
Early Ballooning
Cool Heat from the Galactic Center
Giovanni Fazio
Symposium
May 27-28, 2009
William Hoffmann

Key Participants

Robert Jastrow,
Founding Director NASA Goddard Institute for Space Studies

Hong Yee Chiu Scientific Staff, GISS
Nick Woolf " " "

Frank Low
Inventor of Liquid Helium Cooled Germanium Bolometer

Carl Frederick Graduate Student, Yeshiva University

Bill Hoffmann A little of everything

A Story of

The Mystery of the Holes in the Milky Way

and the New Technologies of

Scientific Ballooning

and

The liquid Helium Cooled Bolometer

When Jupiter summoned the Gods … "they obeyed the call, and took the road to the palace of heaven. The road, which anyone may see in a clear night, stretches across the face of the sky, and is called the Milky Way. Along the road stand the palaces of the illustrious gods; the common people of the skys live apart on either side"

Bulfinch's "Mythology" from Bok and Bok, "The Milky Way", 1941

Galileo Galilei
1564-1642

Galileo's first telescope observations showed the white haze of the Milky Way to be resolved into a myriad of stars

The holes in the Milky Way could be explained as blank areas between clumps of stars

Demise of the “holes” in the Milky Way 1920’s

“in view of recent conceptions of the vast distances of the Milky Way stars, it became impossible to account for the dark spots [as holes]. It is unthinkable that in a system containing billions of moving stars, a clear hole can extend for more than one hundred thousand light years.”

Solon I Bailey, Harvard Observatory Radio Talks, 1926

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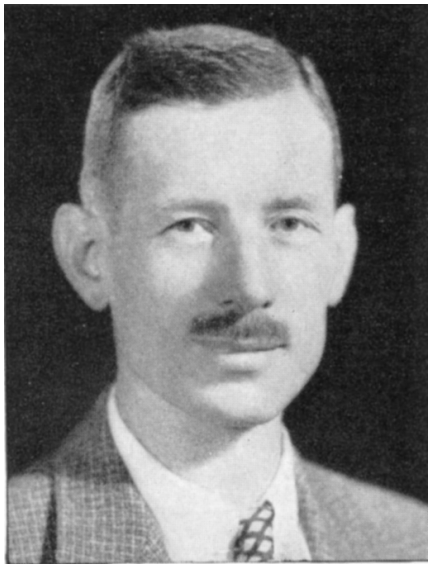
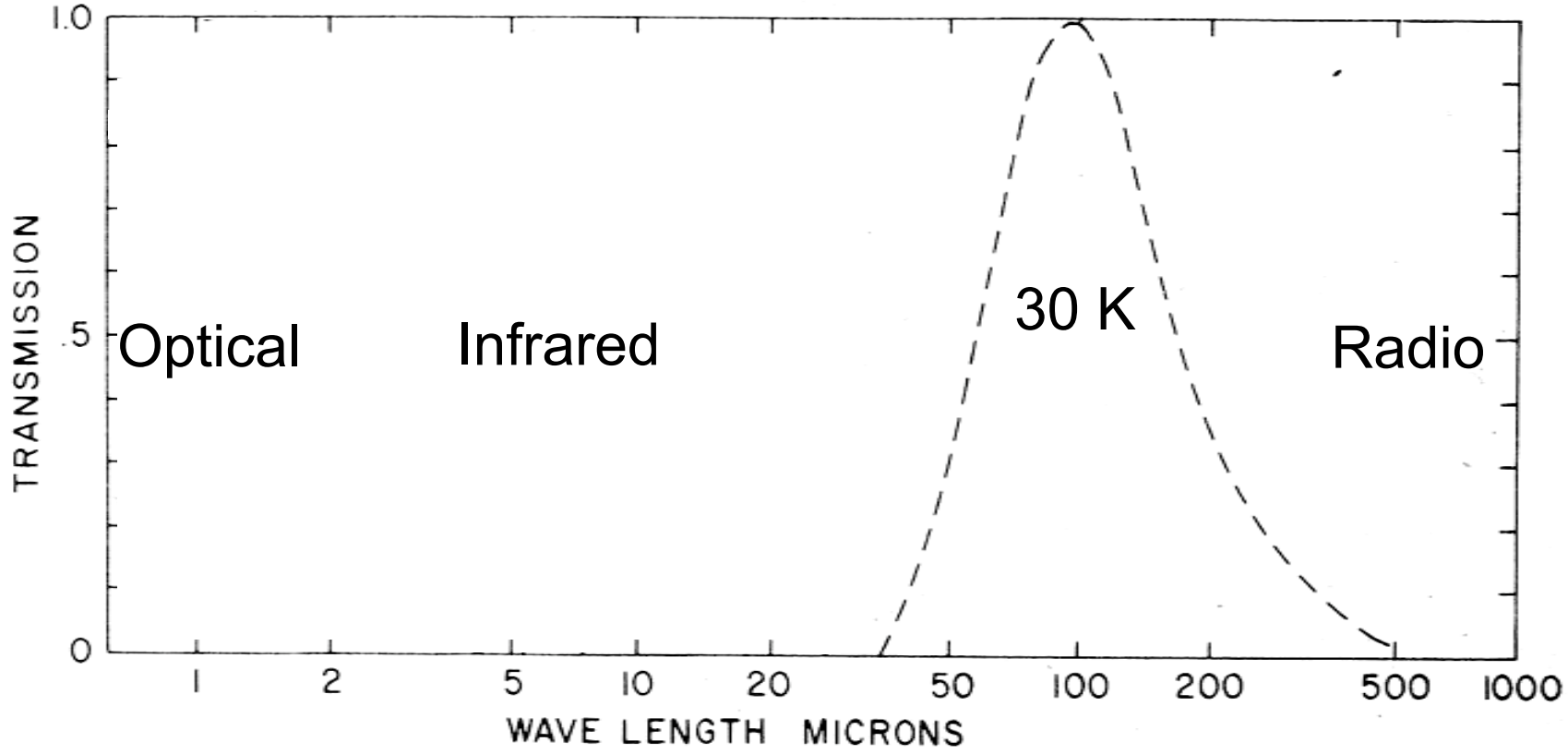
The new explanation: Absorbing dust

Robert Trumpler, Lick Obs Bulletin 1930

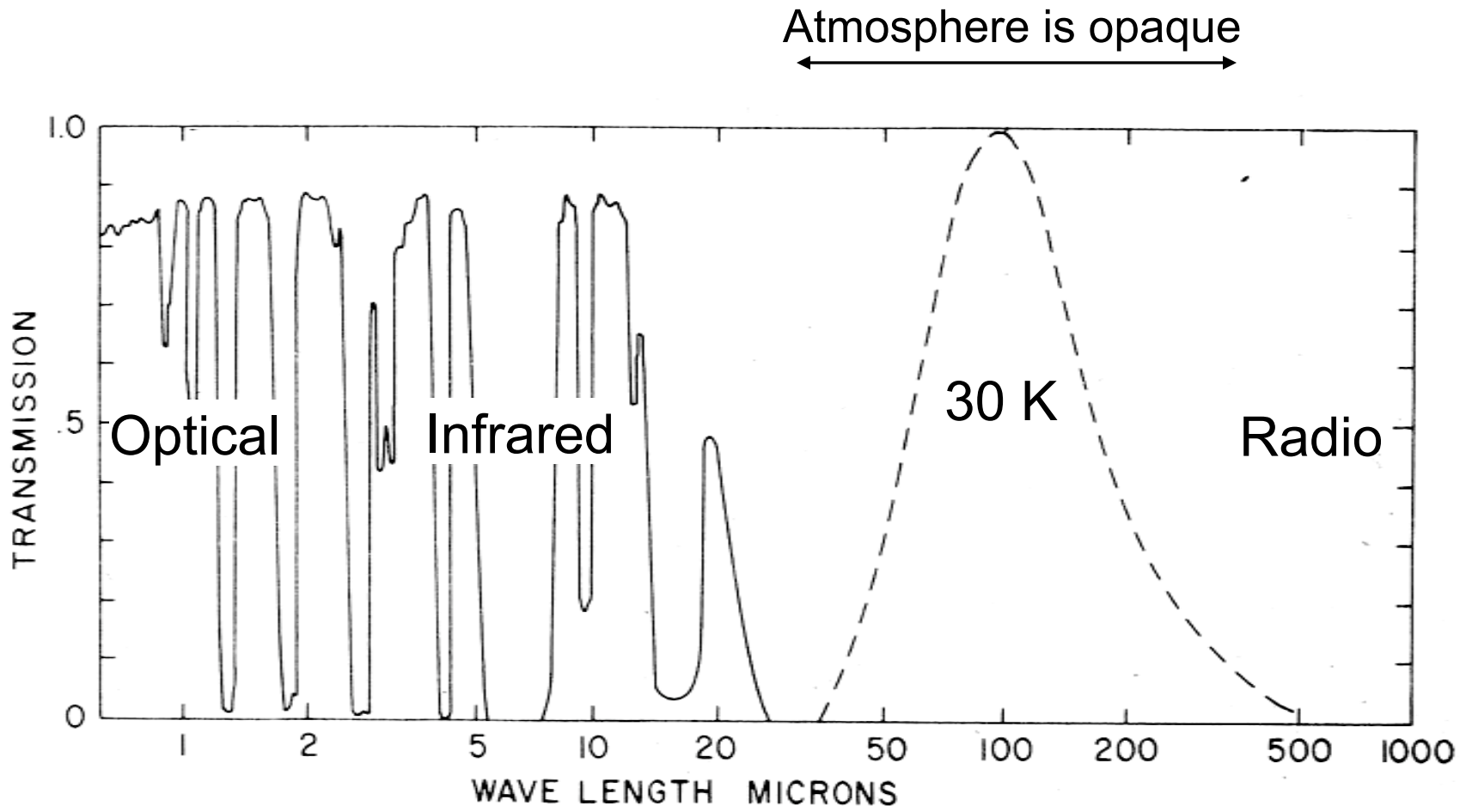
The best explanation for the discrepancy between distances determined by cluster size and by spectrum/magnitude was absorption of starlight from distant clusters



Robert J. Trumpler

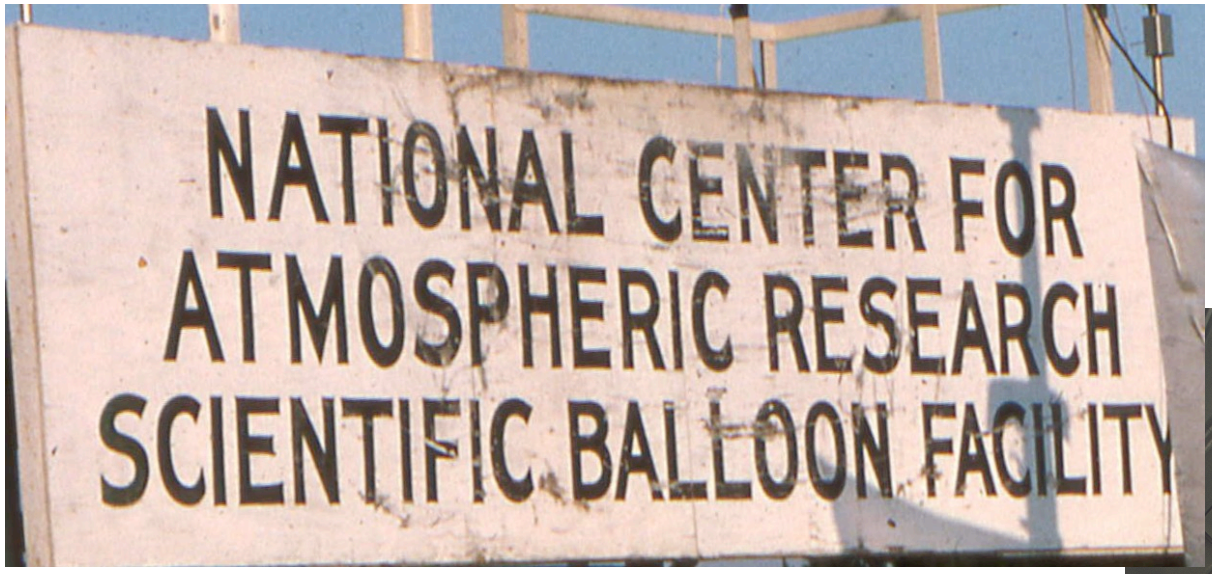


Possible temperature and spectrum of the dust



Possible temperature and spectrum of the dust

Palestine, Texas

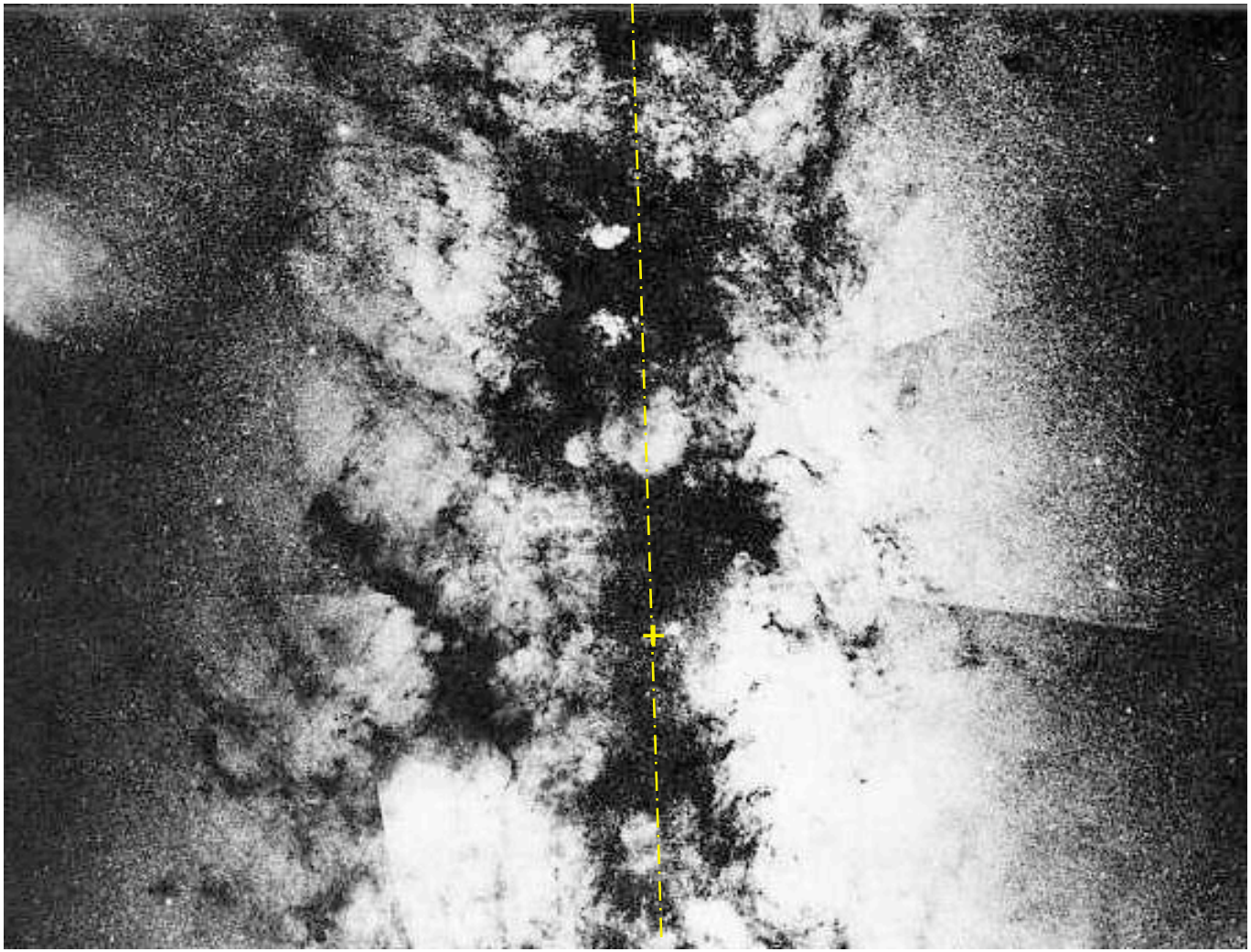


Palestine, Texas

Frank Low observing at the 28-inch telescope on Mt Bigelow with his cryogenic bolometer

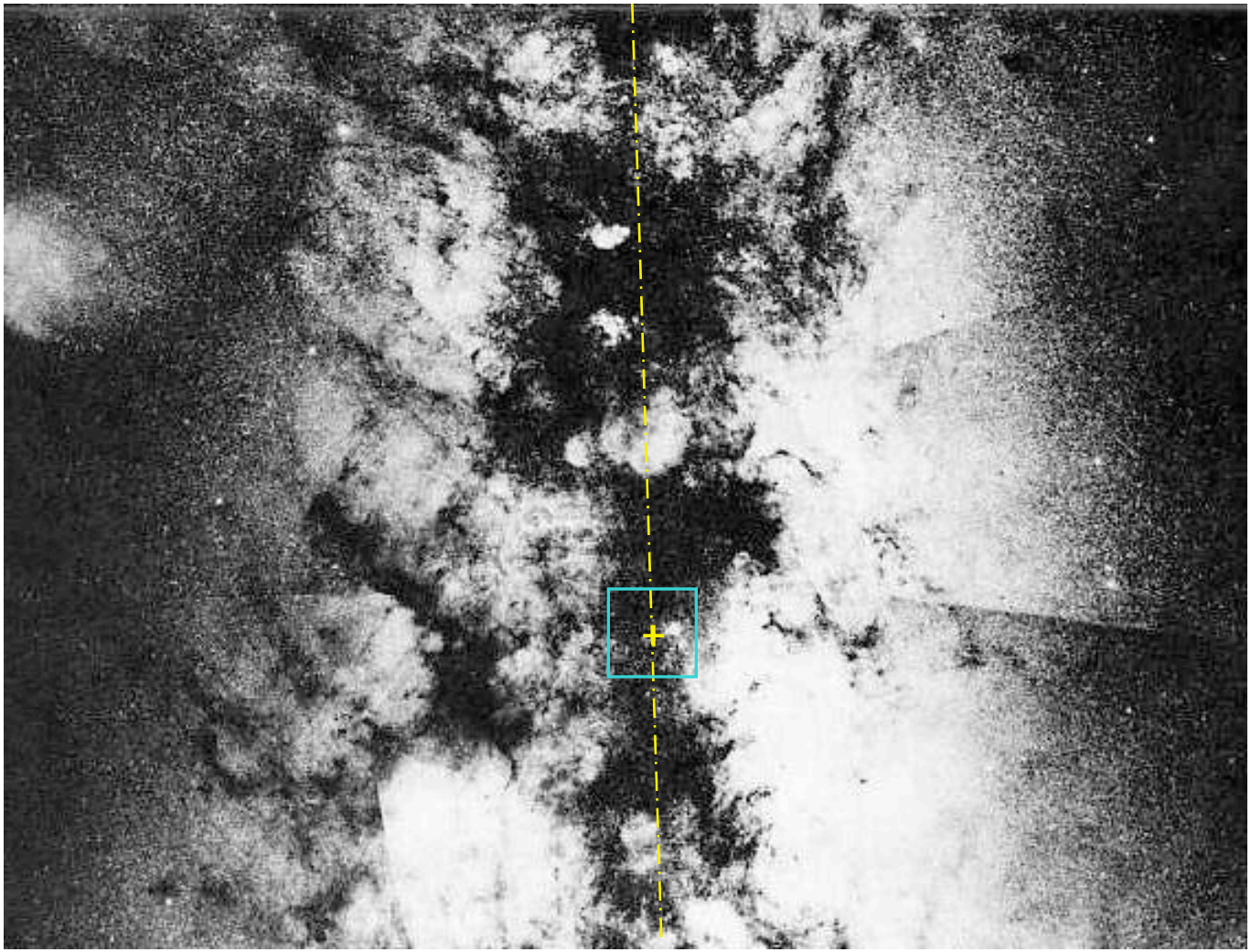
NASA Goddard Institute for Space Studies
Broadway at 112th Street


Balloon Lab
Nick Woolf
BROADWAY
TOM'S RESTAURAN
NASA Goddard Institute for Space Studie
Broadway at 112th Street



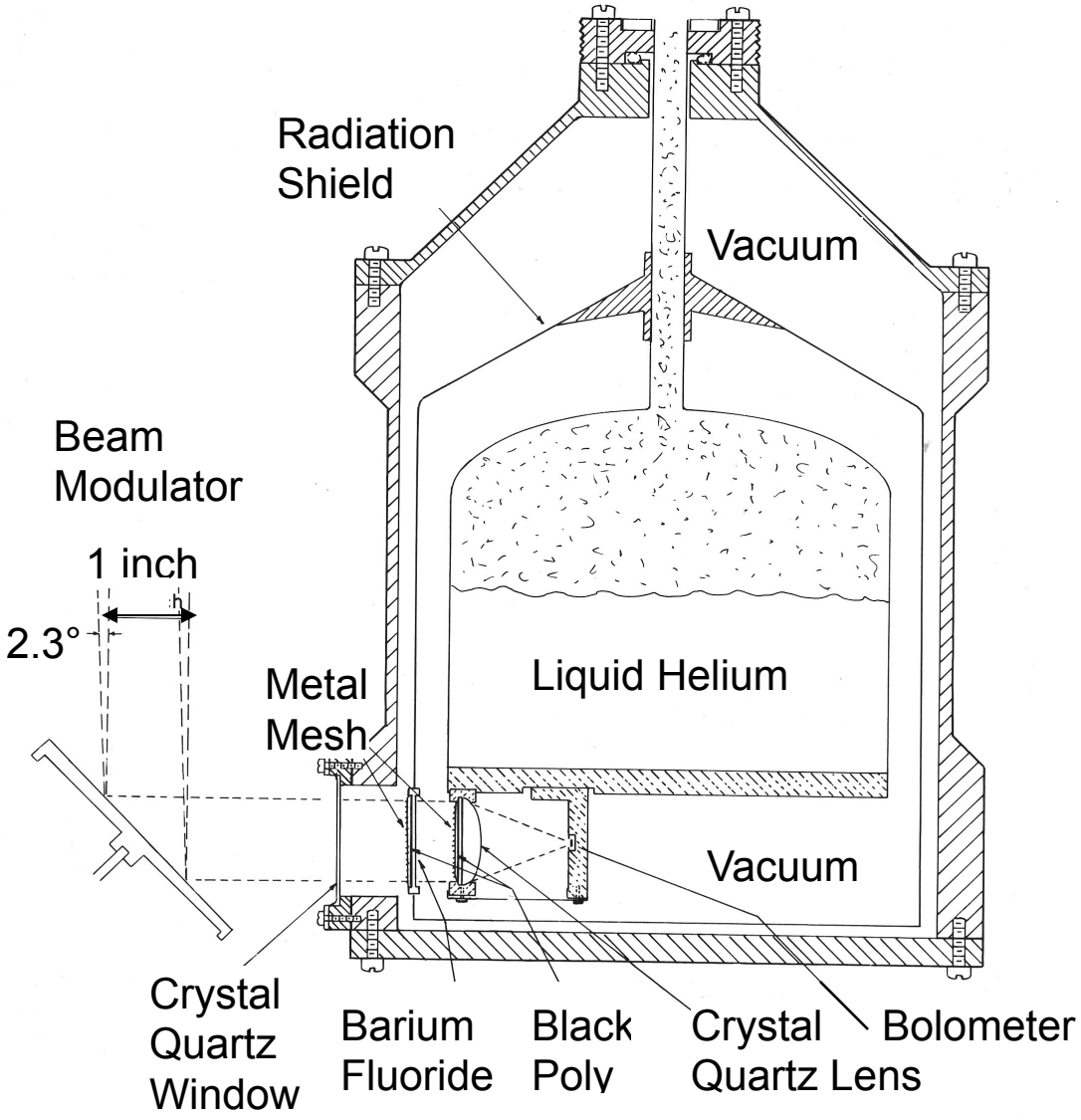
The Milky Way toward the Galactic Center

+ is at SGR-A radio source



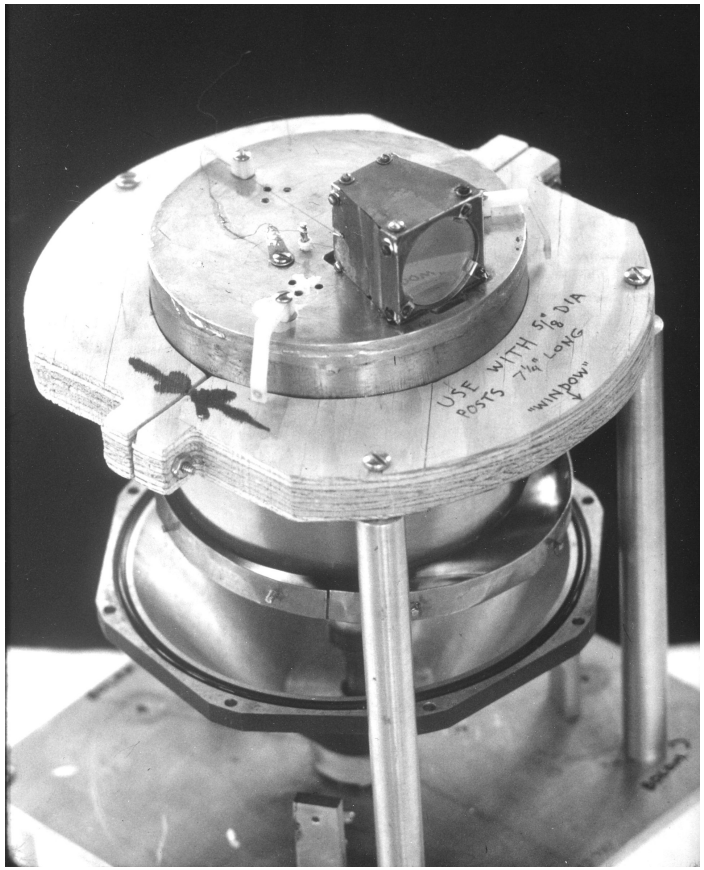
The Milky Way toward the Galactic Center

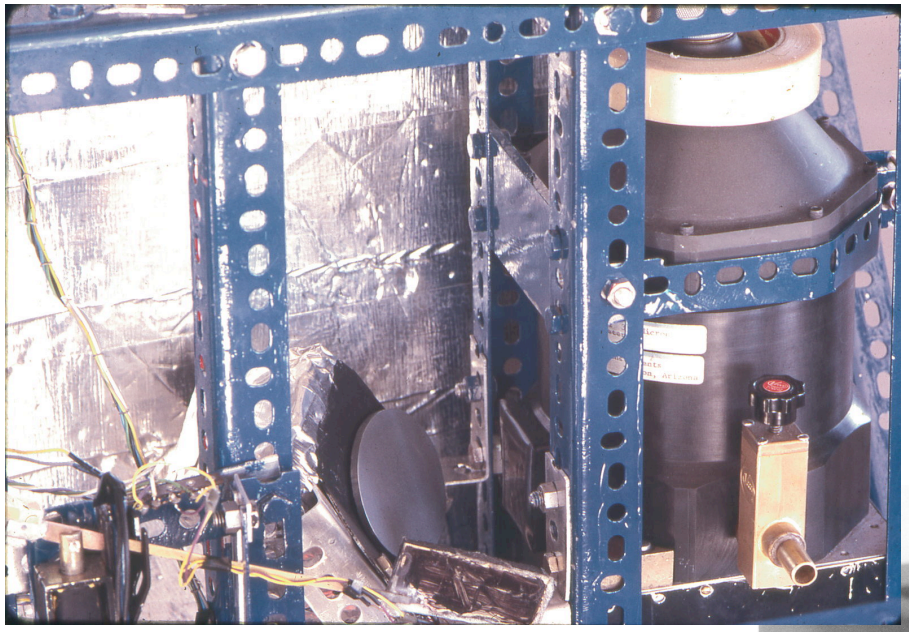
+ is at SGR-A radio source Box is a 2 degree square



Liquid Helium Dewar and 100 micron Optics

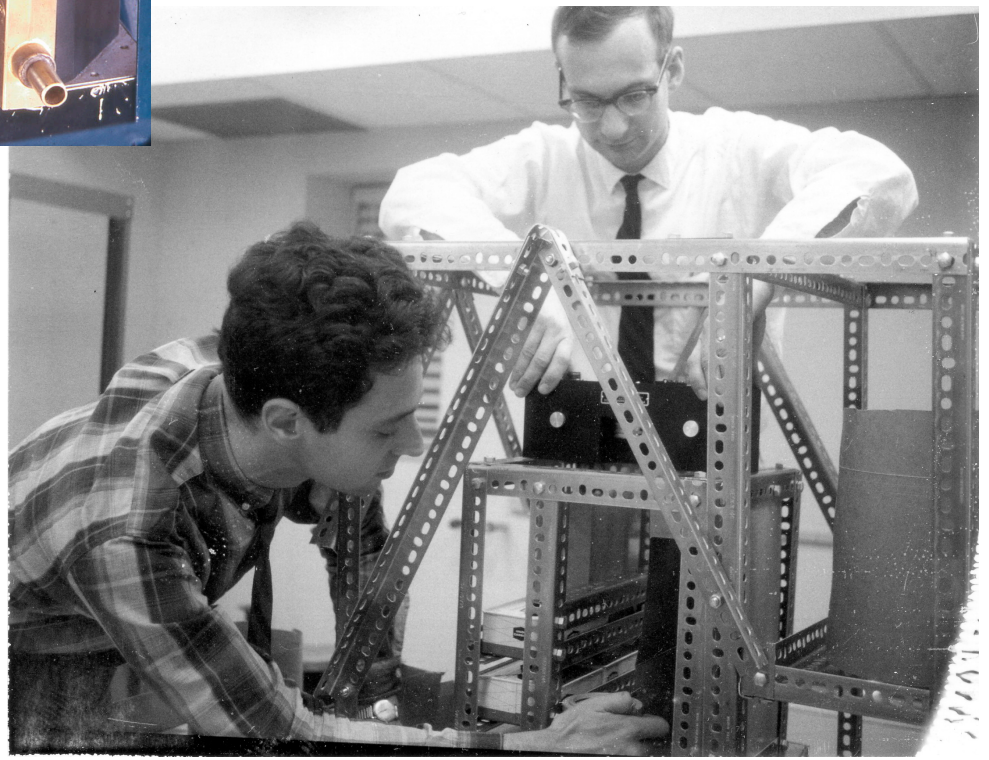
The one inch telescope

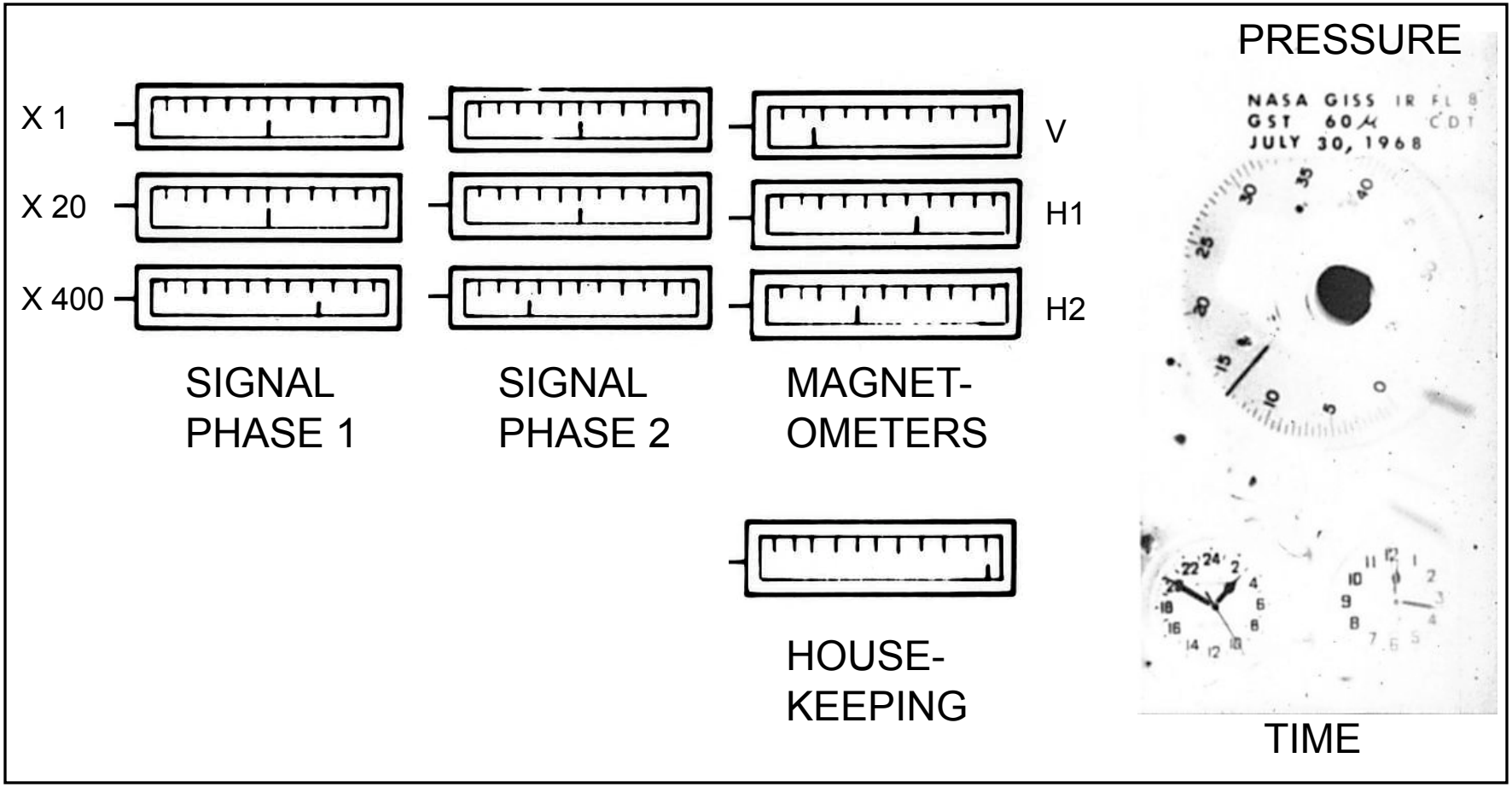




Dewar and nutating mirror in frame

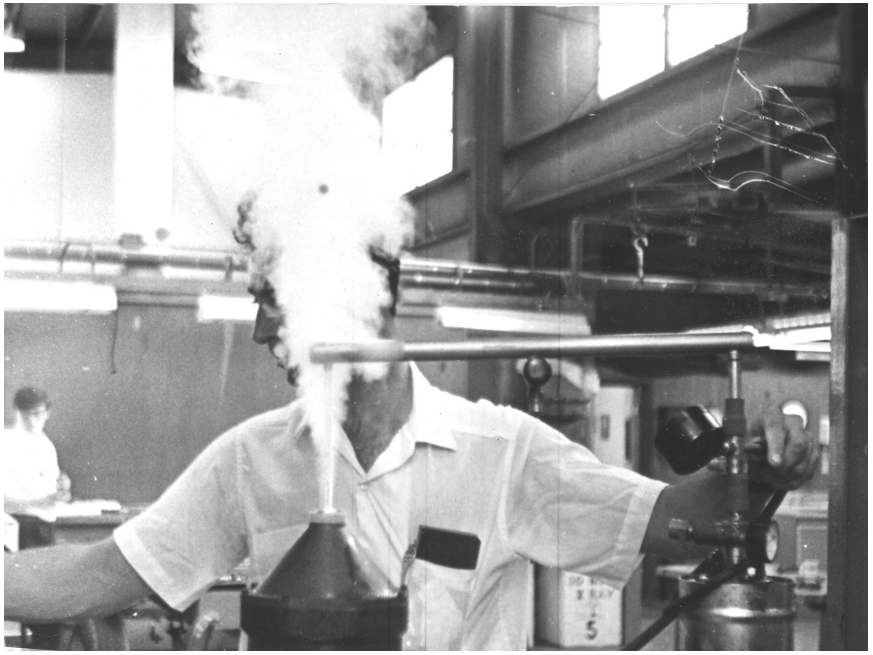
Nick and Bill making “Dexion” frame. Black film transport box is in place





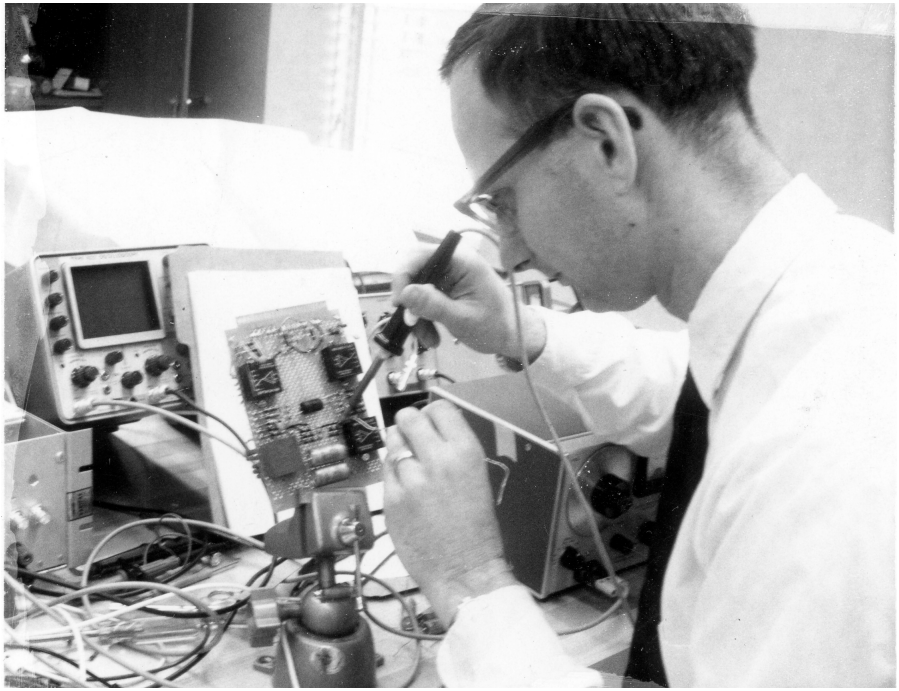
METER PANEL

VIEWED BY A CAMERA WITH CONTINUOUS FILM TRANSPORT

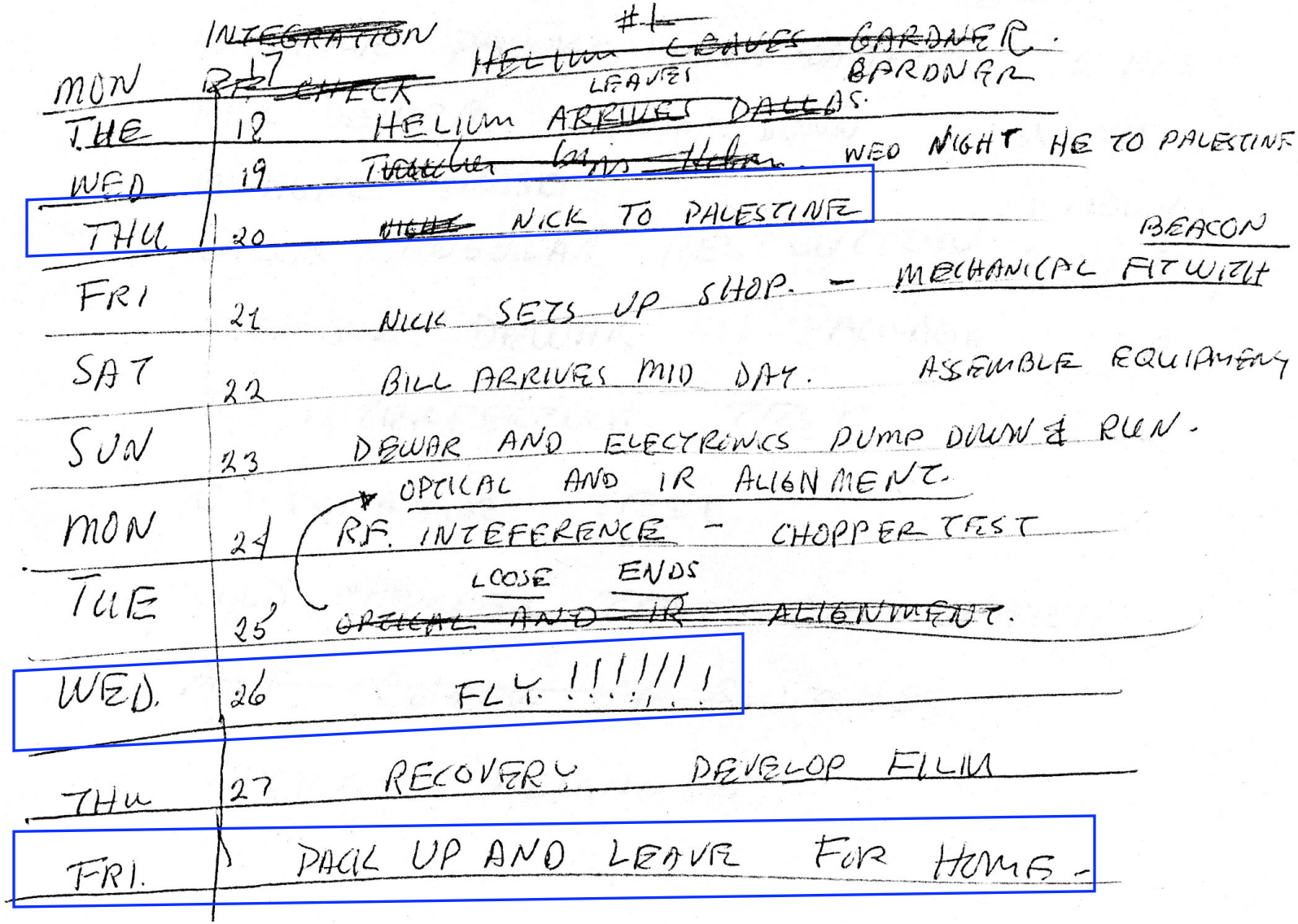


Nick transferring
liquid helium

Bill soldering circuit board



Plan for First Balloon Flight - September 1966



The Reality

After three weeks of preparation we
left for a break and to repair a leaky cryostat
and returned for a flight November 2, 1966

Typical Balloon Launch

Second Flight

Page, Arizona February 21, 1967

Nick and Bill prepare gondola

Andrea at 6 months gets to see a balloon launch

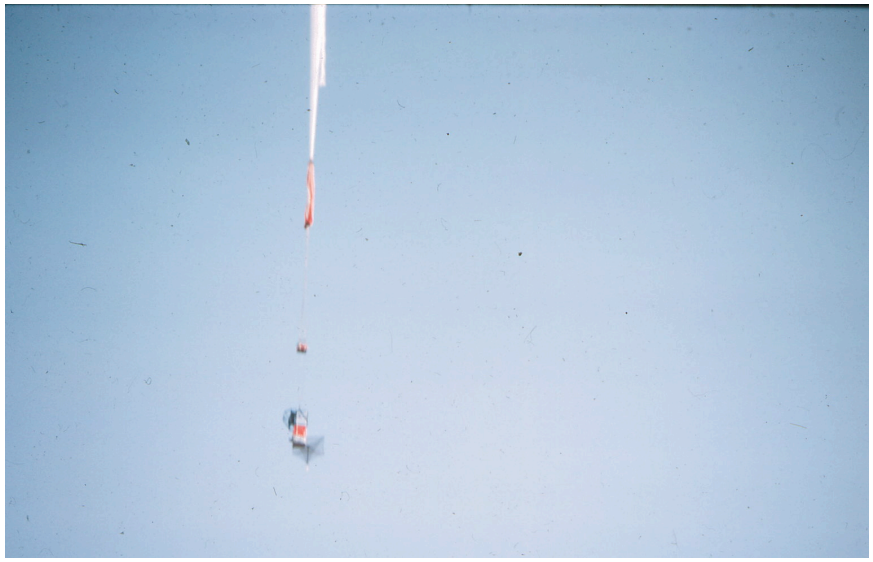
Launch vehicle

Launch “train”

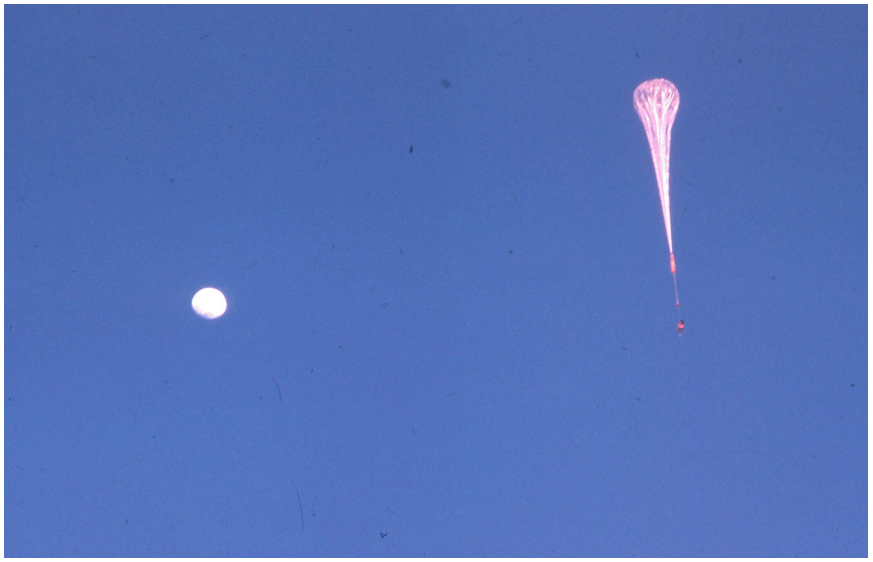
Inflating the balloon

Balloon release

Gondola release



On the way



Ascending past the moon

Eight Balloon Flights in 21 Months

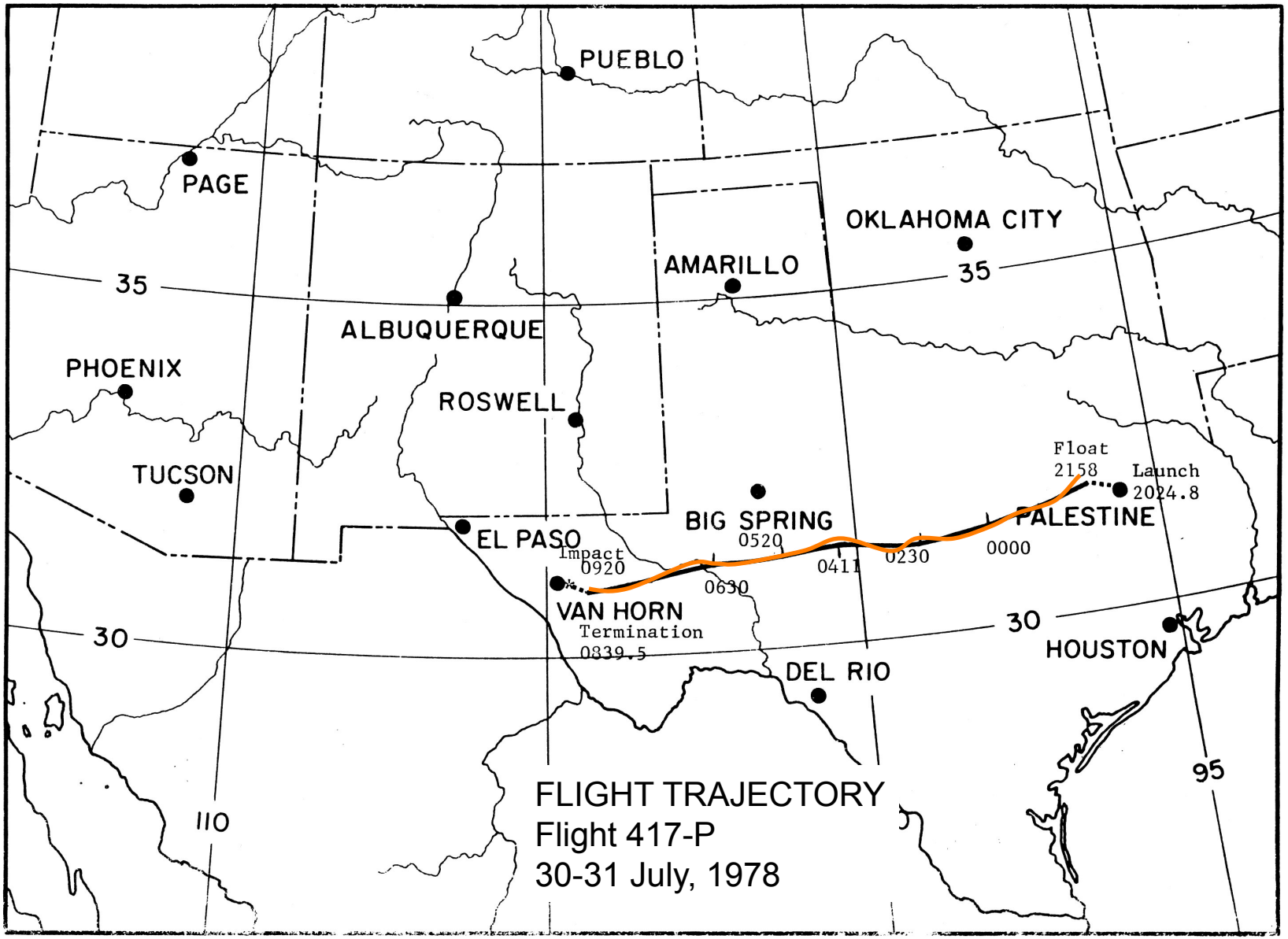
Flight	Year	Month	Day	Hours	Results
1	1966	Nov	2	4	Radio beacon interference - Short track toward Mexico
2	1967	Feb	21	12	Detected Moon at 350 microns - From Page, AZ
3		July	26	0	Slow ascent - Early termination
			27		
4			28	9	
			29		
			30		
			31		
		Aug	1		
			2		
5			3	13	
6	1968	July	22	2	Premature termination from defective command
			23		
			24		
7			25	10	High sensitivity channel saturated
			26		
			27		
			28		
			29		
8			30	11	Detected Galactic Center at 100 microns

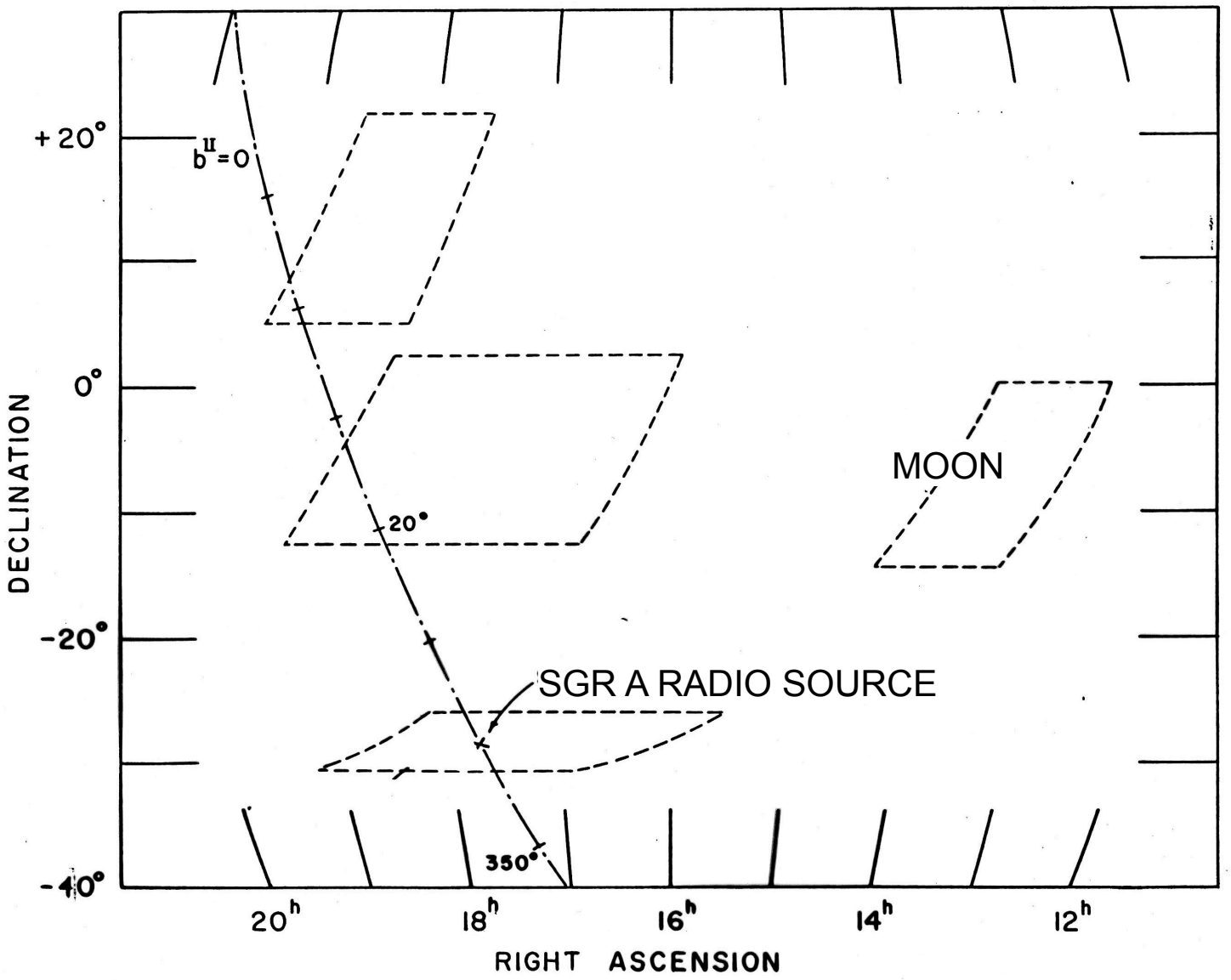
Bill and Carl

The surviving team

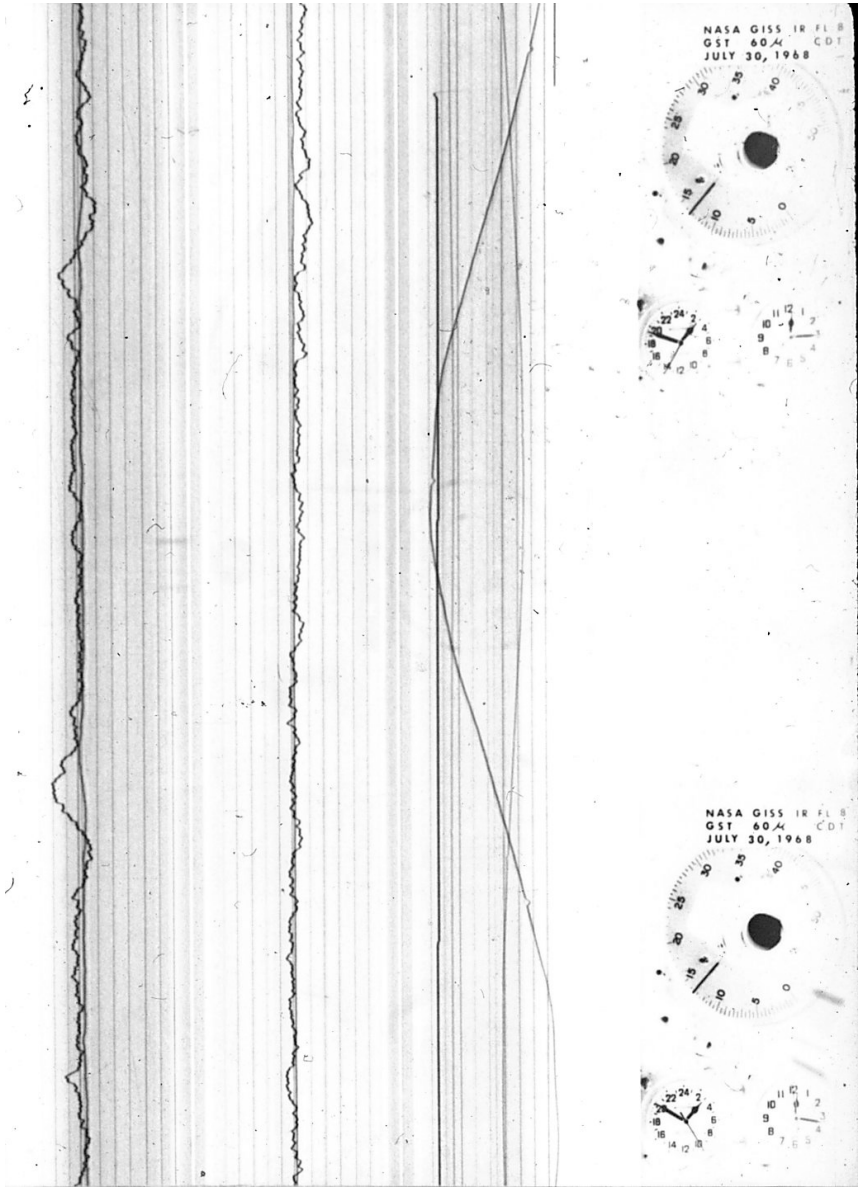
The 8th Flight with the One Inch Telescope

Palestine, Texas – July 30, 1968

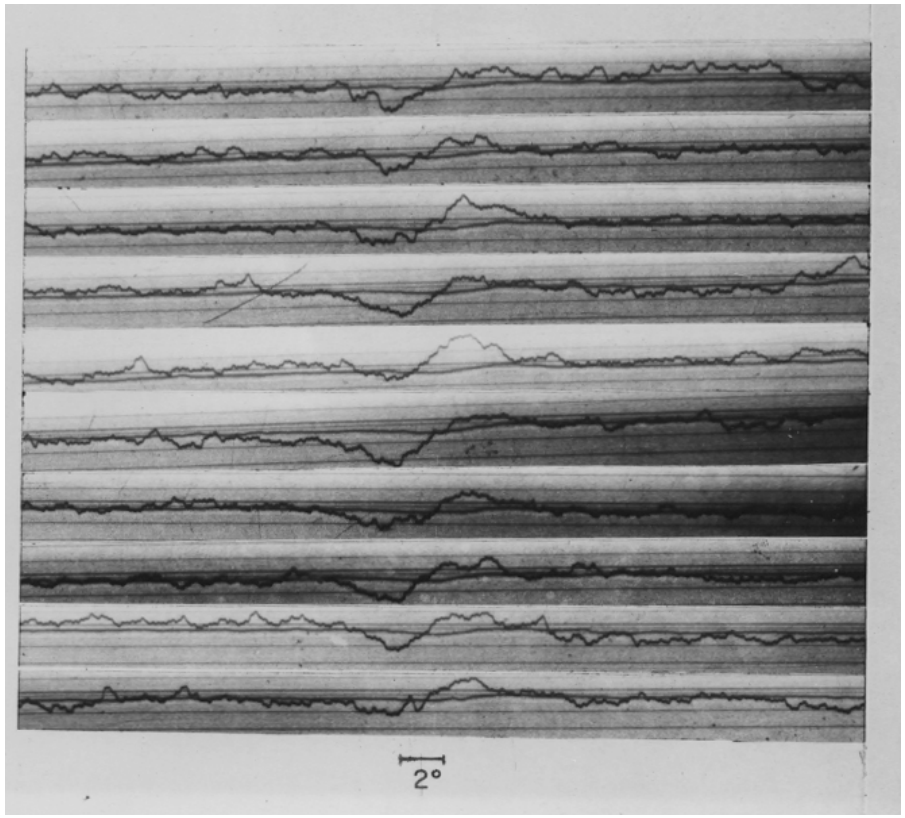

PUEBLO
PAGE
OKLAHOMA CITY
AMARILLO
35
35
ALBUQUERQUE
PHOENIX
ROSWELL
TUCSON
Float
2158
Launch
2024.8
BIG SPRING
PALESTINE
EL PASO
0520
Impact
0920
0411
0230
0000
0630
VAN HORN
Termination
0839.5
30
30
HOUSTON
DEL RIO
95
110
FLIGHT TRAJECTORY
Flight 417-P
30-31 July, 1978



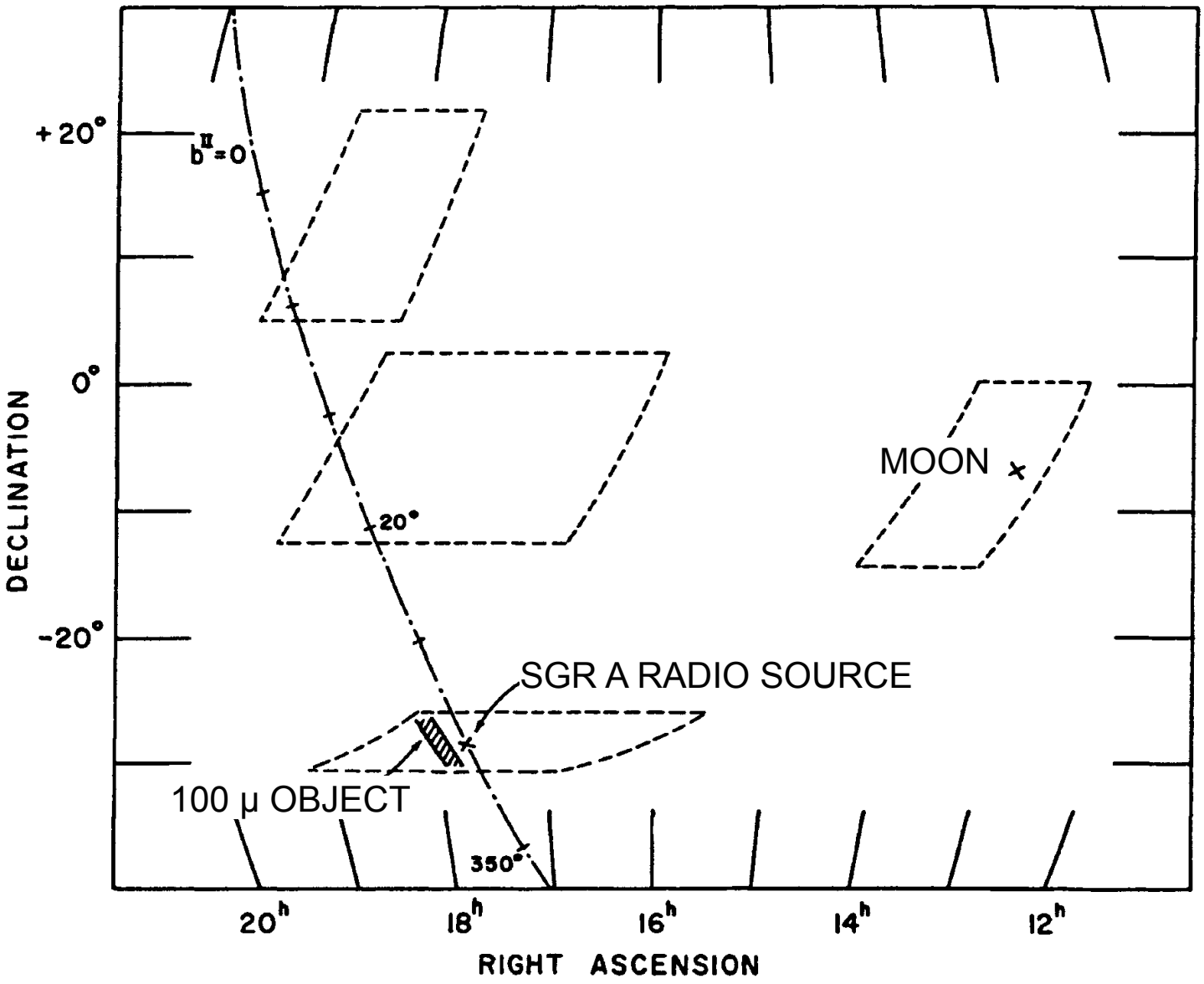
Scanned areas of the sky



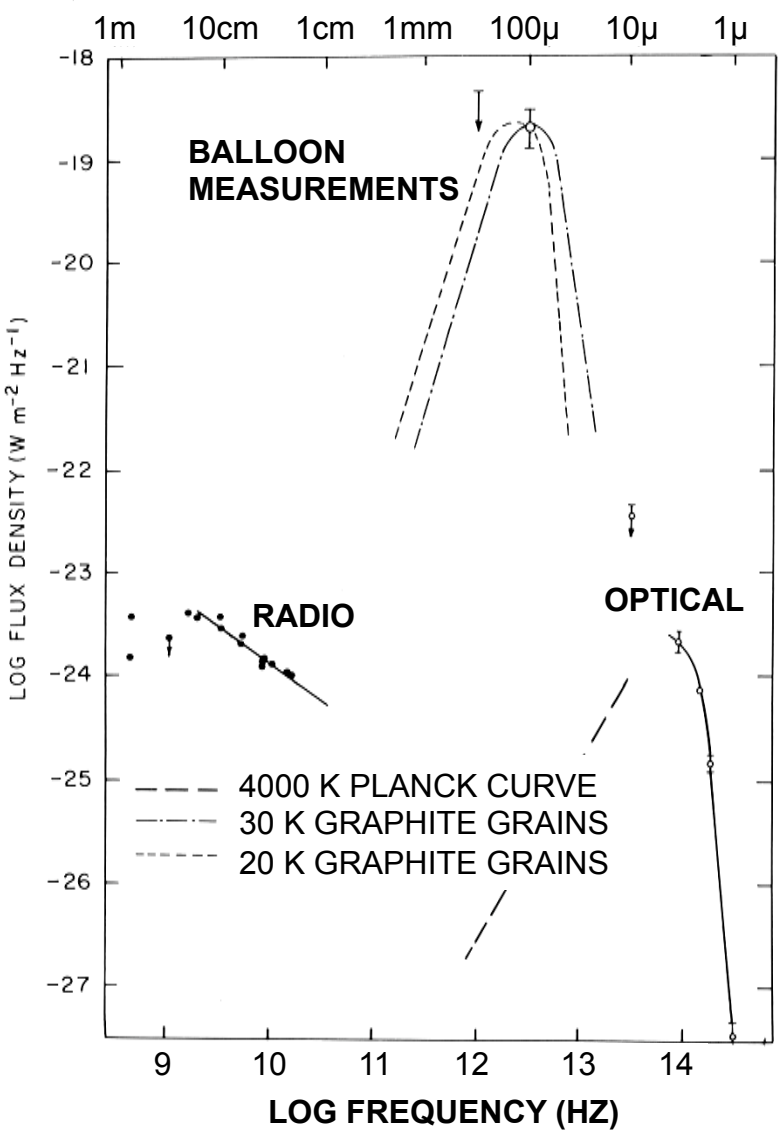
The discovery chart



Traces aligned along galactic longitude



Objects Detected



Galactic Center Flux at 100 microns

So the dust causing the holes in the milky way was seen by its own thermal emission

and

The cool heat from the galactic center was measured