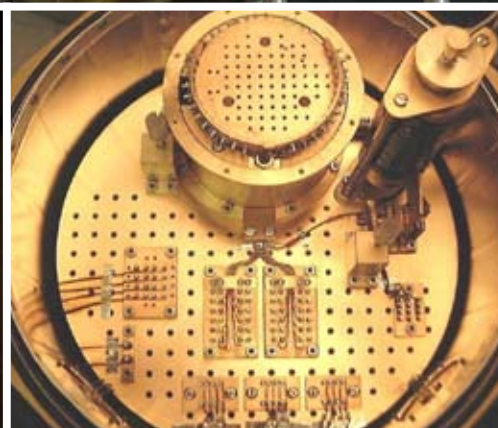
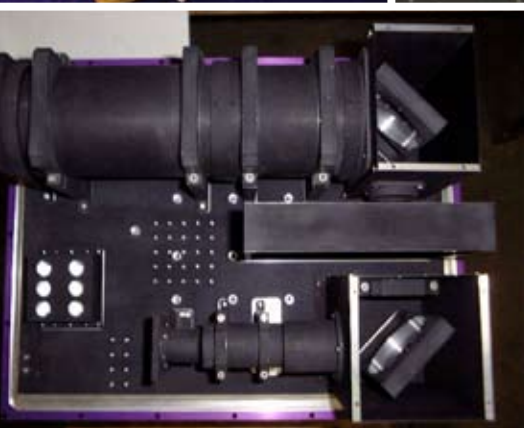
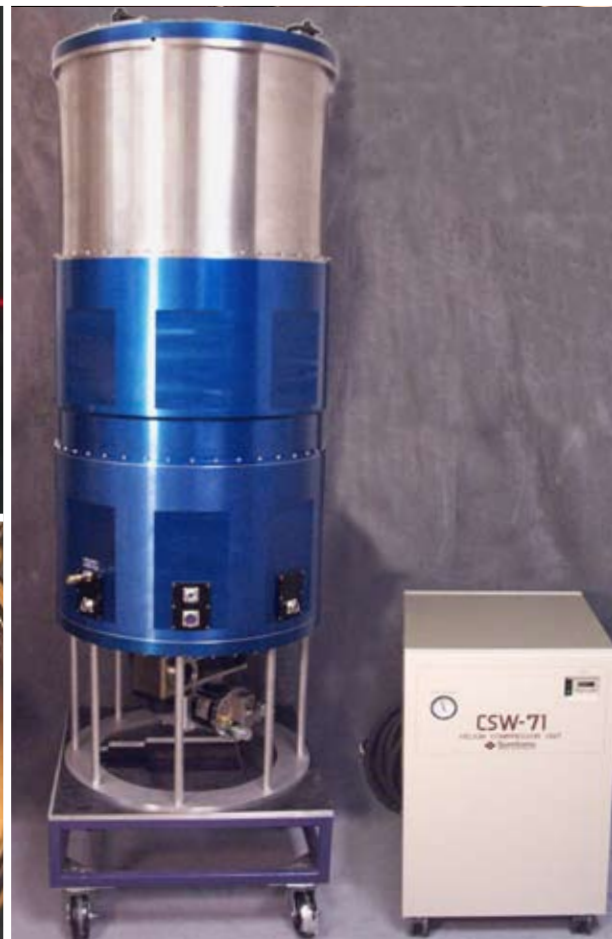
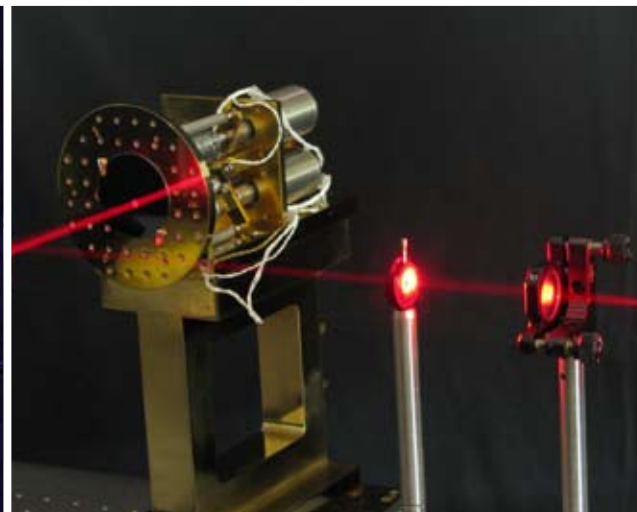
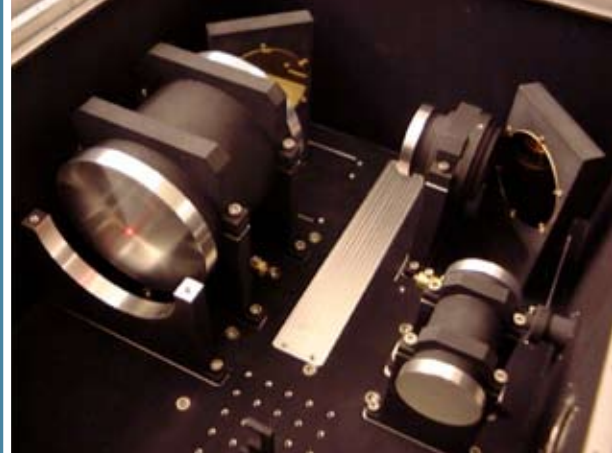


# Custom SYSTEMS



*Providing Custom Cryogenic  
and IR Imaging Solutions  
Since 1967.*

**IRLabs**  
Infrared Laboratories

**Infrared Laboratories, Inc.** was founded in 1967 by Dr. Frank J. Low, the Father of Infrared Astronomy. Since its founding, Infrared Laboratories has built over 4200 dewar systems and over 100 background limited imaging cameras used to detect the faintest objects in

our universe. Our custom systems meet the demands for the infrared astronomical, chemistry, solid-state physics, and material science communities. Infrared Laboratories has the capabilities and experience to meet your most demanding custom applications.

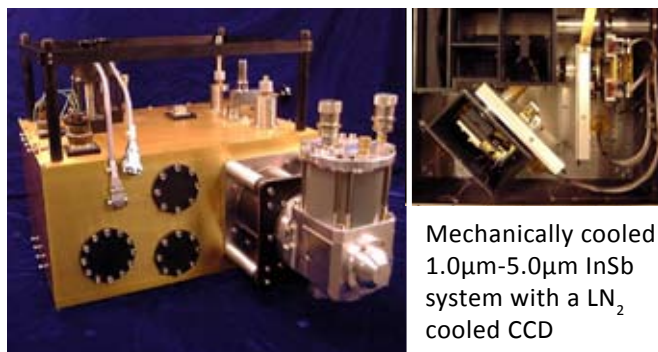
### Three Distinctive Capabilities to Meet Your Custom System Challenges:

#### Custom Cryogenic Systems

Our custom research and test cryostat capabilities include LN<sub>2</sub>, LHe, closed-cycle and cryogen-free cooling systems. Our extensive history provides us many proven designs to draw from to build a system uniquely suited to your needs. Although we can design and fabricate custom cryogenic systems of nearly any size, our standard dewar packages can be used as a baseline to reduce cost and program schedule. Our standard dewars range from 3 to 14 inches in diameter and can also be outfitted with rectangular extensions or other vacuum case geometries.

Our closed-cycle systems use the latest technology along with proprietary, low-vibration coupling to ensure your instruments will reach operating temperature without being subjected to the vibrations normally associated with closed-cycle coolers.

We have the solutions to meet your cryogenic requirements from room temperature to near absolute zero with increased hold times, increased work space, electrical feed-throughs and wiring, and IR window and filters.



Mechanically cooled 1.0 $\mu$ m-5.0 $\mu$ m InSb system with a LN<sub>2</sub> cooled CCD

#### Cryo-Mechanical

Infrared Laboratories has designed and built a variety of top quality custom cryo-mechanical components. We have extensive experience in building temperature controlled work areas, tip/tilt and translational stages, and manual and motor driven filter wheels and turrets (including cooled or uncooled optics). All of these can be integrated into completed systems that operate at cryogenic temperatures.

#### Camera/Imaging Systems

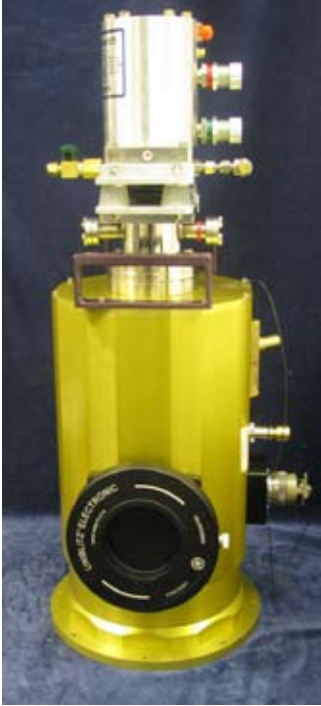
Infrared Laboratories has a long-proven history of expertise in the design and manufacturing of high performance IR camera systems, including many for background limited performance. Designs have included large format HgCdTe (MCT), InSb, and InGaAs focal plane arrays (FPAs), some of which are our proprietary FPA designs. Our IR imaging systems are designed, built, and integrated around your specific requirements, whatever your application may be. Please ask us about our custom image sensor capabilities. We are ready to provide complete turn-key IR camera systems from concept, through design, to complete manufactured system.



Internal Aperture Filter Wheel for InSb 1.0 $\mu$ m-5.0 $\mu$ m camera system



Internal cryo-motor driven 12 position filter wheel



**PRL 1.6M Pixel CCD Camera** for Echelle Spectrograph. This system, built for PRL, is an e2v 4k x 4k CCD low-vibration (~120nm rms) cryo-cooled camera system for their up-coming Echelle Spectrograph, which will be attached to their 1.2 meter Mt. Abu telescope in India.

**Wavelength Range & Detector**

0.300mm - 1.060mm/e2v CCD231-84 BI NIMO

**Temperature Requirements**

Minimum Stage Temperature: 120K, Minimum Operating Temperature: ~140K,  
Typical Operating Temperature: 163K

**Cryo Cooler**

ARS DE102F-X20 Ultra Low Vibration Closed Cycle Cooler

**Optical Specs**

Entrance Window: 80mm Clear Aperture A/R Coated Fused Silica,  
Mechanical Shutter: Uniblitz CS90

**AMICA** (Antarctic Multiband Infrared CAmera) an imaging camera that will support first-light testing for the IRAIT (International Robotic Antarctic Infrared Telescope). AMICA will be exposed to the extreme environmental conditions (Temp: -90°C) of Dome C on the Antarctic Plateau.

**Wavelength Range & Detector**

NIR/MIR: 2µm-5.5µm/7µm-25µm

**Temperature Requirements**

$T_{\text{cold plate}} = 3.5\text{K}-5\text{K};$

$T_{\text{NIR}} = 25\text{K}-35\text{K}; T_{\text{MIR}} = 4\text{K}-8\text{K}$

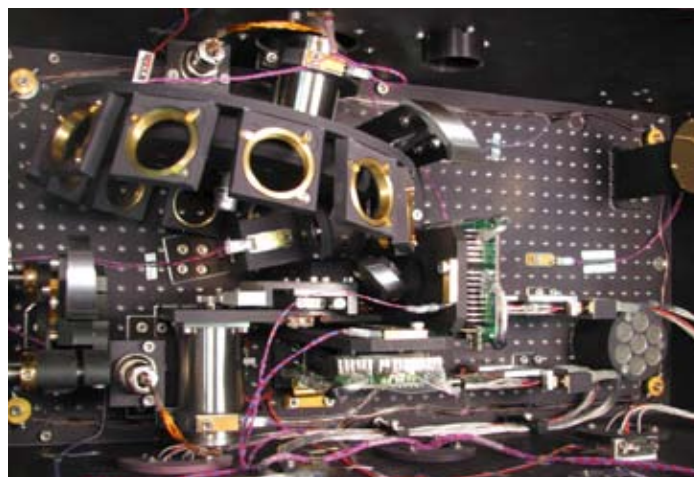
**Cryo Cooler**

Sumitomo RDK 408D2  
(GM Cooler); 1W@4.2K

**Optical Specs**

$\text{FoV}_{\text{NIR}} = 2.29 \times 2.29 \text{ arc-min};$

$\text{FoV}_{\text{MIR}} = 2.86 \times 2.86 \text{ arc-min}$





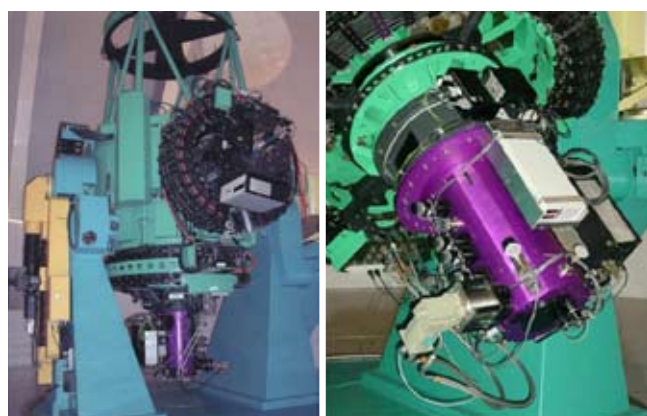
## Customer List (partial)

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Astronomical Research Cameras (ARC)  
 Arcetri Observatory  
 Ball Aerospace  
 California Institute of Technology (Cal Tech)  
 Canada-France Hawaii Telescope (CFH )  
 European Space Observatory (ESO)  
 Gunma Astronomical Observatory  
 International Business Machines (IBM)  
 Indian Institute of Astronomy (IIA)  
 Jet Propulsion Laboratory (JPL)  
 Max-Plank Institute for Astronomy  
 NASA Goddard Space Flight Center  
 National Optical Astronomical Observatory (NOAO)  
 Naval Research Laboratory (NRL)  
 Physical Research Laboratory (PRL)  
 Sandia National Laboratory  
 Smithsonian Astrophysics Observatory  
 Netherlands Institute for Space Research (SRON)  
 Space Telescope Science Institute (STScI)  
 Lawrence Berkeley Laboratory (UC Berkeley)  
 UK Astronomy Technology Centre  
 Universidad Nacional Autonoma de Mexico (UNAM)  
 University of Arizona  
 University of Hawaii



**Sandia National Labs**  
 16 liters of LN<sub>2</sub> provides >  
 60 hours for hold time @ 77K  
**Physical Dimensions:**  
 36in x 21in x 18in



**Japanese Gunma Observatory IR Camera System**  
 Consists of a mechanically cooled stage with a temperature controlled array mount and read-out electronics for 1024 x 1024 MCT Focal Plane Array.

**Wavelength Range & Detector:** NIR 1um to 2.5um /  
 1024 x 1024 MCT (HAWAII)

**Temperature Requirements:** T<sub>NIR</sub> = 77K

**Cryo Cooler:** Cryodyne CTI 1050 (GM Cooler); 80W@77K



**Canada-France-Hawaii Telescope**  
 256 x 256 MCT array camera system with 24kt gold surface exterior  
 Infrared Laboratories model ND-12 LN<sub>2</sub> dewar  
 5 liters of LN<sub>2</sub> provides >  
 60 hours for hold time @ 77K