

Notes from LUVOIR First Telecon
April 5, 2016, 3-4 pm
Full attendee list at the end of the document

Brad Peterson welcomes everyone.

Paul Hertz welcome: Thanks everyone. Four well studied mission concepts. Look at charter on HQ website (<http://science.nasa.gov/astrophysics/2020-decadal-survey-planning/>). Provide a mission concept study with a compelling science case, an existence proof that there is such a mission that can answer those questions.

Technology gap assessment, DRM, NASA cost assessment to figure out a cost box. \$1B, \$2B, \$3B, etc. So, sounds like \pm \$1B. We never build the mission that was proposed. So, this is not an exercise to design a mission that will be built. Rather, show an existence-proof once we decide. Will have to do trades. Notional collecting area. Find sweet spot to answer science objectives.

Not a competition. Four compelling mission concepts to the Decadal Survey. They should prioritize the science. This is a collaborative process. We have bridging activities to look at areas of commonality, science output, etc. Set-up cross-bridging between activities. Capture efficiencies. We explain our ideas of how we are going to do this. Management Plan (on HQ website) is a living document. 1st deliverable: feedback on how we should change the management plan.

HQ is going to step back now that the STDTs have been established. Mario Perez and Erin Smith are programmatic resources. 24 appointed members of this STDT. Paul retains the authority to approve more STDT members. Open and transparent process. Lots of outreach to the community as you do study. ITAR stuff needs to be protected. Difficult issues will be handled by Debra, Brad, and Aki. Community Studies will be ongoing. STDT members come from the community. Goddard is playing a supporting role. Term of duty is up when we have given Decadal committee everything they want. Questions?

Gary Blackwood on the HQ management plan: Aki will bring up my slides <slides>. Thank you for inviting me to talk about the management plan. Hopefully, this will frame some of the management questions enabling you to do science. I am the Program Manager for Exoplanet Exploration. Mooni (Mansoor Ahmed) is my counterpart for Cosmic Origins and Physics of the Cosmos.

On page 14, the deliverables are described. These are the products that the STDT has to deliver by 2019. The M1 and M2 milestones are to comment on our management plan and give us your detailed study plan. We have paced the work with intermediate milestones. The third track is technology. Prioritizing technology gaps is Optional Deliverable 1. I recommend you do this since you can influence the distribution of funds to build technology to enable your science. The M1 milestone accepts inputs from the STDTs to modify the management plan. It will be implemented by the end of May.

Let's go to page 17, the "how". The Study Team is the union of the STDT and the Study Office.

Brad and Debra lead the STDT and the Study office is managed by GSFC by Julie Crooke. The liaison is Aki. The products are received by Andrea Razzaghi at HQ. The chairs are responsible to its managers but are free to do their work. The STDT sets the priorities for the Design Team.

Look at page 19, the study team detail. The members of the STDT are led by its chairs and include ex officio members and observers. On page 20, you see the roles. The community chairs lead the STDT and are accountable for the products. The Center Study Scientist Aki Roberge is the interface between the STDT and the Study Office/Center Engineering Team. Aki is accountable to Julie as well as Brad and Debra. It may be that the STDT chairs may delegate some decisions to Aki at low/medium levels.

Study Team leadership = 2 community chairs (Debra, Brad), center study manager (Julie Crooke), center study scientist (Aki). The APD program scientists = Mario Perez, Erin Smith; Program Chief Scientists for COR = Susan Neff, Debbie Padgett. Other people who may be important: Moonie, Program Manager - gets your resources in order. Moonie and I will work together to get Paul Hertz's goals implemented. We will share resources and bring things forward for the two overlapping concepts (HabEx and LUVOIR). Also reach out to COR chief technologist Bernie Seery and chief engineer Gabe Karpati.

If you have questions, team members should contact the chairs, Aki, or Julie. If you really require a call, call Program Office scientists Susan and Debbie or the Program Scientists Mario and Erin. What is the Decadal Studies Management Team (DSMT)? That is the membership at HQ plus Program Office people. This group meets weekly to anticipate your needs and be on the receiving end of the products you produce. Andrea Razzaghi and Jeanne Davis from HQ chair this committee. Page 34 describes the different roles; Andrea and Jeanne are there, plus Rita Sambruna, who will keep an eye on all this for Paul. On Page 42 are near term deliverables. The M1 is due 4/29 to Andrea. We will review this in May and publish before the AAS. Please hit the technology option as well for technology gap identification. August 26 is the actual deadline for the M2. Questions?

Mario Perez: Thank you. Erin Smith and I will be helping you from HQ <slides>. The first slide talks about your audiences. Among these, the media already has published several articles about the Decadal Studies. If they approach you for general comments on the STDT, answer freely. If they ask general questions about NASA, inform us. There are many outlets that want to change things, so be warned. The stakeholders: NASA is one, US Congress, Foreign Space Agencies, Science and Space Communities. Customers: National Academy of Sciences is the only customer.

The next point I want to make is that NASA has done several STDTs recently (Exo-C and Exo-S; WFIRST). Please familiarize yourself with these studies. LUVOIR Science - consider Cosmic Origins science relevant in the 2030's, presuming WFIRST and JWST have flown. I just attended a talk by Jason Kalarai on COR science after JWST that presumed ELTs, ALMA, etc.

The next issue is technology. The STDTs are critical to identify technology gaps to enable this science. Get industry involved, although export control (ITAR) is very important. Most technologists are well trained on this but if you need training NASA can provide it.

The last topic is the Program Office. The Chief Scientists are Susan Neff and Deborah Padgett. The Program Office is an arm of HQ. They are a bridge with the COPAG and EXOPAG and other interest groups. They are a resource for the STDT, as we are. Questions?

Debra Fischer: Prof. of Astronomy at Yale, working on Exoplanets since 1997. Now working toward detecting exoEarths. I hope to complement the COR expertise of Brad Peterson. Thank you for volunteering! I signed up because it will be a great learning experience with this great set of people. The good thing is that we are not PIs on a mission, not a competition, so we can think creatively and collaboratively with the other STDTs. We will establish science working groups in the next few weeks. We want broad community input. How can we be most successful in soliciting ideas from the community?

Brad Peterson: Emeritus at Ohio State. This will be fun and rewarding. The work will run up really fast. There are early deliverables. By June, I want to have populated the Science Working Groups, and ID 3 notional instruments to help define the technology tall poles. We should also try to define additional instruments as backup to the original instruments. I want to focus on this by the end of June. Questions?

Dave Redding: You mentioned science working groups. There is a technology deliverable by the end of June and will there be a technology working group?

Brad: Yes - we will talk about this at the face-to-face meeting.

Debra: Look at the HDST study and ATLAST report as homework.

Brad: That's where we will start our discussion. We don't need to reinvent the wheel.

We want to take the opportunity for everyone to introduce themselves. Name, institution, science, what do you think about when you think about LUVOIR.

Debra: LUVOIR is a really grand mission - 16 meter telescope parked at L2, segmented, to serve humanity for a century. It will take us where we have never been before. It should be serviceable with a vigorous astronaut program.

Karl Stapelfeldt: JPL; new Program Chief Scientist for EXEP. My vision is going back to the TPF and ATLAST; science to characterize a meaningful sample of exoplanets. I share Debra's vision of an upgradable telescope whether robotic or human serviced. I hope we can come to consensus with HabEx and share the work.

Brad: 12 -15 m telescope UV to IR; Needs to be serviceable and upgradable. I like high-resolution spectroscopy; I would like to get spectra of Cepheids everywhere in the universe.

Jacob Bean: I am excited about taking spectra of habitable planets around nearby stars.

Daniela Calzetti: Interested in star formation at all scales; 20 m telescopes which can see star

forming regions in $z=8-10$ galaxies.

Bekki Dawson: Penn State: Interested in habitable planets in the context of their formation sites

Lee Feinberg: GSFC; I see LUVOIR as a 20 m assembled telescope or 9.4 m in Delta IV heavy.

Brad: A SLS might be better!

Kevin France: U Colorado; Am interested in detection of Earthlike planets, but also where the planets come from and understanding of the host star. I'd like to be a user of this telescope, not just a committee member!

Jay Gallagher: U Wisconsin; I want LUVOIR affordable and very powerful with strong resolution and sensitivity. Want to look at compact star forming regions. I want serviceability but also to be affordable.

Olivier Guyon: U Arizona (JAXA as well;) My background is coronagraphy. I would like LUVOIR to find biomarkers on Earthlike planets. Wavelength coverage and complementarity with other facilities are my goals.

Walt Harris: U Arizona / LPL. Interested in 10+ meter range telescope that would deliver Voyager class imaging out to Pluto. UV capability would help us to monitor energetic events in the solar systems. The sensitivity would allow us to detect Kuiper belt objects at many size scales.

Mark Marley: NASA Ames; exoplanets; I think it is crucial to characterize all types of planets – runaway greenhouse Venus-like planets are interesting too.

Vikki Meadows: U Washington; exoplanet atmospheres interacting with biospheres. Time dependent spectroscopy is important. 12 m class should enable this.

Leonidas Moustakis: JPL; research is observational cosmology; I am exposed to exoplanet and star formation science as well. Interested in a variety of problems; spectroscopic observations over time; excited about communicating with the community.

John O'Meara: St. Michael's College; extragalactic; keep the "LUV" in LUVOIR; keep the UV alive! Want to understand the last 10 billion years of galaxies.

Illaria Pascucci: U Arizona / LPL; I am interested in how planets form and the diversity of planetary systems. Want to image and do spectroscopic observations of planets in habitable zones.

Mark Postman: STScI; I am glad to be on this committee. Am interested in large-scale structure and the ultra faint universe down to mag 35. This sort of capability works well with exoplanet interests as well.

Laurent Pueyo: STScI; I am working on large surveys for finding exoplanet and disks. Am involved in HST and WFIRST. Really excited about LUVOIR since we can get an optimal designed telescope for coronagraphy!

Dave Redding: JPL; background is engineering; designing telescopes: wavefront control, mirrors of all types. Hope to bring a broad perspective to this team to find lowest cost, highest performance solution.

Jane Rigby: GSFC; I am a Project Scientist on JWST, so have experience on trades to maximize science. My interests are galaxies and AGN, have studied lensed galaxies at high z. LUVOIR will do this kind of study for thousands of galaxies, not a few. Makes me think about the diagnostics from lensing for the transformative science of LUVOIR.

Aki: GSFC; Center Study Scientist; research is on planet formation and debris disks. My interest here is to study and understand the diversity of worlds, especially rocky ones. Would be hella excited to find biomarkers. I want to understand planetary systems: planets, stars and asteroid belts. How does all this diversity arise?

Britney Schmidt: Georgia Tech; Planetary scientist and astrobiologist. I am interested in linking solar system objects with exoplanets and debris disks. As a planetary scientist I am happy to work with astronomers.

David Schiminovich: Columbia; galaxy IGM and UV instruments. HST at 2.4 m is still able to detect things much too faint for large GB telescopes. A 12 m telescope would blow away the ground based telescopes. We need a UV telescope that can also find exoEarths.

Brad: I am really jazzed to work with all of you!

Aki: Want to give you an overview of how we will get this work done. <slides> Key members of the study office: myself - as interface; Julie Crooke - Study manager, day to day management, call me anytime; deputy study scientist - Shawn Domagal-Goldman, member of HabEx STDT (deliberate choice), helps Julie and Aki with everything. Norman Rioux is the lead engineer. Matt Bolcar chief technologist.; Avi Mandell - science support and on Standards Team.

Science/Engineering Interactions: One particular science case - exoEarth observation; science objectives -> measurement requirements -> observation requirements -> observatory systems designs and operations concepts -> simulated data sets -> simulated measurements -> simulated science objectives. In the real world, this is an iteration. There could be a slide like this for any science case.

We have a public website now; team member lists, information, etc. (<http://asd.gsfc.nasa.gov/luvoir/>). We have a LUVOIR seminar series, approximately weekly. Science and technology topics, remote presentations are welcome. We will call on you to present or you can assign students and postdocs. Drop an email to Shawn for this.

Shawn Domagal-Goldman: I am Aki's deputy. I will help her with meeting technology needs. I

work on characterizing rocky planets and false positives for biosignatures.

Aki: Our first face-to-face meeting is May 9-10. We have a registration page on the website, so register! (http://asd.gsfc.nasa.gov/luvoir/events/stdt_reg.php)

Brad: we may have a couple of more telecons before then that will be short, perhaps an hour. We will do a doodle poll to decide when to do this.

Brad: Does anyone have questions?

Jane: I suggest that we nail down F2F meetings for the next year. It would be helpful to know what days are under consideration.

Brad: We'll take that as an action.

Marc Postman: Do we know anything about the Standards committee for exoplanets?

Aki: Still under discussion. It probably needs a full-length discussion just on that topic. What happened during the recent Exo-C and Exo-S probe studies was that we found at the end it was near impossible to do an apples-to-apples comparison of planet yields. The ExoPAG foresaw that this would happen with HabEx and LUVOIR. They suggested yield of discovered planets would be a metric calculated by an independent Standards team. Avi Mandell (GSFC) is on the team. It is unclear how much service the team will provide to the STDT due to lack of resources and time.

Gary Blackwood: I would be glad to talk with you or your team on this topic. Paul has limited funding. I am funding this team this year from the PO. I would be happy to talk with any of you on this subject.

Dave Redding: Olivier will be having a meeting at JPL May 5-6 on high contrast with segmented apertures. If you are interested, please email me!

Brad: We have reached the allotted time. Thank you all!

Partial Attendee List: Aki Roberge, Alina Kiessling, Arif Solmaz, Avi Mandell, Brad Peterson, Brian Fleming, Britney Schmidt, Daniel Angerhausen, Daniela Calzetti, Darek Lis, Dave Redding, David Schminovich, Debra Fischer, Erin Smith, Evgenya Shkolnik, Gary Blackwood, Giada Arney, Harley Thronson, Iliaria Pascucci, Jacob Bean, James Breckinridge, Jane Rigby, Jay Gallagher, Jeanette Domber, John Gagosian, John O'Meara, Julie Croke, Karl Stapelfeldt, Kartik Sheth, Kevin France, Lars A. Buchhave, Laurent Pueyo, Lee Feinberg, Leonidas Moustakas, Marc Postman, Mario Perez, Mark Marley, Mary Beth Kaiser, Matt Bolcar, Matt Greenhouse, Nick Cowan, Nick Siegler, Norman Rioux, Oliver Guyon, Paul Scowen, Pauli Laine, Phil Stahl, Ravi Kopparapu, Rebekah Dawson, Rhonda Morgan, Rita Sambruna, Sarah Lipsy, Shahid Habib, Shawn Domagal-Goldman, Stu Wiens, Susan Neff, Vikki Meadows, Walt Harris