James Webb Space Telescope
Project Science
Update for the JSTUC, Sep 14, 2017

John Mather
JWST Senior Project Scientist
NASA's Goddard Space Flight Center

on behalf of 7 billion current Earthlings, ~10,000 future observers, ~ 1000 engineers and technicians, ~ 100 scientists worldwide, 3 space agencies

JWST Project Science Team at Goddard

Mather

Senior Project Scientist
Deputy Senior Project Scientist
Deputy Senior Project Scientist/Technical

Gardner

Niedner

Straughn

Deputy Project Scientist for Communications

Deputy Project Scientist for Planetary Science

Milam

McElwain

Greenhouse

Sonneborn

Kimble

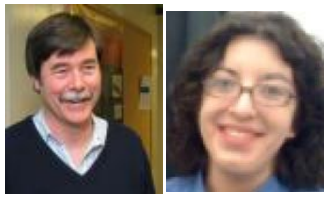
Observatory Project Scientist

ISIM Project Scientist

Operations Project Scientist

I&T Project Scientist

Deputy Observatory Project Scientists



Bowers & Smith

Deputy ISIM Project Scientist

Rauscher

Deputy Operations Project Scientist

Rigby

Microshutter PI

Moseley

GSFC Project Scientist Roles and Responsibilities

- Advise Project Manager (Mather, Deputy Gardner, Technical Deputy Niedner)
- Chair Science Working Group (Mather, Deputy Gardner)
- Defined and documented detailed scientific requirements
  - Scientific Requirements Document (SRD)
  - Space Science Review article (PDF online)
  - Science Requirements Analysis Board (SRAB) to manage possible changes (Niedner)
- Work side by side with management and engineering teams to ensure requirements are met. Accept single point accountability to me for the science performance of their mission elements:
  - Telescope/Spacecraft/Sunshield (McElwain, Deputies Bowers & Smith)
  - ISIM (Greenhouse, Deputy Rauscher)
  - Integration and Test (Kimble)
  - Operations (Sonneborn, Deputy Rigby, Planetary Science Milam)
- My PS staff has authority commensurate with the above accountability.
- Deputy Project Scientist for Communications (Straughn)
- PI for NIRSpec detectors (Rauscher)

Also essential (not members of official GSFC PS team):

- PI for NIRSpec microshutters (Moseley, GSFC, competitively selected)
- PI for MIRI detector system, NASA Project Scientist for the MIRI (Ressler, JPL)

Project Science (GSFC) Activities

- Weekly coordination meeting with all Project Scientists (OSWG)
  - Chaired by M. McElwain
  - Actions tracked by C. Bowers
  - Ensures awareness of technical issues and current meetings
- I have weekly tagups or telecons with:
  - Project Manager, Program Scientist (Smith, deputies Hasan & Sheth, with Gardner & Niedner), each Project Scientist
- Project Science Team works with STScI
  - Mather telecons with STScI Director and Mission Head (Sembach, Stiavelli)
  - Thursday telecons on operations
  - GSFC science visits to STScI
    - Flight & Science operations, planning/scheduling, calibration pipeline, science policy: discuss progress, issues, and testing
    - Observatory, discuss systems engineering, optics (M. Mountain as Telescope Scientist keeps team at STScI), preparations for in-flight checkout
    - Participation at monthly Project-STScI "Roundtable" meetings
    - Outreach, coordinate events, materials, and web updates

JWST SWG

- Chair: Senior Project Scientist
- Reporting: Program Scientist (HQ), Project Manager (GSFC)
- Membership: IDS's, instrument leads, Telescope Scientist, ex officio
- Responsibilities
  - Advise on all matters affecting science
    - Requirements and goals
    - Advises SRAB on descopes, threats to requirements, requirements changes or requirements waivers
    - I&T questions – on request and presentation from Project Scientist team
    - Policy issues regarding GO, GTO, proprietary time, etc. (advisory to Program Scientist)
    - Coordinate GTO plan
    - Respond to specific questions from Program Scientist or Project Manager
  - Outreach: professional outreach, white papers, conferences, media outreach and public talks
  - Carry out research proposed at selection in 2002 (IDS's, TS)
- Meeting schedule
  - 2x/yr face to face, 1/yr electronic meetings
  - Weekly telecons on rotating list of topics
  - Recent meetings: Dec. 7-8, 2016, STScI,; May 4-5, 2017, STScI; next Jan. 8, 2018
  - Larger science community, monthly telecon

JWST Science Working Group (#4)

- Chartered by HQ, advisory to Program Scientist (E. Smith) and Project Manager (W. Ochs)
- 6 Interdisciplinary Scientists (IDS's): H. Hammel, S. Lilly, J. Lunine, M. McCaughrean, M. Stiavelli, R. Windhorst
- Instrument Team Lead/ Science Representative: M. Rieke (NIRCam), G. Rieke and G. Wright (MIRI), Chris Willott (NIRISS science rep), & Marijn Franx rotating scientist member, NIRSpec
- Telescope Scientist: M. Mountain
- Ex Officio: J. Mather (Chair), J. Gardner, M. Greenhouse, N. Lewis (replaced Kalirai), M. McElwain (replaced M. Clampin), M. Niedner, G. Sonneborn, P. Ferruit (replaced Jakobsen), R. Doyon (replaced Hutchings)
- Moves: Lilly at ETH, Zurich; McCaughrean is Head, Research & Scientific Support Department (SRE-S) at ESA HQ; Hammel Exec VP of AURA. Stiavelli JWST Mission Head, STScI; Mountain Pres of AURA; Kalirai promoted within STScI

JWST Science Working Group

John Mather,
Senior Project Scientist,
Chair

Mike McElwain,
Observatory PS

Rene Doyon,
CSA PS

Pierre Ferruit,
ESA PS

Nikole Lewis
SOC

Marijn Franx,
NIRSpec Science

Jonathan Gardner,
Dep Sr PS

Matt Greenhouse,
ISIM PS

Heidi Hammel,
IDS

Simon Lilly,
IDS

Jonathan Lunine,
IDS

Mark McCaughrean,
IDS

Matt Mountain,
Telescope Scientist

Mal Niedner,
DSPS/Technical

George Rieke,
MIRI Science Lead

Marcia Rieke,
NIRCam PI

George Sonneborn,
Ops PS

Massimo Stiavelli,
IDS

Rogier Windhorst,
IDS

Chris Willott,
NIRISS Science

Gillian Wright,
MIRI European Lead

Current Observatory Activities

(McElwain, Niedner, McElwain, Bowers and Kimble)

- **OTIS** = Optical Telescope Element + Integrated Science Instrument Module
  - Post-environmental ambient testing of integrated assembly
  - Stray light inspections of telescope's thermal blanket closeouts
  - Cryogenic testing of the flight unit at JSC, ongoing!
  - Reviewing contamination control results and procedures
  - Project Science team actively supports the execution of JSC test in a variety of roles: Test Director, Optical Test Conductor, and ISIM Representative shift support, lead of Independent Verification Team, member of OTIS CV Lead Steering Committee and Daily Test Configuration Board
- **Deployment**
  - Project Scientists to observe deployment tests at NGAS

Operations Planning

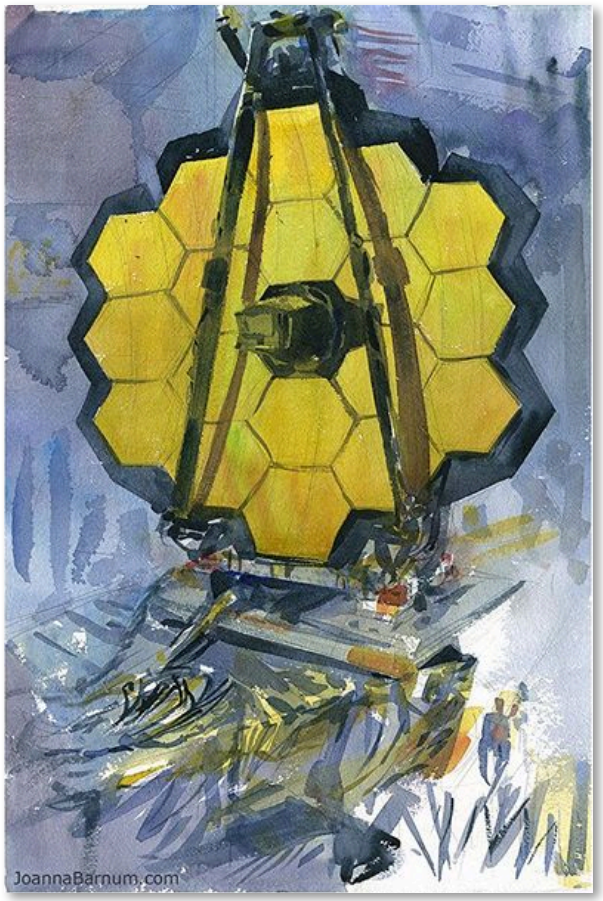
- Sonneborn and Rigby ensure flight readiness for all steps from test support to calibrated data release
- Review every JDox (JWST Documentation) page before publication; Wrote and edited webpages now live at https://jwst-docs.stsci.edu/display/JTI
- Mission Operations Review in Apr 2017. Worked extensively with STScI on content, dry runs.
- Reviewed ERS Call for Proposals
- Worked with STScI on releasing the ETC (v1.0, v1.1)
- Wrote user tool to calculate backgrounds for JWST — STScI will make available to community
- Held SI Commissioning Summit with STScI to walk through SI commissioning plan with PIs, PS team
- Working with STScI to identify opportunities for efficiency gain.

SRAB (Science Requirements Analysis Board)

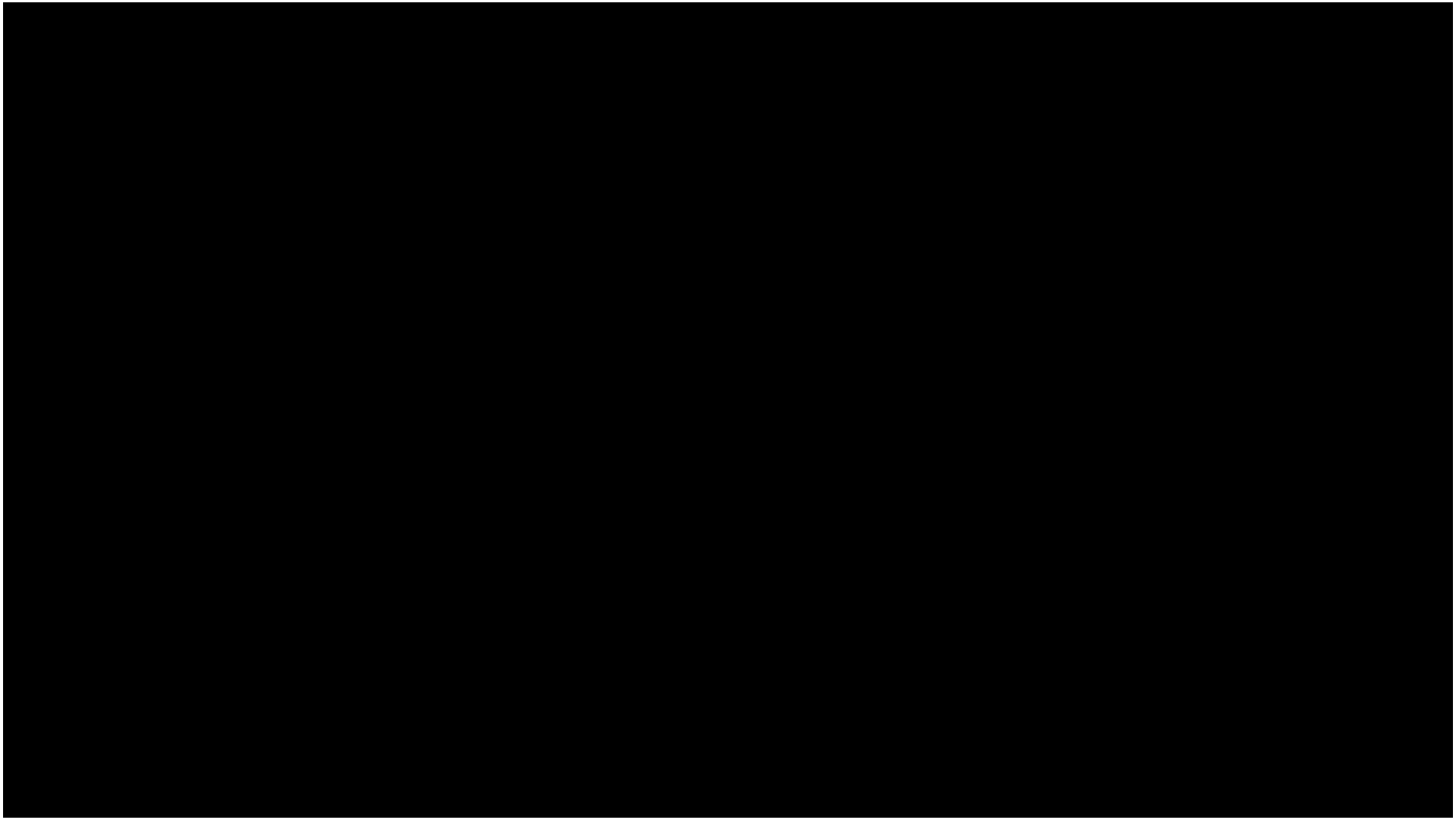
- Created May 2008 by Mather
- Chaired by DPS/T (Niedner) on behalf of Senior Project Scientist
- Board consists of the JWST Project Science Team
- Receives alerts on possible failures to meet scientific requirements
- Analyzes consequences, considers alternatives, briefs the Science Working Group
- Considered so far: wavefront sensing requirements, NIRCam wavefront accuracy, pointing stability requirements, MIRI sensitivity requirement, revisions to Science Requirements Document as result of TF conversion to NIRISS, encircled energy stability requirement, field of regard
- Many other topics remained as engineering issues with Project commitment to meet requirements: e/g: stray light and jitter (see Clampin reports)
- Expected future topics: test results from I&T at JSC, Northrop Grumman, (rapid response required)

Communications

- Highlight: Media Day Nov. 2 w/ Admin. Bolden
  - 30+ journalists from USA Today, NYTimes, Washington Post, Reuters, Av Week, etc.
  - Supported by News Feature from GSFC & 2 new videos
  - Resulted in over 30 stories including NYTimes, BBC, CBS, Space.com, Business Insider, Popular Science etc.
  - Social Media views/impressions: 1.4 million
- Highlight: JWST Artist Social
  - 23 artists, 4 NASA speakers
  - artists spent 2.5 hours in front of the mirror creating
  - Art collected in Storify & Flickr galleries
  - Held Artist Exhibition at GSFC Visitor Center
  - Social Media views/impressions: 1.4 million+ with sustained new interactions
- Amber Straughn as Communications Scientist, with Laura Betz of PAO
- Media coverage very positive
- Communications Implementation Plan up-to-launch now in work



See more:
https://storify.com/JWSTFan/jwst-artist-event



Summary and Conclusions – Still good!

- JWST science teams deeply and actively engaged in technical efforts worldwide
- All engineering teams have assigned scientific contacts
- Scientific performance codified in the Science Requirements Document (2003, latest revisions in July 2012) and published in Space Science Reviews (2006) still expected almost everywhere.
  - Image quality as expected
  - Stray light meets spec, thanks to serious work by many many people
  - Pointing stability supports image quality
    - Non-sidereal tracking enabled for non-linear track rates sufficient for solar system objects at or outside the orbit of Mars
  - Instrument payload (ISIM) compliant with all baseline science performance requirements, including sensitivity
  - Solar System observable from Mars outwards
  - NOTHING IN TEST PROGRAM TO DATE CHALLENGES SCIENTIFIC PERFORMANCE