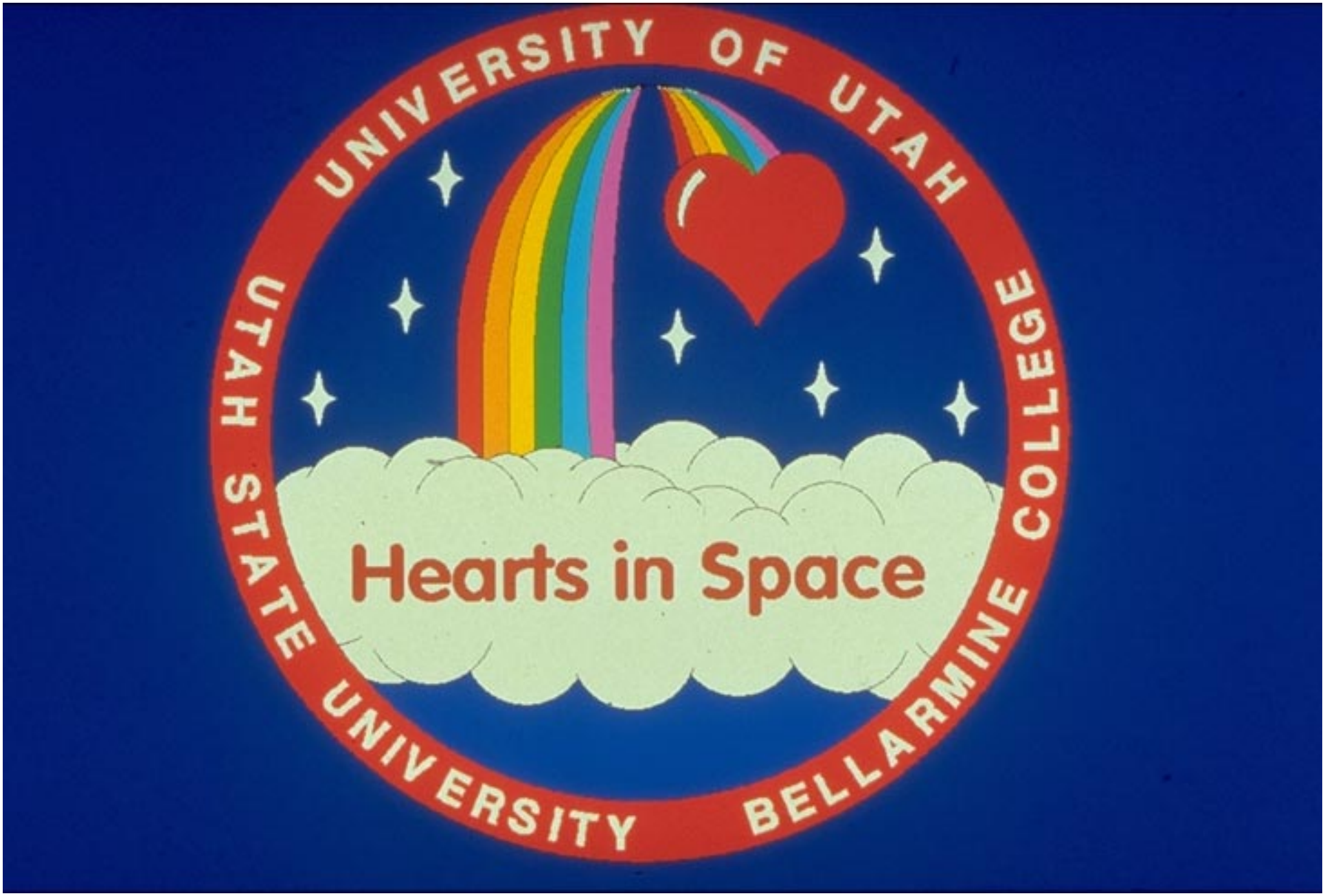
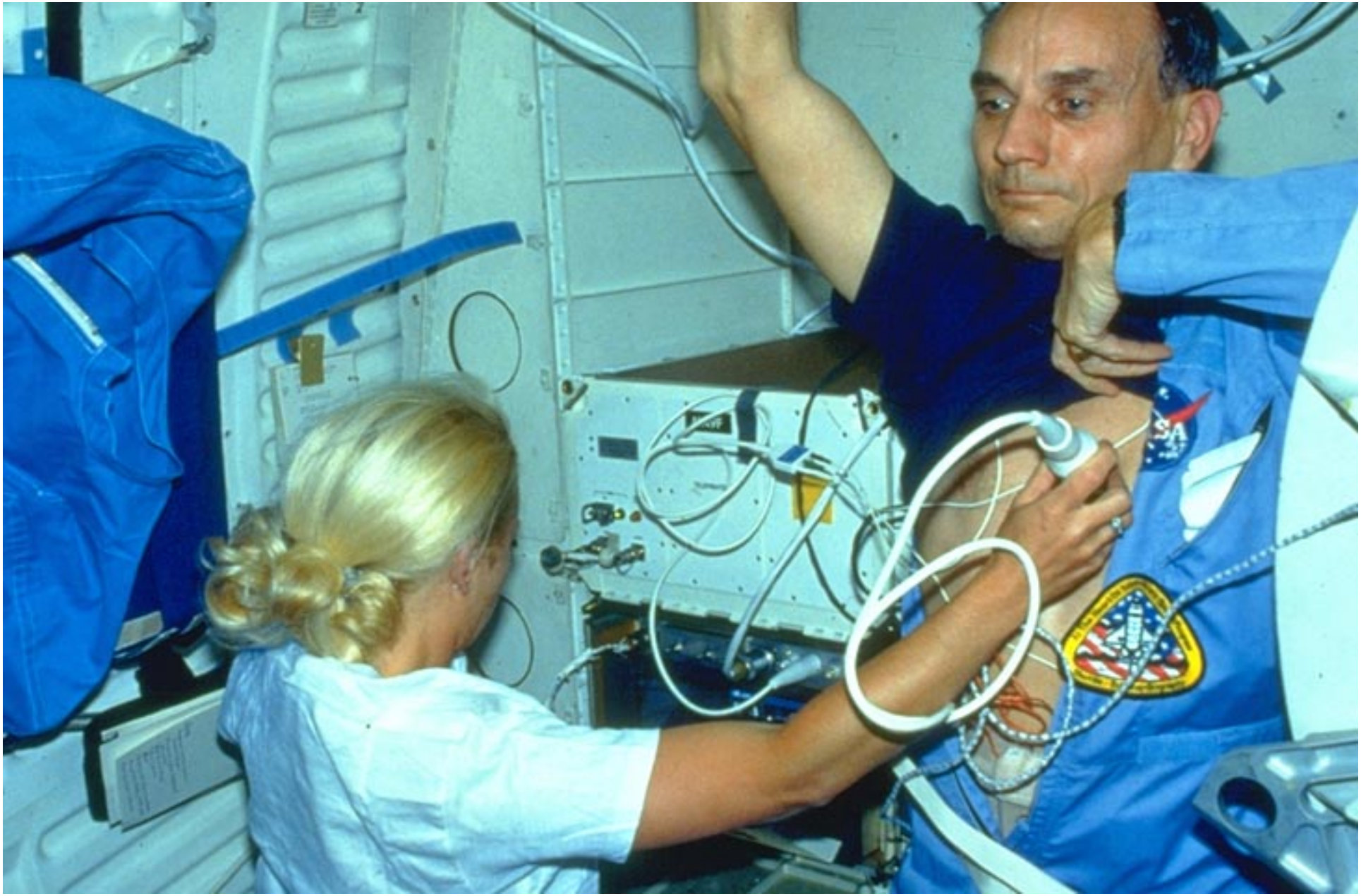

UNIVERSITY OF UTAH
UTAH STATE UNIVERSITY
BELLARMINE COLLEGE
Hearts in Space

Kentucky Tomorrow

Project Challenge

August 1985



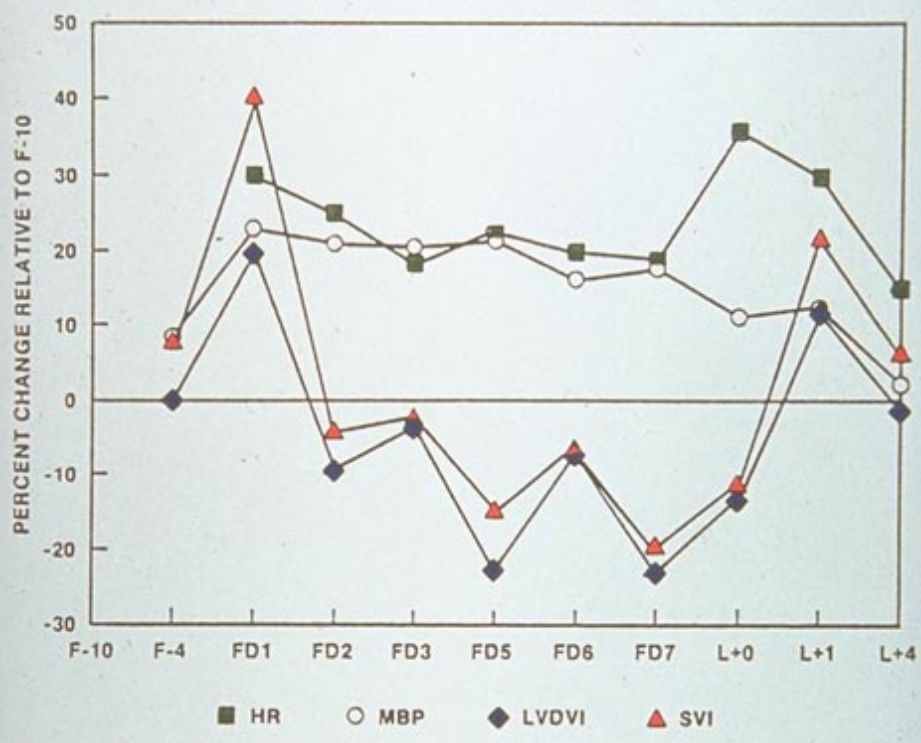


Figure 27.4. Composite of heart rate (*HR*), mean blood pressure (*MBP*), left ventricular diastolic volume index (*LVDVI*), and stroke volume index (*SVI*) as these parameters change during space flight. See the legend to Figure 27.3 for explanation of axis labeling.

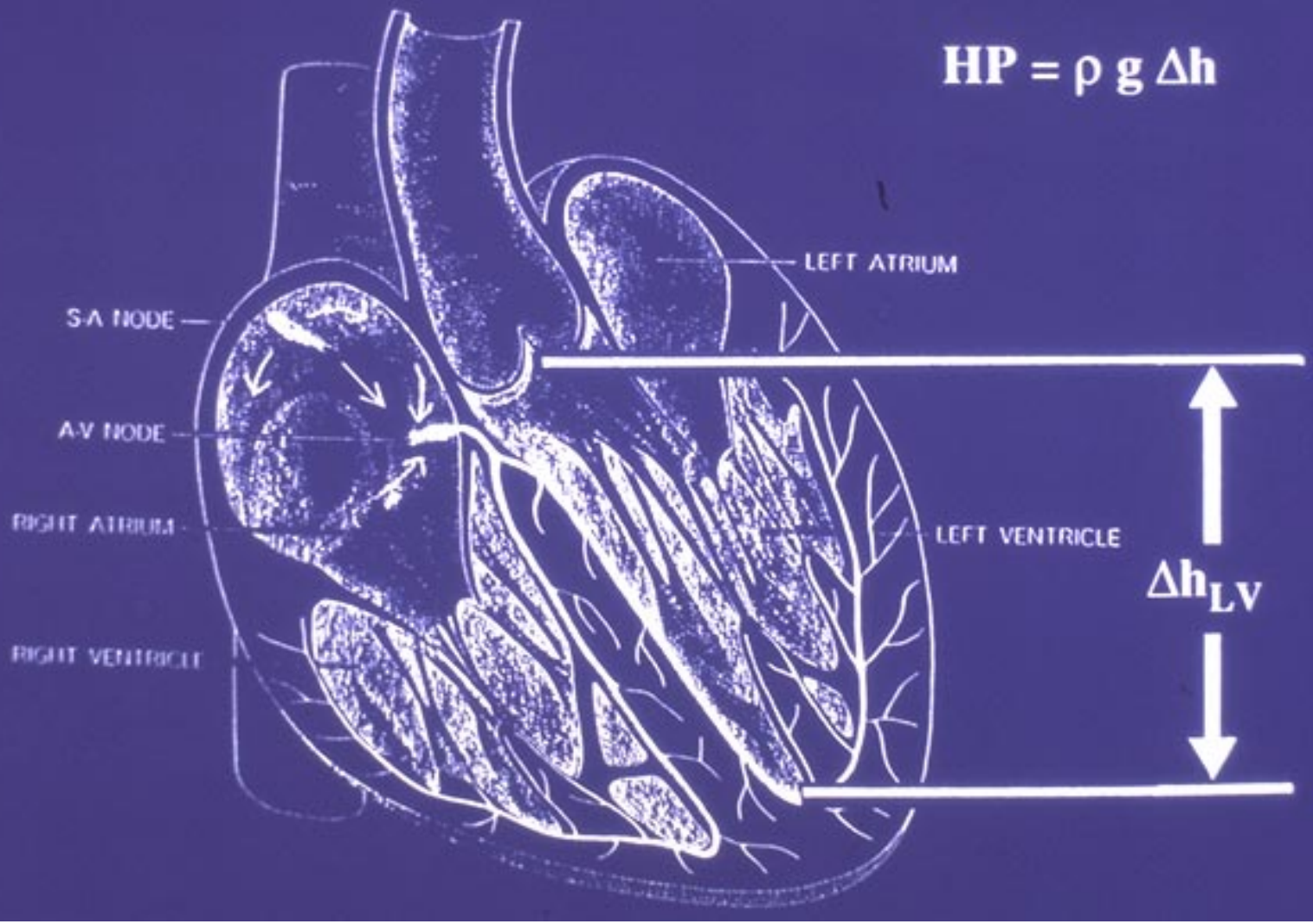
Bungo MW. Echocardiographic changes related to space travel. In Two-Dimensional Echocardiography and Cardiac Doppler. 2nd Edition, (Eds) Schapira JN, Harold JG, Williams & Wilkins, Baltimore, pp 524-529, 1990.

Factors Influencing Diastolic Filling

1. Atrial Pressure
2. Kinetic Energy of Blood Entering Ventricle
3. Transmural Pressure Gradient
4. Passive Elastic Recoil of Myofibers
   (the "parallel elastic element")
5. Gravitational Acceleration-Dependent
   Hydrostatic Pressure Gradient

HYDROSTATIC PRESSURE

$$HP = \rho\, g\, \Delta h$$



Proof of Concept

KC-135 Parabolic Flight Studies
("The Vomit Comet")

NASA
Johnson Space Center
Ellington Field, Houston, Texas

TEAC

AZL

Student Investigators

Bellarmine College

Max R. Barton*
C. Michael Brown
Rose A. Devasia
Joilynn Gillespie
Charles Hufford
David J. Johnson
Stephan J. Keiran
Dan P. Kirchgessner
Jason W. Lyddane
Thomas A. Schurfranz*
Stuart Spalding
G. Scott Tucker
Robert C. Wessel*
Daniel W. Wilkey

University of Utah

Scott D. Everett*
Darren Kimoto
Kevin J. Gillars*
Richard D. Lorange*
D. Sean O'Leary*
Kristy Peterson
William J. Shaw
Stewart J. Woodruff*

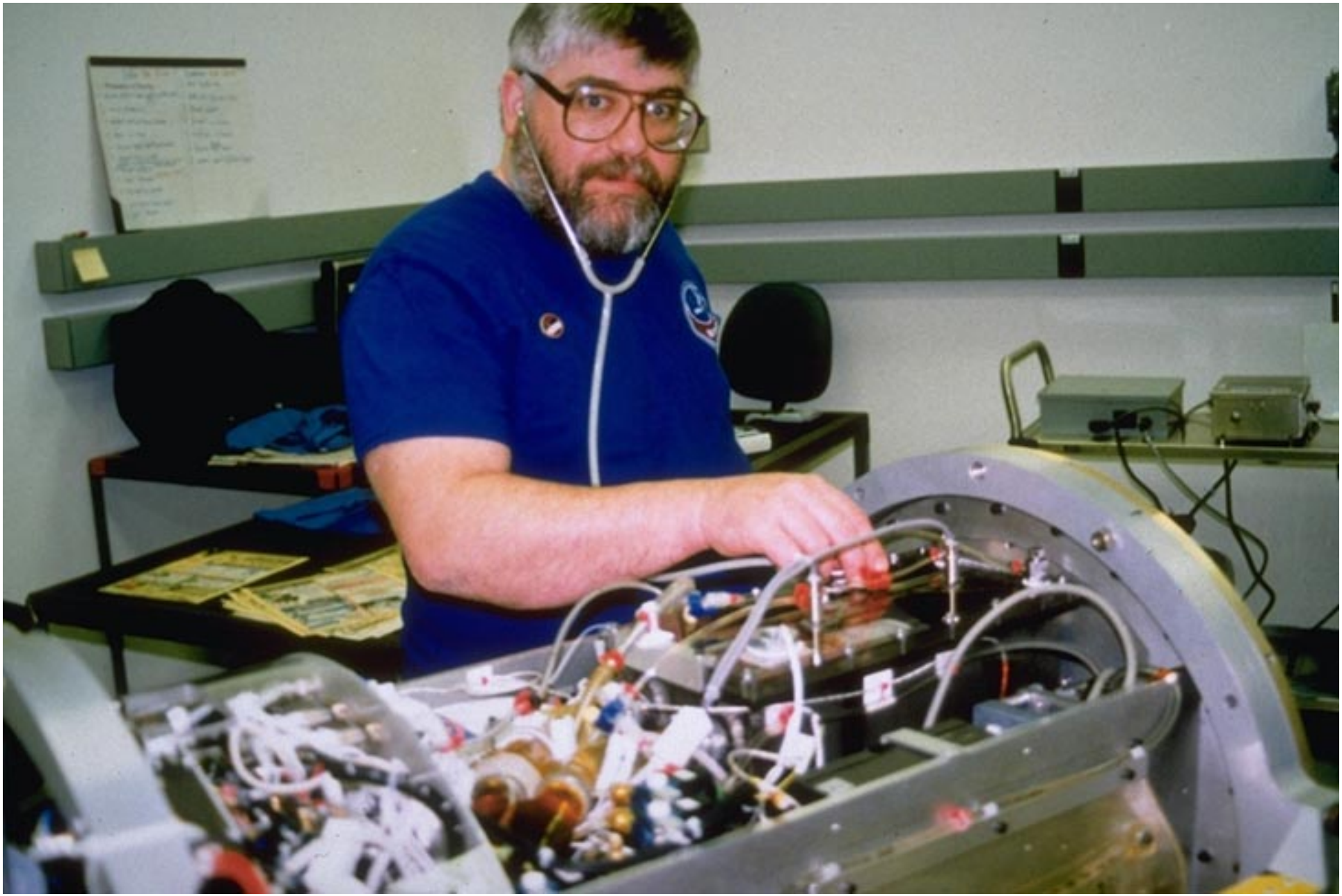
Utah State University

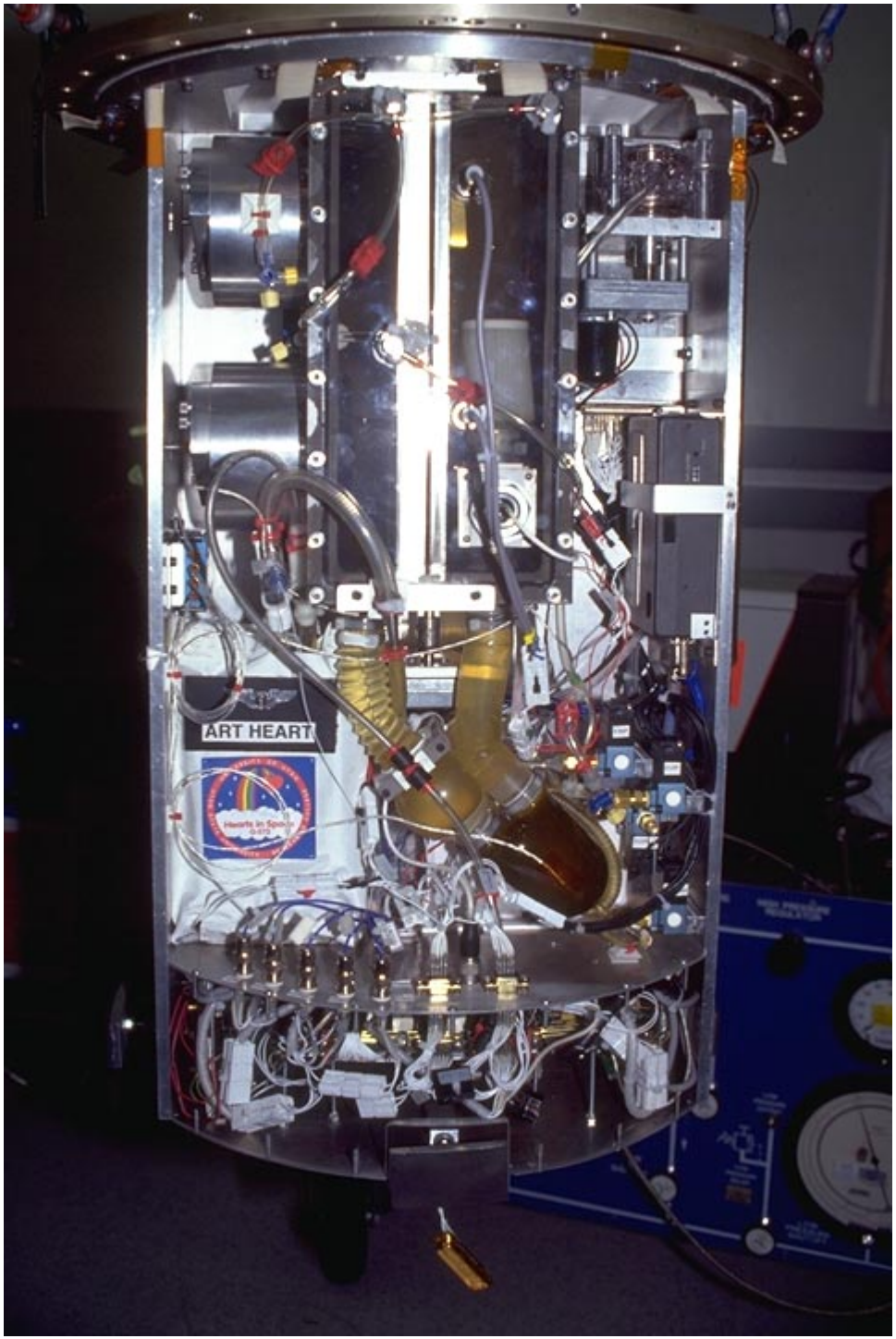
Jeff Chevalier
Kathryn Chevalier
Matt Droter
Casey Hatch
Neva Herr
Mark Lemon*
Tumkur Raghurum

(* significant contributor)

6.479
6.462

TRYGGVASON • DAVIS • BROWN • ROMINGER • CURBEAM • ROBINSON
85



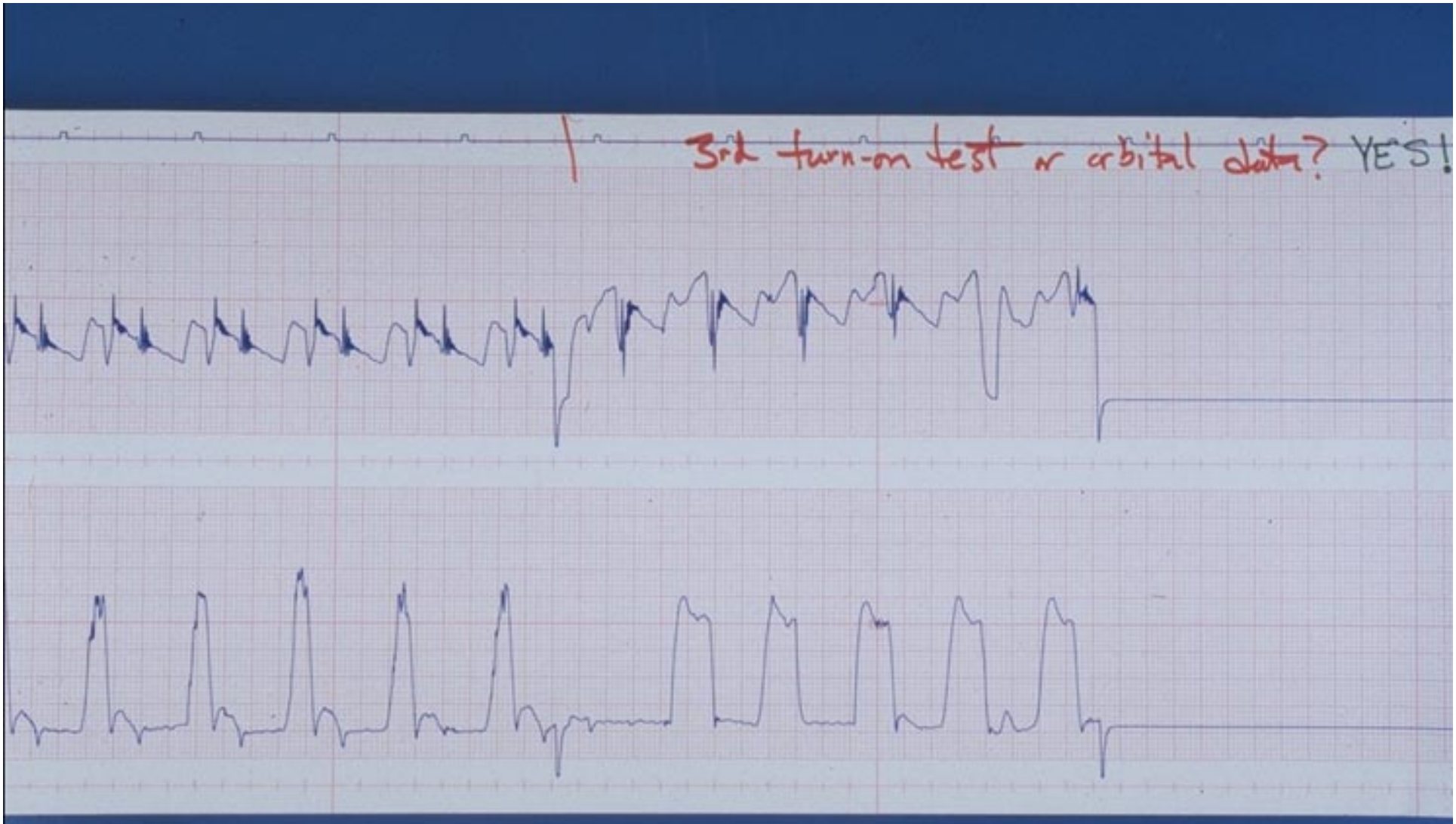

ART HEART

UNIVERSITY OF UTAH
MDCCCL
UNIVERSITY OF UTAH
UTAH STATE UNIVERSITY
BELLARMINE COLLEGE
Hearts in Space
G-572
ROCKY MOUNTAIN
SPACE GRANT CONSORTIUM

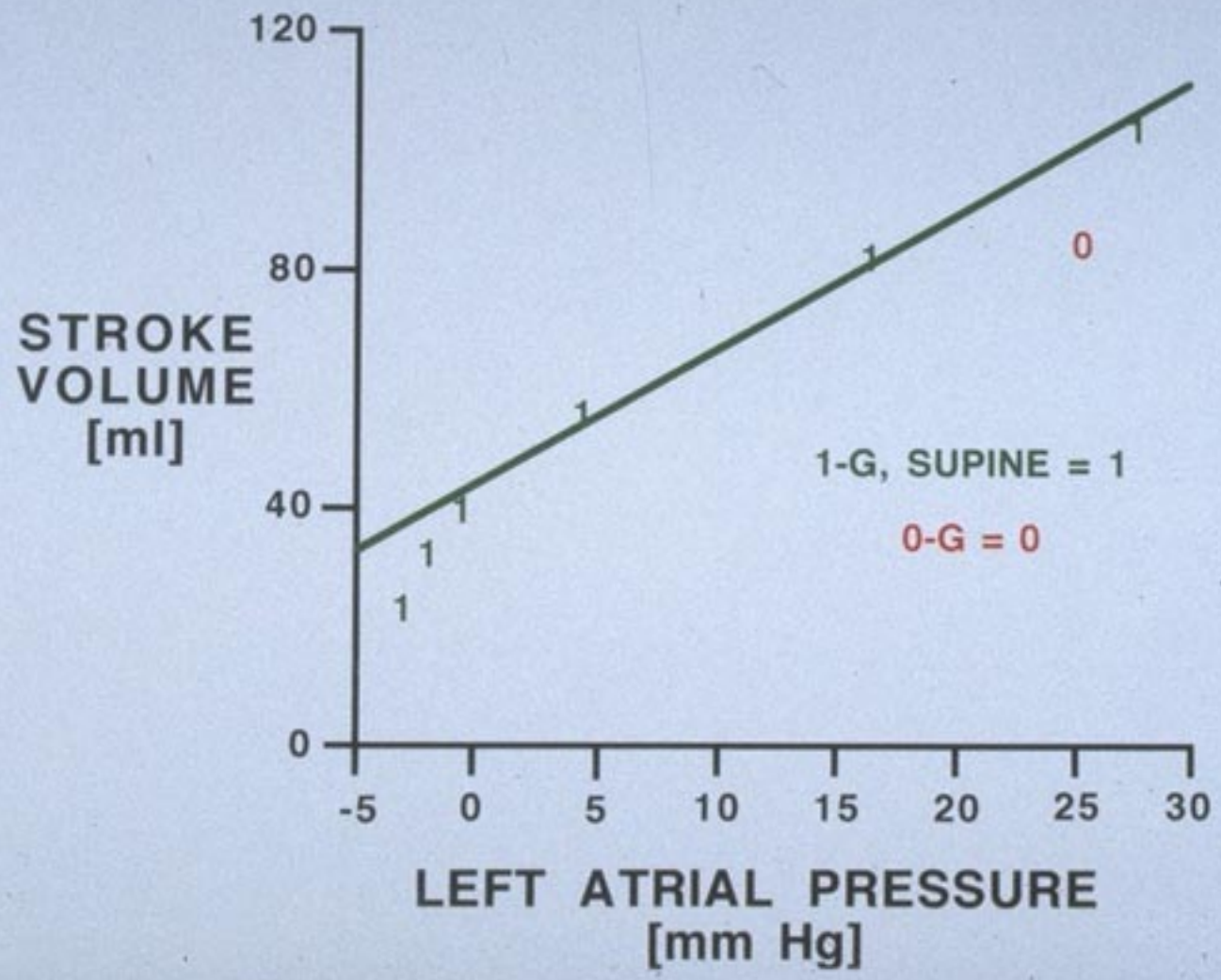
Hearts in Space
G-572

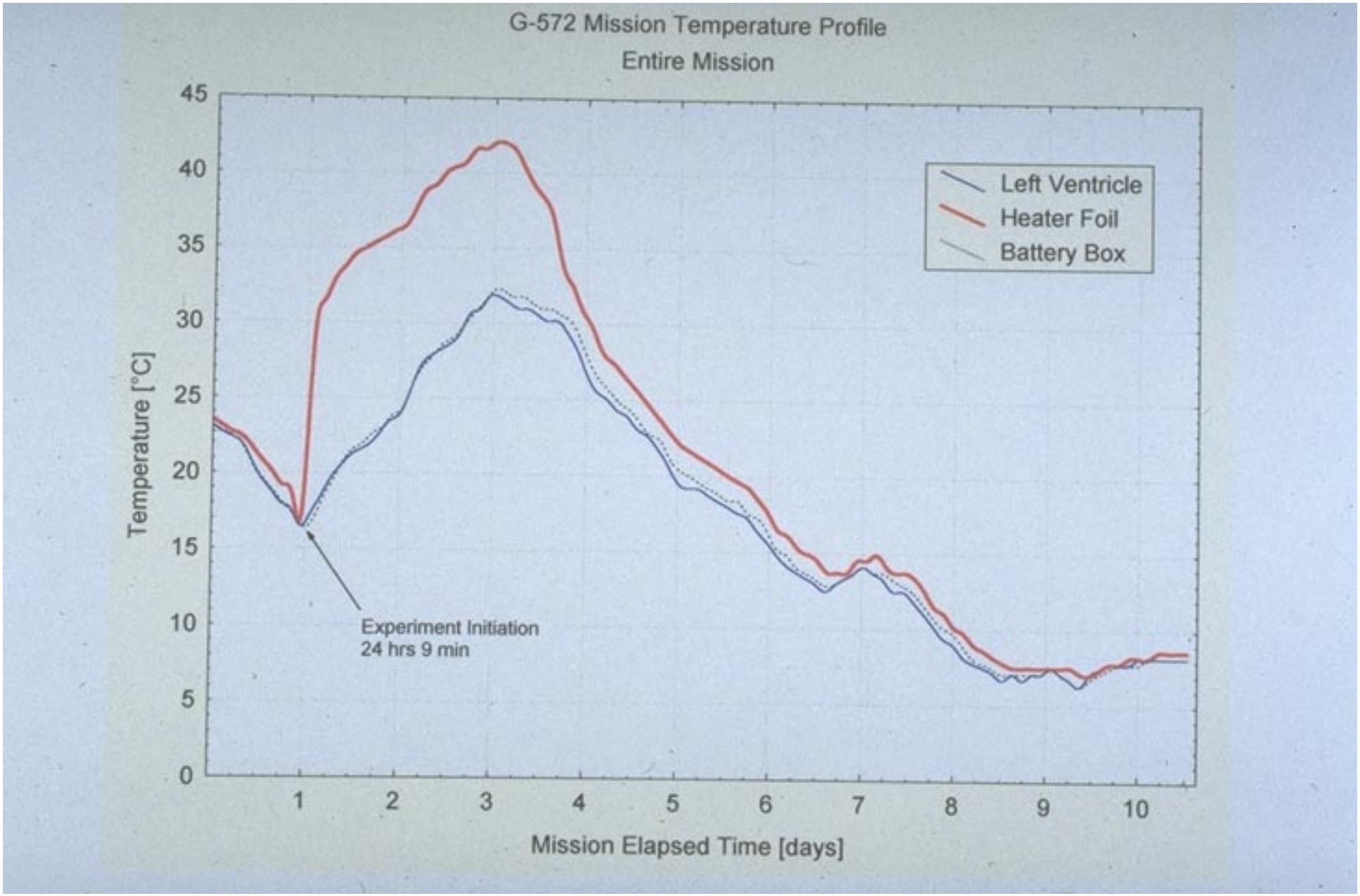
MCDL
USA
NASA
Atlantis

"Show me the data!"

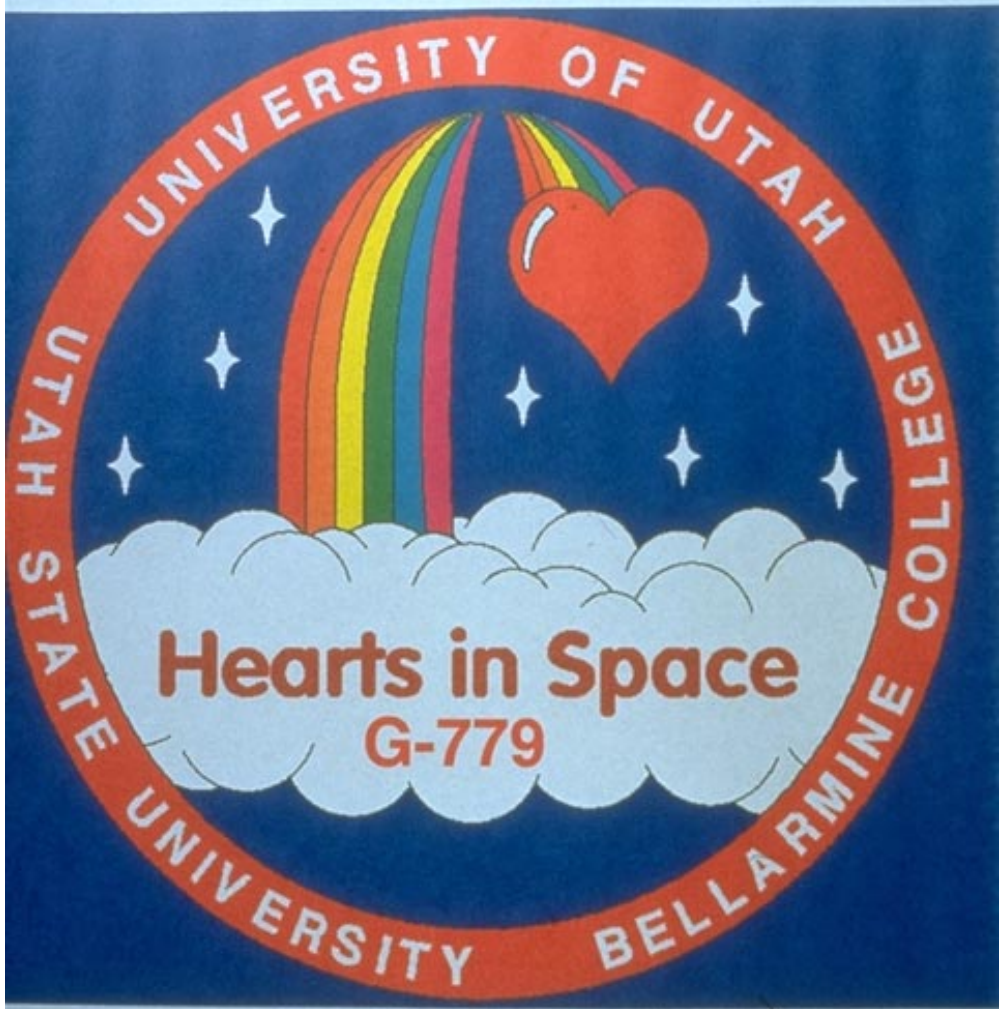

3rd turn-on test or orbital data? YES!

VENTRICULAR FUNCTION CURVE




G-572 Mission Temperature Profile
Entire Mission
Left Ventricle
Heater Foil
Battery Box
Experiment Initiation
24 hrs 9 min
Temperature [°C]
Mission Elapsed Time [days]
0
5
10
15
20
25
30
35
40
45
1
2
3
4
5
6
7
8
9
10

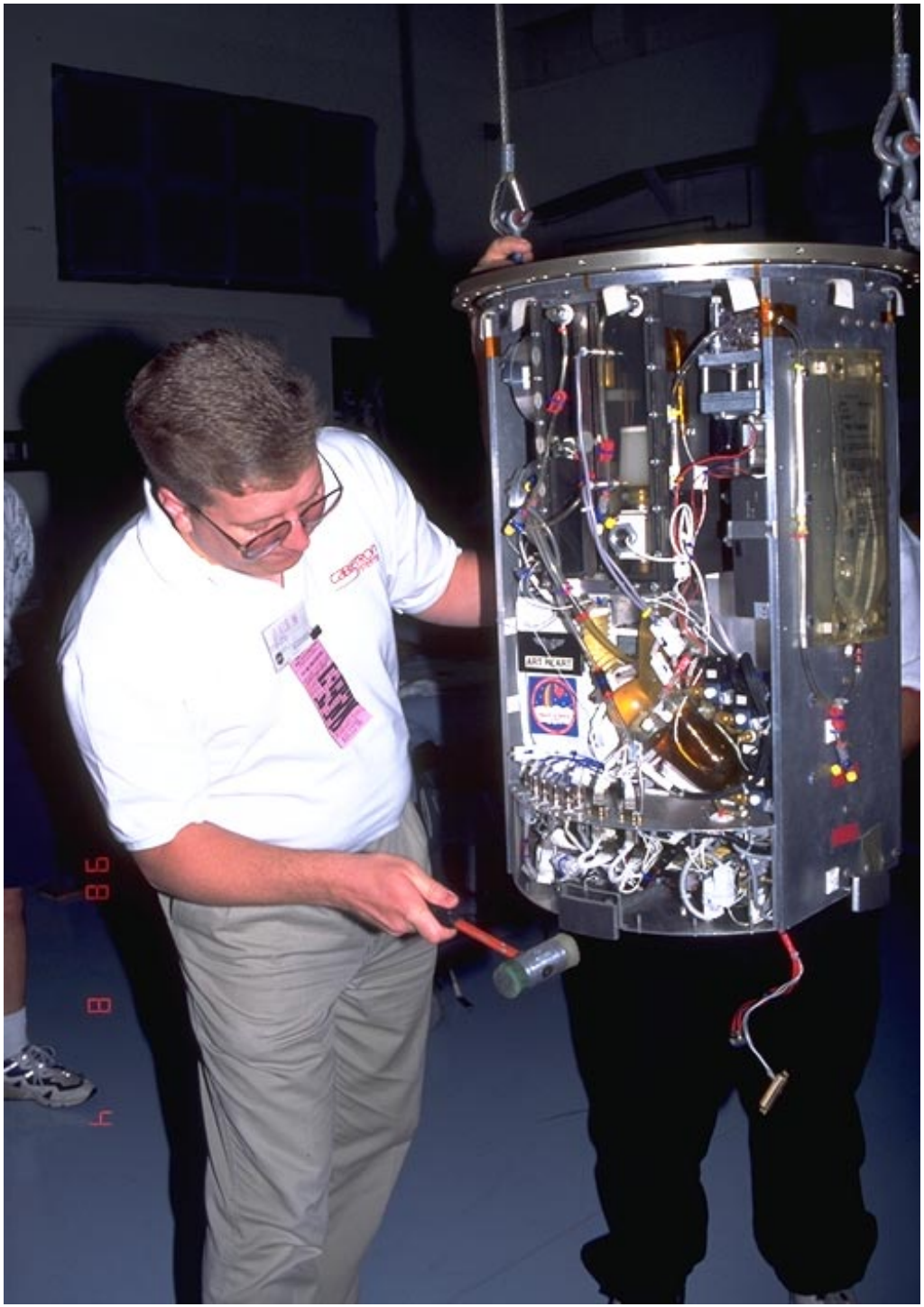
Coming soon to a Space Shuttle near you . . . . .



THE SEQUEL!

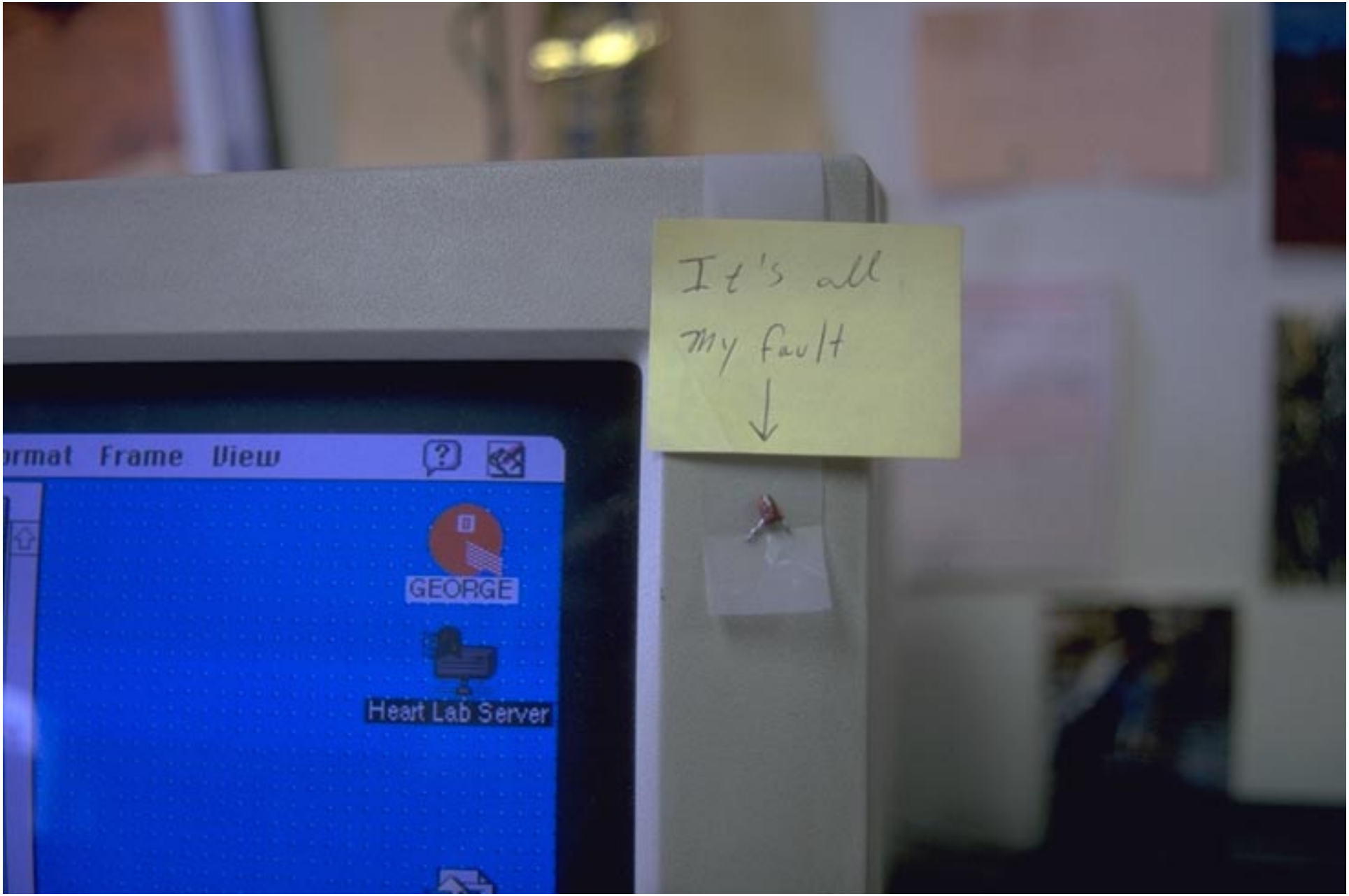
DUQUE
BROWN
LINDSEY
ROBINSON
MUKAI
GLENN
PARAZYNSKI
7
DISCOVERY

rt & Lung
itute

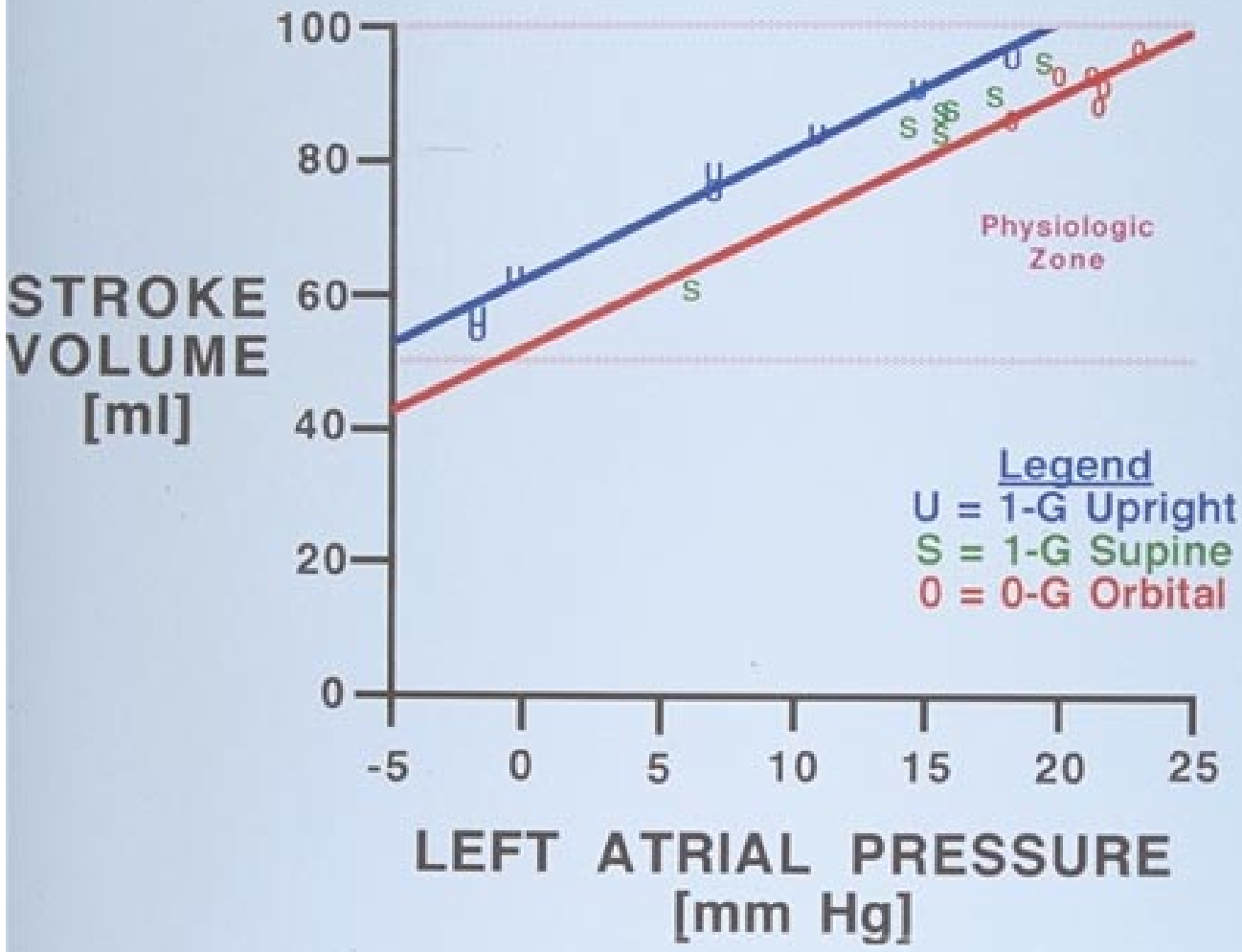


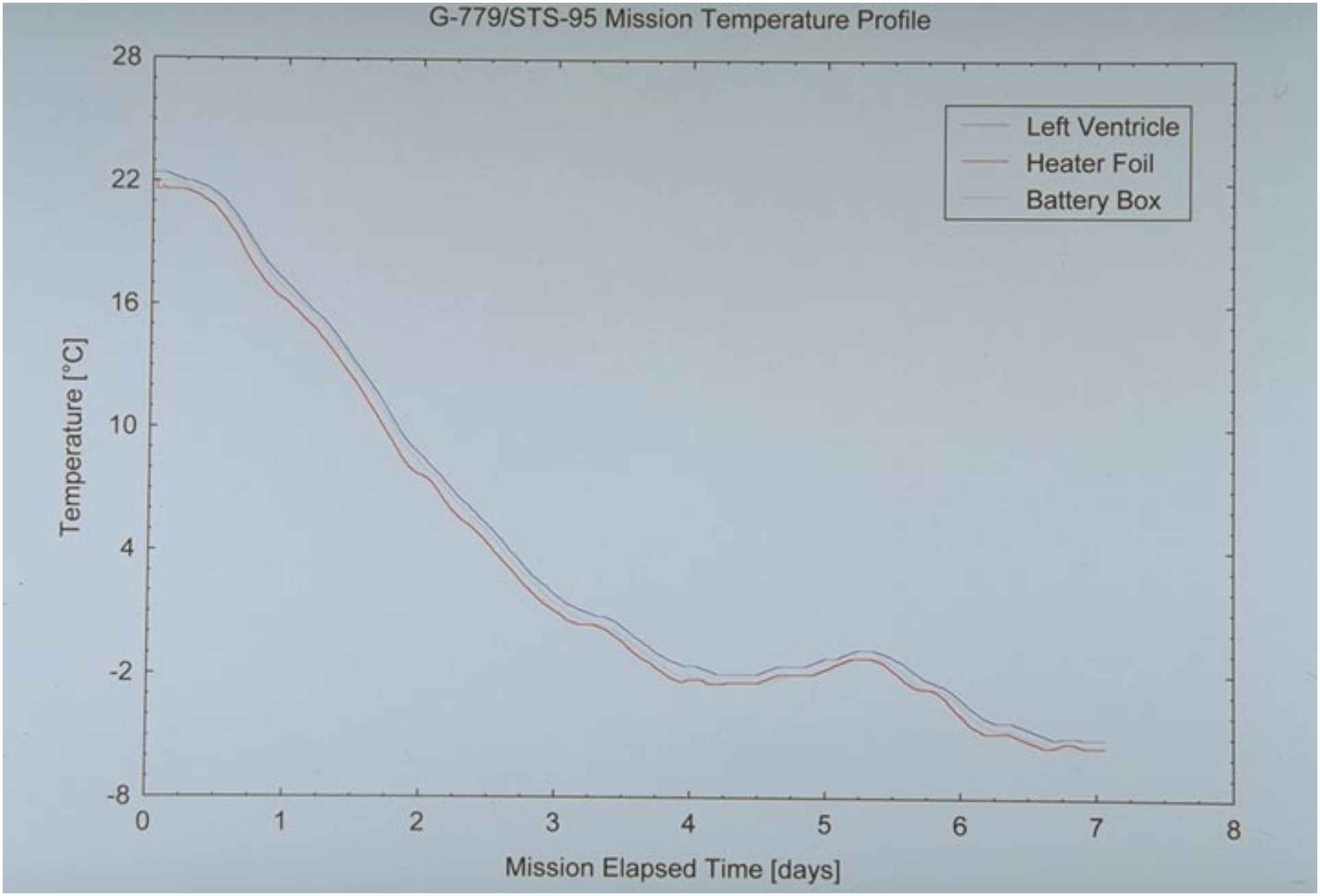
Outscope

United States
7


It's all
my fault
rmat Frame View
GEORGE
Heart Lab Server

G-779 VENTRICULAR FUNCTION CURVE
[STS-95]




G-779/STS-95 Mission Temperature Profile
Left Ventricle
Heater Foil
Battery Box
Temperature [°C]
28
22
16
10
4
-2
-8
0
1
2
3
4
5
6
7
8
Mission Elapsed Time [days]

BAYOUR

Unbrako
HIGH STRENGTH SOCKET SCREWS
DURACELL
NASA
ENDEVCO
GOULD
TEAC
Medtronic
AQUACIDE
MOTOROLA
Hearts in Space
USRA
KRUG
MILLER
Thiokol CORPORATION