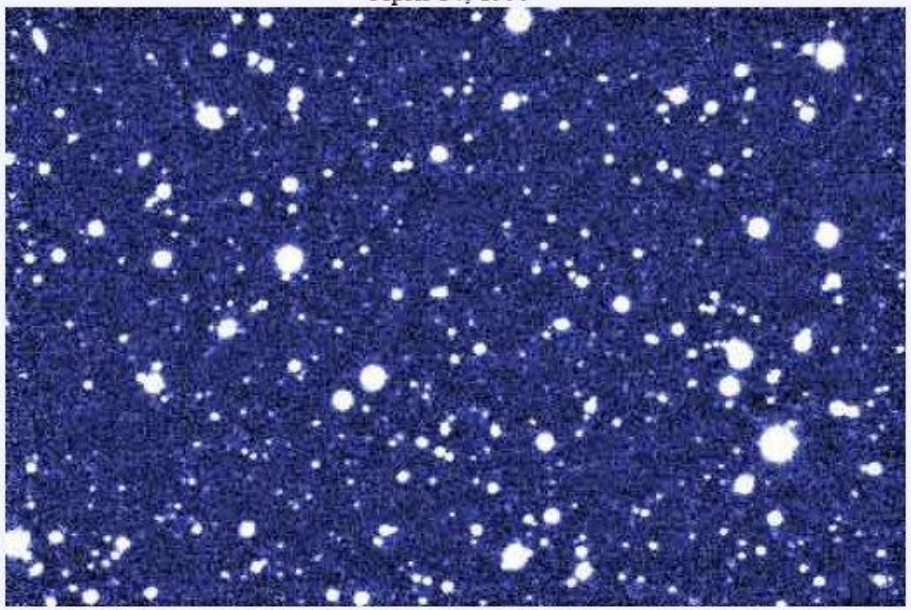
- 1999 challenge to take the deepest amateur image ever
- Imaged from suburbia!
- Total exposure time: 20 hours
- Magnitude 24.1
  (later – better processing 24.5)
- About an hour on Keck…



Astronomy Picture of the Day

Discover the cosmos! Each day a different image or photograph of our fascinating universe is featured, along with a brief explanation written by a professional astronomer.

April 14, 1999



The Backyard Universe
Credit & Copyright: Paul Boltwood

Explanation: How far can you see from your own backyard? Across the Solar System, even across our Galaxy, these sights are not difficult. Recently, however, amateur Paul Boltwood gazed across the universe. His record setting image is shown above in false color. Boltwood imaged sources more faint than magnitude 24 in response to a challenge made to amateur astronomers by Yale Astronomy Professor Bradley Schaefer. Objects this dim tend to be galaxies billions of light years away. Although professionals have recently recovered objects as dim as magnitude 30, Boltwood's image rivals even the best professional efforts of only a few decades ago. Since then, photon-catching Charge Coupled Devices (CCDs) have allowed high efficiency frames to be added together. As evidence, Boltwood used only a 16-inch telescope, but co-added 767 exposures each lasting only two minutes.

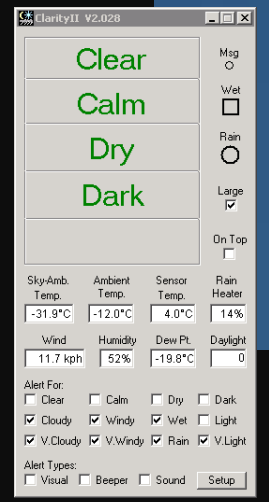
Tomorrow's picture: Moonship

≤ Archive | Index | Search | Calendar | Glossary | Education | About APOD ≥

Authors & editors: Robert Nemiroff (MTU) & Jerry Bonnell (USRA)
NASA Technical Rep.: Jay Norris.
A service of: LHEA at NASA/ GSFC
& Michigan Tech. U.

Commercial Astronomical Ventures

- MaxIm DL FITS package
- Boltwood Cloud Sensor
  - IR cloud detection
  - Rain detector counts individual drops
  - Weather sensors for wind, humidity, temperature
  - Daylight detection
  - Automatic observatory shutdown
  - Automatic observatory startup!
  - Used worldwide, including Mauna Kea



Awards and Recognition

- 1991 RASC Ottawa Observer of the Year
- 1994 RASC Ottawa Observer of the Year
- 1995 RASC Chant Medal
- 2000 ASP Amateur Achievement Award
- 2003 RASC Ken Chilton Prize
- Asteroid 8785 Boltwood