Explore the Possibilities

National Aeronautics and Space Administration

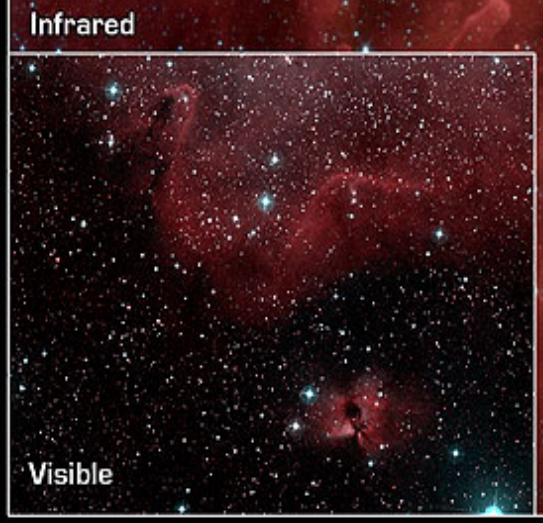
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

Astronomy and Physics Directorate Overview

Presentation to Industry Day

April 18, 2006

Dr. Jakob van Zyl, Director
Fred O'Callaghan, Program Manager



8TH BRIEFING FOR INDUSTRY

Astronomy and Physics Directorate

- The Astronomy and Physics Directorate defines, acquires, formulates, implements and operates activities associated with Astronomy, and Fundamental Physics, [programs and projects assigned to JPL].

  - provides support to the science community, both within JPL and outside, in areas aligned with directorate program and projects

  - advocates and advances associated technologies both from NASA and other sponsors

  - supports NASA and other agencies in the development and execution of strategic plans, and is responsible for the implementation of applicable portions of the JPL Strategic Plan

Astronomy and Physics Directorate

700
Jakob van Zyl, Director for
Leslie Livesay, Deputy Director for
Mike Werner, Chief Scientist
John Hong, Chief Technologist
Fred Vescelus, Chief Engineer

701
Spitzer
Robert Wilson (PM)
Mike Werner (PS)(AD)(7000)

703
SIM
Dave Gallagher (PM)
Jim Marr, IV (DM)
Mike Shao (PS)(3020)
Calvin Mitchell (PBM)(2507)

704
GALEX
Kerry Erickson (PM)
Chris Martin (PI) - Caltech

705
Voyager & Ulysses
Ed Massey (PM)
Ed Stone(Voyager)(PS)(1000)
Ed Smith(Ulysses)(PS)(3263)

706
WISE
Bill Irace (PM)
Peter Eisenhardt (PS) (3266)
Ned Wright (PI) - UCLA

708
Kepler
Chet Sasaki (PM)
Jim Fanson (DPM)
Nick Gautier (PS)(3266)
Roberta Martin (PBM)(2507)
Bill Borucki (PI) - ARC

709
AMT
Kirk Seaman (PM)
Greg Hickey (DPM)/(PT)
David Redding (PS) (AD) (3836)

710
Astrophysics Formulation Office
Moshe Pniel (PM)

711
Astronomy & Physics Competed Missions & Technology
Roger Lee (PM)

712
Origins & Astrophysics R & A
Jim Ling (AD) (3265)

713
ST7/DRS Project
Phil Barela (PM)
Bill Folkner (PT) (343R)

714
LISA Project
Moshe Pniel (DPM) (AD) (7100)
Tom Prince (MS) (AD) (1200)

715
JWST Support
David van Buren (3500)

716
Advanced Telescopes and Technology Office
B. Martin Levine (AD) (3020)

717
Sun-Earth Connections Mission Concepts
Neil Murphy (AD) (3263)
Marco Velli (LS) (3263)

718
NuSTAR Project
Perry Bankston (PM)
Fiona Harrison (PI) - Caltech

719
Distributed Spacecraft Technology
Fred Hadaegh (AD) (343H)

720
Astronomy & Fundamental Physics Experiments Office
Fred O'Callaghan (PM)
John Wellman (DPM)
Ulf Israelsson (PS)

721
Special Projects
John Wellman (AD)

722
Herschel/Planck Projects
Peg Frerking (PM)
Hal Yorke (Herschel) (PS) (3260)
Charles Lawrence (Planck)(PS) (3265)

724
LCAP Project
David Seidel (PM)

725
MIRI Project
Graham Bothwell (PM)
Michael Ressler (PS) (3266)

730
Navigator Office
Mike Devirian (PM)
Dan Coulter (DM)
Wes Traub (PS) (3200)
Jim Breckinridge (TT)
Debby Padilla (PBM) (2507)
Fernando Tolivar (PEngM)

731
Keck Interferometer Project
Ben Parvin (PM) (AD)
Ben Parvin (DPM)

732
LBTI Project
Ben Parvin (AD)

733
TPF-C Project
Dan Coulter (PM) (AD) (7300)
Wes Traub (PS) (3200)
Jennifer Dooley (PT) (3830)

734
TPF-I Project
Dan Coulter (PM) (AD)
Chas Beichman (PS) (AD)
Peter Lawson (PT) (A) (3830)

780
Business Operations Office
Charlie Hicks (DBM) (2507)

781
Business Administration Office
Katie Richards (M)

790
Astrophysics Science Centers
IPAC: George Helou
SSC: Tom Soifer
MSC: Chas Beichman

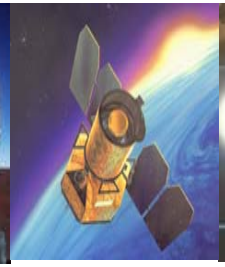
A	=	Acting
AM	=	Acting Manager
AD	=	Additional Duty
CS	=	Chief Scientist
DM	=	Deputy Manager
DBM	=	Directorate Business Manager
LS	=	Lead Scientist
M	=	Manager
MS	=	Mission Scientist
PBM	=	Program/Project Business Manager
PI	=	Principal Investigator
PM	=	Program/Project Manager
PS	=	Program/Project Scientist
PEngM	=	Program Engineering Manager
PT	=	Project Technologist
TT	=	Theme Technologist
(#)	=	Home Organization

2/27/06

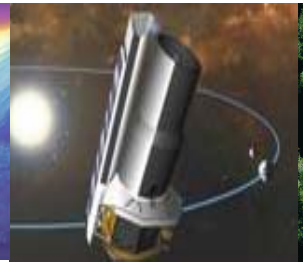
Jakob van Zyl — Date
Director for, Astronomy and Physics Directorate

Astronomy Missions

Keck Interferometer

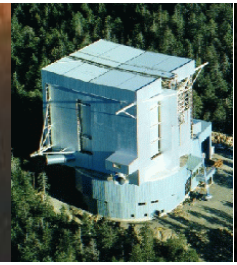


Galaxy Evolution Explorer



Spitzer Observatory

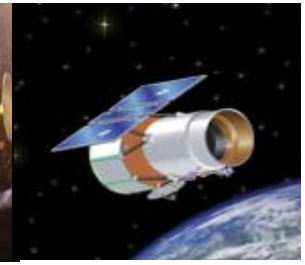
IR astronomy/astrophysics



Large Binocular Telescope

Kepler

Visible wide field planet finder (occultation)



WISE

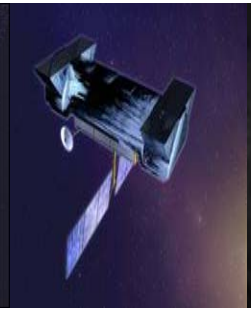
Wide field IR (0.6-28um) survey

Herschel

3.5m IR-FIR telescope

Planck

CMB Science

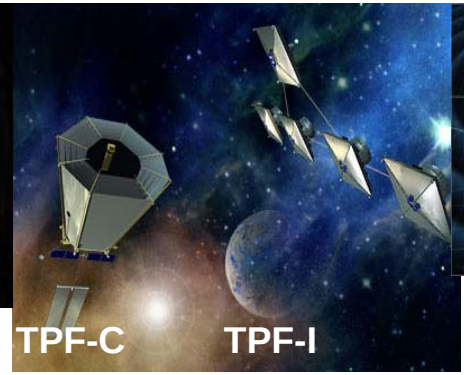


SIM

9m visible interferometer (microarcsecond)

JWST / MIRI

(MIR cryo camera)

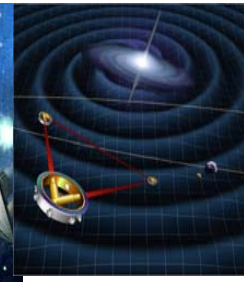


TPF-C

~8m visible coronagraph

TPF-I

~40-60m MIR formation flying nulling interferometer



LISA

3 S/C with free flying proof masses & laser metrology

Explore the Possibilities

Science / Missions

	CMB Pol	Dark Energy	Extrasolar Planets		Gravity Waves	IR Astrophysics
Science	Measure the curl component of CMB polarization (~uK)	Survey Type Ia Supernovae & Gravitational Weak Lensing to measure inflation	Direct Imaging and Characterization of planets orbiting stars		Direct detection of gravity waves due to Big Bang and other sources	Broad astrophysics spanning MIR to submm (formation and evolution of stars/galaxies/planetary systems, characterization of ISM, ...)
Wavelength / Frequency	30-500 GHz	0.35 - 1.7 um	0.4 - 0.9 um	7-17 um	30M meters / 10 mHz	20 - 1000 um
Mission	Inflation Probe (Beyond Einstein)	Joint Dark Energy Mission	Terrestrial Planet Finder (TPF-Coronagraph)	Terrestrial Planet Finder (TPF-Interferometer)	Laser Interferometer Space Antenna	Single Aperture Far InfraRed Telescope
Instruments	3-4 m telescope with cooled aperture (~40K); antenna coupled bolometric polarimeter array or HEMT polarimeter array	2 m aperture telescope with wide field of view (~1 sq deg); Billion pixel visible/NIR focal plane array	4x8 m high fidelity visible telescope with high contrast imaging corograph	40-60 m multiple element PFF nulling interferometer	3 S/C constellation flying 5M Km apart with S/C to proof mass distance controlled to 10 nm	10 m aperture with cryocooled optics to 4K; large format bolometric arrays (1000-10,000 pixels; space background limited)

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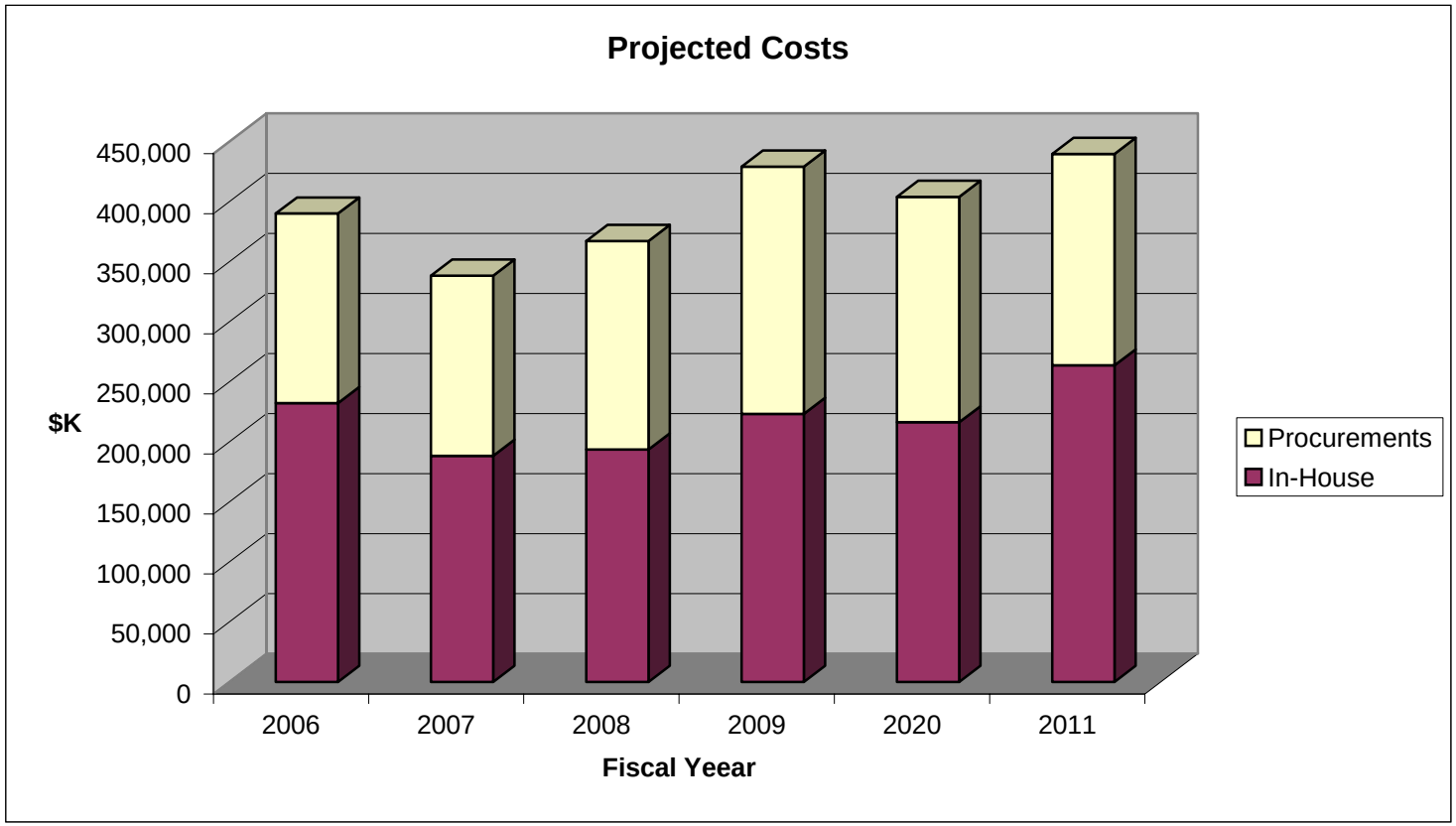
Astronomy and Physics Directorate

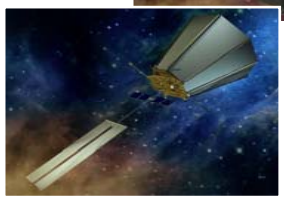
Industry Day, 2006



Fiscal Year	2006	2007	2008	2009	2020	2011
In-House	232,329	188,370	193,586	223,320	216,245	263,579
Procurements	157,664	149,919	173,590	205,798	187,722	176,075
Total Costs	389,993	338,289	367,176	429,118	403,967	439,654

Explore the Possibilities

Summary of NASA's Planet Finding Missions



TPF-C/I

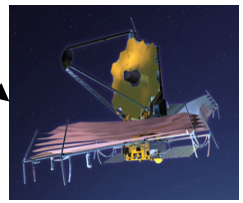
- Characterize temperature, size, composition of other Earths
- Look for signatures of Life

Find Nearby Earths & Life

SIM

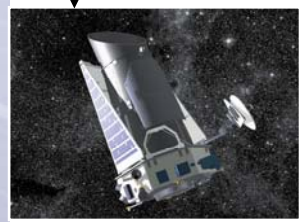
- Search 250 *neighboring* stars for Earths (<50 l. yr.)
- Architecture of systems
- Masses and orbits

Distant Planets



JWST

- Image Jupiter's within 5 pc
- Image disks and distant hot young Jupiter's
- Follow–up Kepler "Jupiter's" with spectroscopy



Kepler (2008)

- Transits to identify Jupiter's → Earths around 100,000 distant Suns (<1,000 l. yr.) to determine incidence of Earths

Keck (2006)

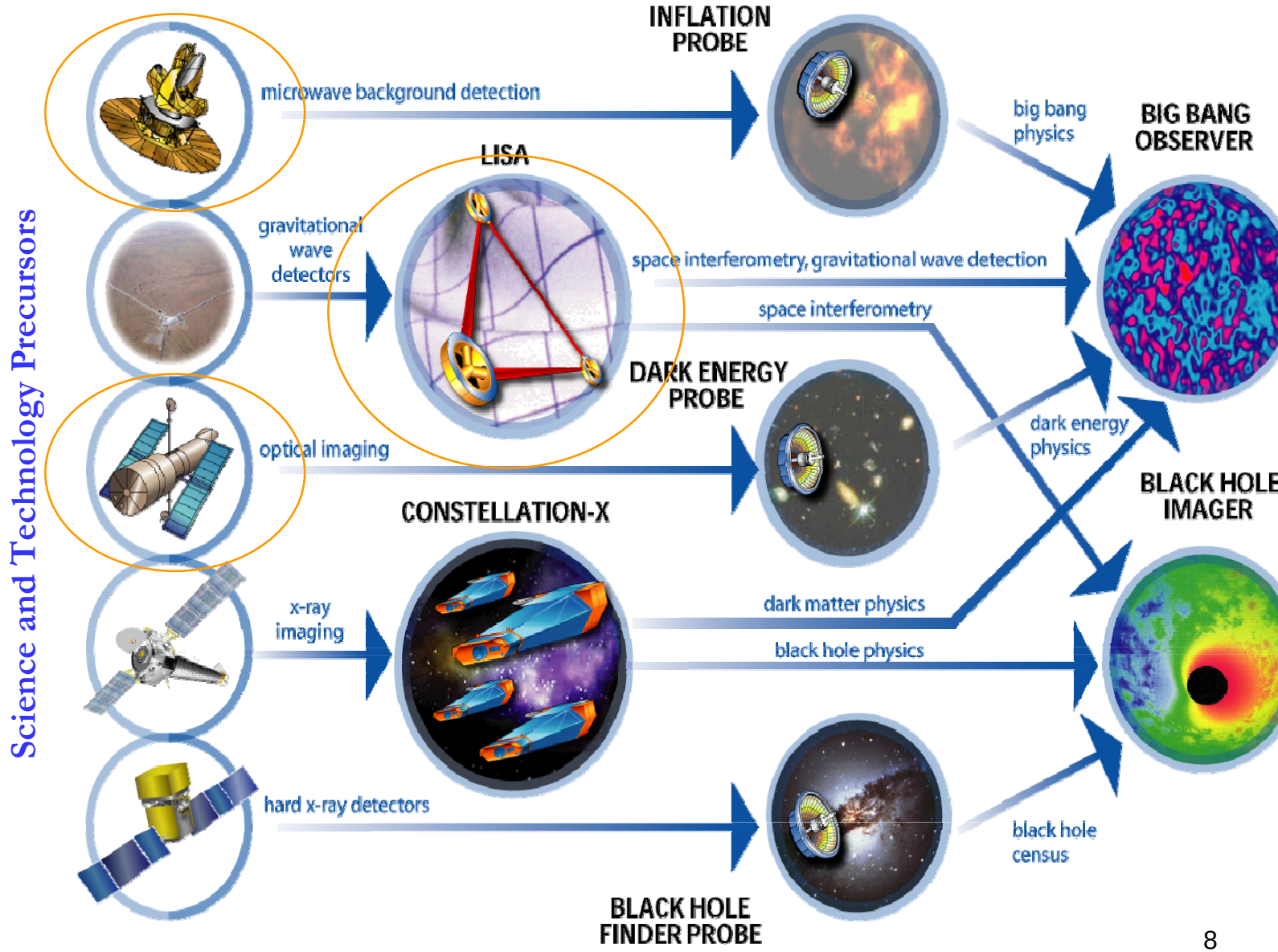
- Dust disks at 10 zodi to 0.01" for nearby stars

LBTI (2008)

- Dust disks at 3 zodi to 0.5" – 25" for nearby stars

Explore the Possibilities

Structure & Evolution of the Universe Roadmap - Beyond Einstein Initiative



Explore the Possibilities

Astronomy Directorate Key Technology Areas

- Collecting Apertures
- Wavefront Sensing and Active Control
- Detectors
- Precision Structures
- Electronic Systems (Flight & Ground)
- Cryogenics
- Formation Flying

Industry Day Summary

- A significant portion of the work in APD is shared with our industrial partners
- Our work is scientifically exciting, and technologically challenging, particularly in the areas of optics, structures, control systems, and instrumentation
- APD looks forward to, and depends on, contributions from many organizations in successfully completing our missions

Thanks for listening