Molecules in Cas A

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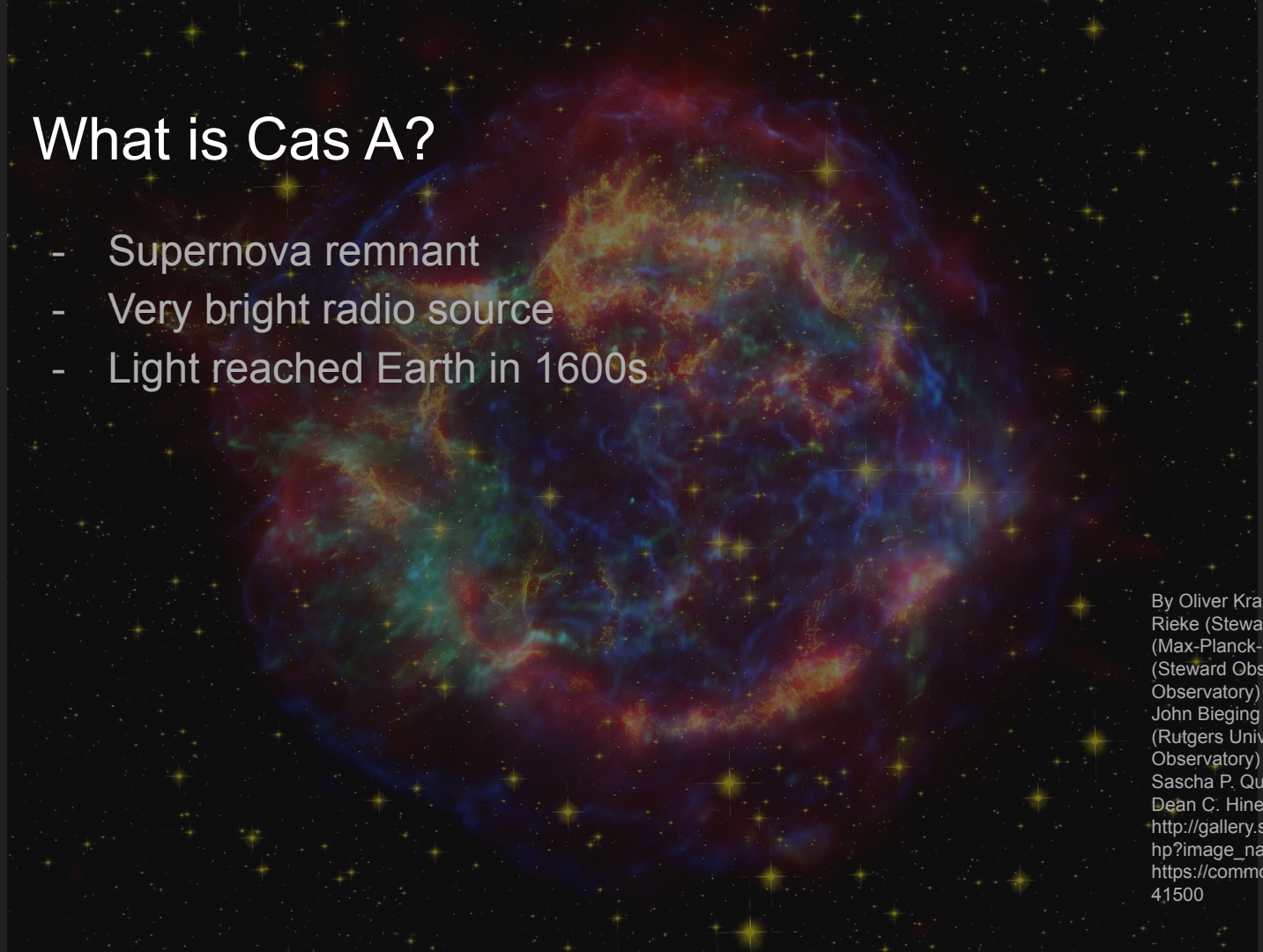
What is Cas A?

- Supernova remnant
- Very bright radio source
- Light reached Earth in 1600s



By Oliver Krause (Steward Observatory) George H. Rieke (Steward Observatory) Stephan M. Birkmann (Max-Planck-Institut für Astronomie) Emeric Le Floc'h (Steward Observatory) Karl D. Gordon (Steward Observatory) Eiichi Egami (Steward Observatory) John Bieging (Steward Observatory) John P. Hughes (Rutgers University) Erick Young (Steward Observatory) Joannah L. Hinz (Steward Observatory) Sascha P. Quanz (Max-Planck-Institut für Astronomie) Dean C. Hines (Space Science Institute) - http://gallery.spitzer.caltech.edu/Imagegallery/image.php?image_name=ssc2005-14c, Public Domain, https://commons.wikimedia.org/w/index.php?curid=4341500

What did we *plan* to do?

- Look for molecules in Cas A using radio telescopes
- Take narrowband + LRGB image on the 32 inch for plotting where we observed for this

How did it *actually* turn out?

- 12 meter: Small amount of noisy data, just before they shut down for maintenance for the summer
  - To be discussed next slide
- SMT: broken motor drive resulted in lack of data, which was supposed to be the core of the project
  - We are considering writing a proposal with Dr. Scibelli to gather data
- 32 inch: clouds prevented the gathering of data
  - However, there is LRGB archival data, but we are still working to track it down
  - Due to the lack of people involved in positions to track data down, this could be months as of 6/29/24

Literature Review / Why we pointed where we did

- https://arxiv.org/abs/1808.03058 (“Molecular gas toward supernova remnant Cassiopeia A”)
  - This paper gave a position for the western radio peak, which we observed with the 12 meter
- Other papers reviewed:
  - https://arxiv.org/abs/1704.00002 (“The fading of Cassiopeia A, and improved models for the absolute spectrum of primary radio calibration sources”)
  - https://arxiv.org/abs/1411.4308 (“Interaction between Cassiopeia A and Nearby Molecular Clouds”); image on slide from paper

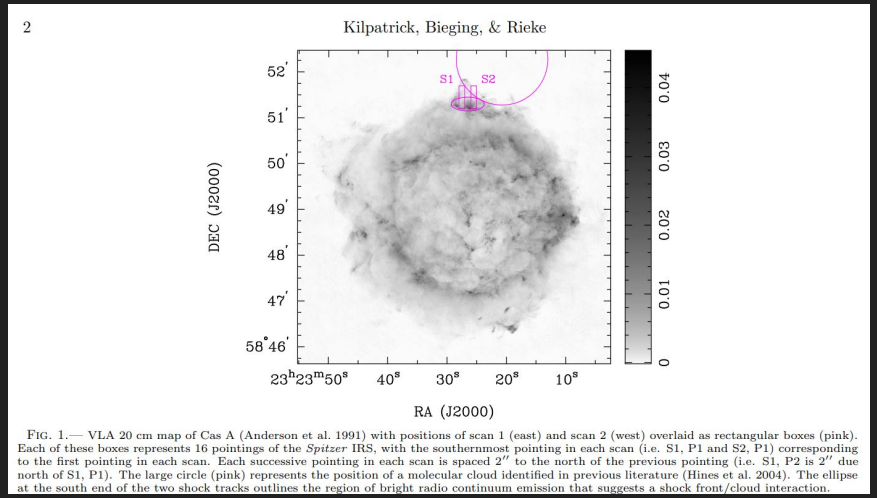


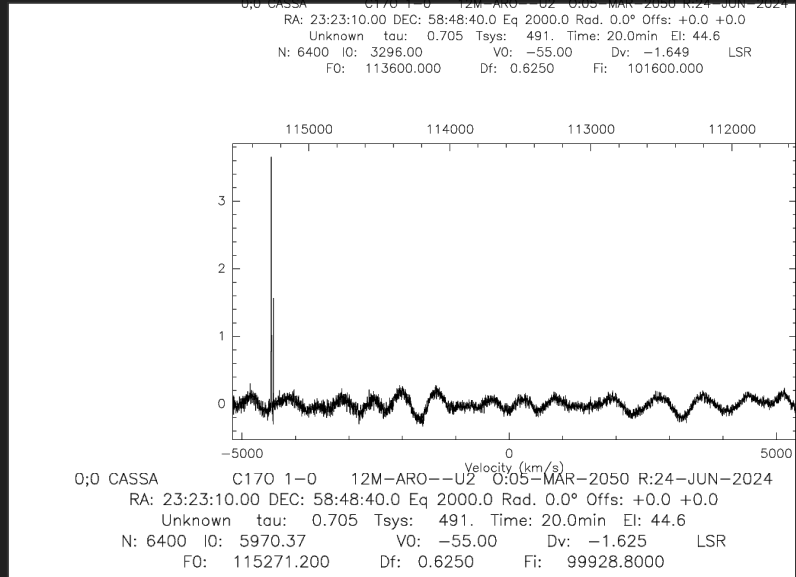
FIG. 1.— VLA 20 cm map of Cas A (Anderson et al. 1991) with positions of scan 1 (east) and scan 2 (west) overlaid as rectangular boxes (pink). Each of these boxes represents 16 pointings of the *Spitzer* IRS, with the southernmost pointing in each scan (i.e. S1, P1 and S2, P1) corresponding to the first pointing in each scan. Each successive pointing in each scan is spaced 2″ to the north of the previous pointing (i.e. S1, P2 is 2″ due north of S1, P1). The large circle (pink) represents the position of a molecular cloud identified in previous literature (Hines et al. 2004). The ellipse at the south end of the two shock tracks outlines the region of bright radio continuum emission that suggests a shock front/cloud interaction.

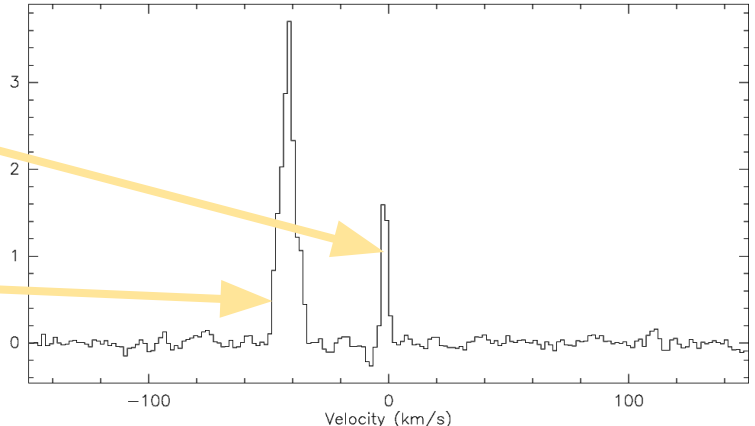
Our 12 meter data: Part 1

- Credits to Dr. Scibelli and Hanga Andras-Letanovszky for helping in the data processing
- Despite the minimal observation time (20-30 minutes), carbon monoxide was detected
- Archival Data was also located

The line from Cas A

Molecular cloud in between the remnant and Earth





Our 12 Meter Data: Part 2