Astro 2010 Town Hall New York

- Notes taken by M-M Mac Low (AMNH), who is responsible for any misrepresentations of people's opinion or identity.
- D. Hogg (NYU) moderating and provoking

Scott Tremaine (ST) / *Meg Urry* (MU) : intro slides on survey, available at: http://www7.nationalacademies.org/bpa/Astro2010.html

Hogg, Prof, NYU: How were panel memberships chosen? Very important for how this goes down.
ST: Like making sausage. Panel members had to have a lot of expertise on panel subject, breadth of expertise, also had to maintain balance among fields, levels of seniority, geographical distribution, different types of institutions, etc. Seriously overconstrained problem. We were very successful in recruiting people – 80-90% of nominees.
?, Prof: Is there a concept in the meetings/document of recusal?
MU: NRC has really strict Conflict of Interest (CoI) rules. Everyone knows panel member interests. Attempts were made to choose committee members to avoid serious CoI, but tension between CoI and expertise is always present. NRC process is very careful. One other thing: boundaries of committee charge: areas covered by previous recent NRC studies are not being reconsidered.
Hogg: Please keep comments specific, but about principles first, projects/science later.
Hogg: There was a provocative Facebook group discussion: private telescopes, public telescopes – here in New York we don't have a major telescope…
Mac Low, curator, AMNH, interrupting: SALT is a major telescope that AMNH is partnered with.
Hogg: … there was a provocative Facebook comment arguing that no public money should support programs on private telescopes.
Putman, Prof, Columbia: Public money on private telescopes means they becomes less private (NSF program)
Beichmann, head, NASA Exoplanetary Sci Inst: Extinction of OIR ground-based astronomy in US needs to be addressed. Europeans have 4 x 8 m and

are moving ahead on 42 m. We have no plan for a good large public telescope (or even for a private one – I mean, there are plans, but no money). There is a major lack of vision for ground-based OIR astronomy.
Hogg: Why has Gemini not been so effective?
Beichmann: Because the instrumentation budget is zero. If we did not have a space-based program we would not be in OIR work
Johnston: ESO has an open skies policy. I disagree with Chas. In next generation, we need to think about global funding. Large optical/radio telescopes need to be globally funded. Definition of open skies is all can apply (OK, maybe some subrosa preferences)
Oppenheimer, curator, AMNH: I have to agree w/Chas – the US is already blind on the ground. I also want to address the previous comment suggesting that no public money should go into private facilities. That is absurd, like suggesting there should be no PI-led projects w/public money. Everything that is publicly funded must not be immediately publicly accessible.
ST: Let me address some parameters: the committee has been instructed that it should work within different budget scenarios, one of which is flat budgeting for NSF. Plausible estimates for public 30m telescope are $40-50M per year. LSST has a comparable operating budget: 50% of current NSF Astronomy. If operating costs have to come out of current budget, everything else drops by a factor of two. Thus the committee will face these sorts of questions.
Savin, rsch sci, Columbia: Lab astrophysics: we like to think of ourselves as a Rosetta Stone. Historically lab astro funding has come from NSF physics & DOE. Those programs no longer support us – they have moved on to photonics etc. Now lab astro data in atom/molec/nuclear/particle physics must come from astrophysics itself. This must be accounted for – it has a major budget impact potentially.
Hogg: theory, data analysis/inference are similar
Ebel, curator, AMNH: I want to follow up as a meteoritics curator, working on lab characterization of materials. This is really important stuff. Right now, lab spectra of many materials are not as good as ground/space observation, so acquisition of better lab spectra needs to be prioritized.
Gawiser, prof, Rutgers: Public funding for private telescopes. Old model doesn't work anymore. Tradition is of universities having access to their own

telescopes from different sources. Even in this model there was some scattered public access. Not enough, though, so we also have NOAO, Gemini. Significant improvements are still possible. Private / public partnerships are still standard, with public contributions to private projects. Public / private partnerships are now needed, though. NSF should not settle for less than 50% of a 30m telescope. If we also need to partner with Europe, fine, but we must have public leadership to avoid starving the US astronomical community.
Johnston: curious why the European model is working well? Is it true that most Euro institutions are publicly funded? Why do they have more money? Or are they better organized? Are we shooting ourselves in the foot by fragmenting?
Sivaramakrishnan, instrumentation sci, AMNH – The European model has a longer timescale. Instrumentation takes longer in Europe, while development occurs in short bursts here.
Beichmann – US model has had successes: 10 m US telescopes were online long before VLT. Next step is hard to find funding for. Gemini was done at the cost of destroying NOAO.
May, senior sci, Brookhaven – timing of report: Jan-April 2010. I encourage earliest possible release, since agencies are waiting for report to make decisions, start projects. Present atmosphere is favorable towards science, how long it will last is unclear.
Heckman (TH), Astro2010 member: NRC process has strengths/weaknesses. Strength is that it is a deliberate process, weakness is time. Refereeing etc. makes it difficult
Savin: How do you find reviewers given the huge participation in the survey?
MU/ST/TH: there are still many possibilities– also international referees are allowed.
Hogg: my bias is towards large facilities that provide lot of data for lot of projects. But, some projects are narrowly focused. My view is that one of the primary goals of astronomy is to map the sky at the highest possible resolution, (spatial, time, spectral, etc). I think the Astro2010 survey process is focused more on key science goals that may or may not motivate such mapping.
Gawiser: Mapping as much of the sky as possible has huge possible value – everyone in the community has a useful data stream.

Shara, curator, AMNH: In the last couple of weeks I have gotten a red flag flashed at me. Something wonderful is going to happen: LSST. One precursor is the Palomar Transient Factory ($2M for a surplus CCD on the Palomar Schmidt w/pipeline [*Hogg:* using astrometry.net!] that is spilling out transients). Problem – this has been so successful that we are already overwhelmed with data. For example, what happens when a 25m point source goes to 18m? We need spectra. Now we are scrambling for them. With LSST, we'll be at the bottom of Niagara Falls with a teaspoon. 0.1% of LSST objects could be spectrally sampled with full time use of the NOAO 4m. We are likely to drop the ball on this!
Hogg: It's not just LSST. SZ surveys, ALMA, everything, is going to need follow up spectroscopy. European telescopes may be who does that.
Crott, prof, Columbia: I'd like to raise an issue regarding surveys that several of us have been thinking about. Dark energy. The plan of the Dark Energy Task Force (DETF) is to do surveys (Baryon acoustic oscillations, weak lensing/LSST, growth of structure, CMB, Type Ia SNe). All give constraints, amount of dark energy, EOS, d/dt (EOS). We tend to make graph in these parameters, maybe vs rho. None give THE answer because of degeneracies. Must combine surveys to get intersecting error ellipses. Most orthogonal survey, crucial in breaking degeneracies and giving precise answers, is SNe, using the standard candle relation. This method of measuring distances is good to 14% using the empirically determined maximum light stretch parameter. Great: gave us dark energy. To do better, though, we need to improve to 2%. Nobody knows how to do this. Major projects are based on assumption we can, but nobody has a plan on how to go about this. Need to attack with very good k corrections, zero point corrections in photometric bands, calibrating dust in galaxies, understand SNe to know if they ARE standard candles at 2%. Maybe in IR using JDEM satellite the systematics are less. But 2% drift would give us wrong answer. We are going to spend $3B on this, but need to settle this question. Our group has come up with a cost effective plan to determine if we can do this right, which will cost $20-30M. I put it in the form of a white paper, and hope people are appreciating it.
Sokoloski, rsch sci, Columbia: I agree with Arlin [Crotts]. David [Hogg]: what is your vision for surveys? How will people be funded to analyze these surveys? What is the best funding model?

Hogg: People working on public data have had a lot of trouble getting money to work on it. My own group got no money to write SDSS papers. Very few of the 2000 SDSS papers were funded outside of the SDSS grants themselves. There is an issue that funders seem to assume that w/public data there is no need for further funding. In my vision, there is a lot of public data, and a lot of funding for its analysis. Of course, spectroscopic followup observations are often part of that analysis.
Sokoloski: I also want to raise the same question of radio and ground-based astronomy. I do radio astronomy, and fund it with grants from X-ray telescopes. With NSF you usually need to have data in hand and a three year plan to get funding.
Hogg: Many of us have had NOAO time but no funding to travel to telescope!
Crotts: Why does this occur? Is this a Congressional priority? Does building instruments generate jobs in a way that funding researchers doesn't?
Hogg: Chas [Beichmann] would say, we haven't done *enough* there.
MU: The last decadal survey prioritized building new things, so we did.
Way, scientist, NASA GISS: The elephant in the room is closing facilities. According to the survey rules we can't talk about closing facilities. If we have a flat budget, we must either close things, or not build new things.
Audience member: choose more money instead of flat budget!
Hogg: NY area buys Gemini?
Way: Why can't the committee talk about closing things? If we keep funding even great telescopes like the CTIO 1m class telescopes, we will not move forward.
ST: This is very delicate. The NSF Senior review did address this a few years ago. Above my pay grade, but I think the view is that closing facilities is very tough, must be done carefully, and that it should be done by a separate group from Decadal Survey, maybe in 2015? Committee will not *only* consider flat funding scenarios. We will consider other possibilities. On the issue of data reduction: to first order, the NSF astronomy budget is a fixed pot. We've heard arguments for large new optical facilities, for data analysis of existing data… this is a basic problem. NSF astronomy spends just over 50% on large facilities. This is major question for committee, no easy answers.
TH: If there were someone from NSF, here, they would probably argue that the individual grants program is their crown jewel. The way that operates is

that they have a pot of money, and respond to science proposals from community. They are thus resistant to funding tightly tied to observational time rather than driven by larger scientific issues. NSF looks at community driven science, NASA is more strategic in funding use of facilities.
Shara: I have one solution for the question of what to close. Rather than closing these facilities, turn them into very efficient support instruments. E.g., devote the 4m CTIO entirely to spectroscopic follow up for LSST. SMARTS has worked well as universities buy time on these small CTIO telescopes in 50/100 night chunks. We could recycle these smaller telescopes into direct support instruments. Put a single instrument on, automate as much as possible. Point/point, spectrum/spectrum continuously, so that for a little more money we get vastly more science.
Ulvestad NRAO: As Chair of the demographics infrastructure study group, I have taken on the job of following the money. Just to make sure people understand: the NSF facilities budget is $120M/yr. A 30 m optical telescope is likely to cost of order $1B. A standard model of operational costs is that they will run 10% of construction costs. That means $100M/yr of operating costs! The program becomes a 30m optical telescope and ALMA. Period.
Hogg: Europe?
Ulvestad: My opinion (only) – The ESO annual budget from member contributions is steady, and its expenditure is controlled by ESO, so they can make 10 year plans with guaranteed funding. This doesn't work the same way in the US – we rely on the MRI line and so forth. Guarantee of fixed budget allows amortization over long periods. US doesn't have that. (Maybe not *just* my opinion).
Gawiser: On the issue of facilities – we will face hard decisions this decade. I want to see full costing that includes the full cost to complete the science: that is, including instrumentation, analysis pipeline (to avoid reinventing the wheel at every university), and observation and analysis funding. This will lead to much more efficient use of facilities.
ST: I was on the last decadal survey, and we did just that. That was completely ignored by both community & NSF. Senior review at NSF was needed because NSF built ALMA w/o doing this. NSF capital and operating budgets are completely decoupled. Despite argument this has not been changed. NASA has fewer of these difficulties because their missions have limited lifetimes. However, cost estimates for NASA missions were badly

underestimated in last survey. Useful statistic: in last decade, NASA spent as much as was requested, by the survey, but since costs were so badly underestimated, the field got less than requested in programs.
Hogg: Giacconi wrote an important paper pointing out that in this sort of exercise, underbudgeting gives competitive advantage
Weaver, grad student, NYU – Astronomers need to buy into supercomputer facilities. This will allow them to share experience w/particle physicists, who already know how to analyze, transmit, and store very large data sets. E.g., the involvement of the Nearby Supernova Factory with the National Energy Research Scientific Computing Center (NERSC) gave both hardware and software support.
Johnston: another thing on list of support: THEORY. If you just analyze data, you may understand answer, may not. We need two kinds of theory – sit in office and be brilliant, and run many models to understand universe. This must be included in funding stream for facilities.
Hogg: We should recommend fewer projects properly funded, so that rationing is not done in a historically contingent way depending on who runs over budget when. If every SDSS scale project produced 2000 pubs we'd not be upset.
Way: Whole costing stuff: Scott you said that the ex-CEO of Lockheed Martin, and Battelle are involved. Why on Earth would we want to take advice from people who have caused such big overruns themselves?
MU: The last decadal survey asked projects themselves for cost estimates. It doesn't take a genius to see that this will lead to low ball estimates. For space projects, the NASA independent project assessment (IPA) office is working on better cost estimates. The Space Studies Board had a study on this topic, and these guys made very significant contributions. They know what they are talking about. [Ed. Note: Steve Battel is not associated with the giant Battelle Engineering firm. Rather, he is the principal of Battel Engineering.] The survey is working with indpt contractors who have their own cost models empirically calibrated from past missions. The contractors will be doing much of the costing for this exercise. Caveats: it is impossible to cost things that have not been developed – must first develop, then decide. Most people would say the 1990 survey was successful, but those cost estimates were also under. Finally, note that costs are asymmetric: they are bounded on the low end, but not on the high end.

Schiminovich, prof, Columbia: Is the comparison of NSF vs NASA funding models really comparing apples to apples? Is same amount of money really going into research? There has been a huge bump from the NASA Great Observatories. When they go away, will we start seeing complaints that we can't do research any more? Let's understand how much true funding from each agency is there. NSF is pursuing ideas, while NASA is pursuing observations with their funding. Despite lack of need for travel, you get NASA funding for analysis – but it's just to take data, not to pursue coherent scientific projects like NSF. It's not obvious that is what we want. It's certainly not the model in Europe, for example. There are many valid criticisms of the NASA model – but they put a lot of money in during the last decade so they look good.
Savin: let's hear from students – it's your future! How are they going to get into a career?
Hogg: I'll start putting them on the spot in a moment.
van Gorkom, prof, Columbia: Europe generally only funds very small personal investigator grants. Generally there is only funding to support students and build facilities.
Jha, prof, Rutgers: Another direction to discuss: how do we ensure the effectiveness of this survey? For example, the DETF report took a lot of public input, and a lot of people worked hard on that. They came out with priorities, 4 primary ways to pursue dark energy. People expected competition among ideas. Instead, DOE, which has gotten into the game, and NASA have decided what JDEM will look like, and told the community what it will be. Now this compromised mission must be used to pursue science. How do we avoid this sort of result?
Hogg: I guess that's one of the things we are trying to determine here.
[Duane] Lee, grad student, Columbia: Question/comment: Astronomy overall requires a wide variety of skills across fields. New subfields are appearing, like astrochemistry, astrobiology, and there is also our reliance on CS, etc. I wonder if there's a better way to integrate what we do with other depts./fields to fund certain sorts of things that would also benefit folks in other fields in addition to our own.
Sivaramakrishnan: That's a very pertinent question. Biology for example has a lot of imaging technology now coming into play.

Hogg: What is the point of getting a PhD in astro? This has become a big battle on Facebook. Some view it as an apprenticeship for academe. But, we train more students than positions. Does this mean that we should reduce the number of students, or increase their experience base to allow the ones who don't become academics to pursue successful careers?
Tribiano, prof, Boro of Manhattan Comm Coll/CUNY: Back to funding -- US vs Europe; compromises/low balling for approval. Are we continually going to be faced with the whims of Congress? With x postdocs and students they will continue to need jobs regardless of budget fluctuations. Are we as a country actually not committed to science? If Europe is making decade plans and we are fluctuating administration to administration, what do we do? Can we somehow resolve this?
Hummels, grad stud, Columbia: We've been talking about funding this whole time. Educating or captivating the public are how we get money. Hubble has been a huge boon. We must convince the public to either give money privately or via Congress. This suggests that we must invest more money into public education, iconic imaging to maintain public involvement.
May: The report of the committee itself will be also helpful in getting more money. Are you able to make recommendations for higher funding scenarios using opportunity cost arguments, for example?
ST: Yes, we can, and we will try very hard to do so.
Maller, prof, NYC Coll of Tech/CUNY: For the sake of this meeting, let's realize that every science panel ever done goes to Congress and ends up asking for money. We won't have huge effect on the NSF or NASA budget. We need to instead think about how we can use money more effectively. For example, how we fund data reduction and theory. Data reduction seems to be done inefficiently – there seems to be little effort to make public pipelines as far as I can tell (as a theorist). 200K / yr for help notes might already be useful. We're not talking 100M here. Money to increase efficiency is well spent. Theory is same way. There is no way to access what simulations have been run, what kinds of analyses have been done on them. People reinvent wheels all the time. Try to improve this as well through communication.
ST: Two points: 1. The reason ESO can make long range plans while the US cannot is because ESO member nations have treaty obligations. US involvement in international projects is either through MoU or treaties.

Treaties guarantee money flow because of the difficulty of renegotiating them. MoU are not so good. Eg ITER has gotten in trouble because Congress hasn't funded MoU money for last several years. Treaties currently only solution. 2. Sloan. The reason that Sloan has good web, databases, etc was that it was part of the condition for funding by NSF. Demand from funding agencies drove this. Nobody here has yet mentioned archiving. Very serious issue. Only reason we still have access to SDSS1/2 is because of private university funding of those databases. No long term NSF funding – no archiving money at all. This is important.
Hogg: relates to Maller point about efficiency
Crotts: In Congress there seems to be this gap between approval and appropriation. NSF doubling authorized, but not appropriated every year for the last several. What can we do?
ST: That's above my pay grade
Crotts: me too.
Agueros, postdoc, Columbia: We may be doing a real disservice to entering grad students by pretending they will have classic astro career. State of prof white papers have been really creative. Depts need to examine training of students to align with likely careers. I encourage people to enter astronomy, but I feel hypocritical as I don't know if they will succeed in the terms we have defined, which may be far too narrow
Pereira, grad stud, Columbia: There is a clear discrepancy between the numbers of students graduating and of faculty positions. This suggests that we should either train differently or reduce the number of students. But astro depts are not really good places to train non-astronomers. Should we reduce the number of students, use saved money to hire specialized faculty in fields like data reduction, software, etc?
Perez-Giz, grad stud, Columbia: These days in astronomy, everyone codes, but most of us are not particularly good at it. There is no systematic peer review of software, to make sure that what got written was done correctly. No teaching of good coding practices, style. Don't know what is solution, but this is related to increasing efficiency.
Way: take more CS
Hogg: hear hear! There are intellectual issues in coding, inference that are not considered science issues by committee.

Perez-Giz: But, there's not a lot of numerical work in undergraduate CS courses – scientific computing not in standard CS either. We need to professionalize scientific computing. People are not checking each others work.
McNally: response to [Maria] Pereira: as a funding thing, both here and in other countries: governments LIKE to fund more students, as this is associated with economic development. Governments will not like hearing "educate less". Very tricky. Code is huge underaddressed problem. Few places have incorporated sci comp in undergrad curriculum.
Weaver: Another issue about CS courses is that they don't teach high performance networking, large data sets, hardware for large data sets. It is possible to learn, but at this point, pretty much only from pcle physics.
Ebel: The problem of software extends to many other disciplines, not just astrophysics.
Oppenheimer, curator, AMNH: It's been very interesting to hear what is going on here. I am confused about some things. If you are going into astro to have a career and make money, you are taking the wrong approach. A PhD is an education in an area, not just training. Many faculty do very little astronomy - they are mid-level managers for most of their career! Another thing about funding: you cannot put a price tag on something never before done. It is extraordinarily difficult to put a price tag on a $10B project never done before, not even on parts. If projects don't meet price, though, scientists are blamed. Drift towards fixed price contracts makes projects very expensive as you must put in a huge buffer for the unexpected. Funding either must be buffered or come out hugely over nominal budget. I am worried as PPP member about how to deal with this. There should be discussion about how to tolerate cost overruns treat.
Chantelle Damas[?], admin, CUNY: I was a AAAS fellow at NSF for a year. Going to hearings was a real education. One time a scientist talking about the asteroid hazard quoted a diameter in meters, and a Senator said, "What the hell is this meters business? I don't understand this!" The NIH doubling has actually been funded, because Congressmen understand prostate cancer. Public must also understand astrophysics. The NSF board is a geriatric club (no offense!). No public comments, no involvement from younger people. That's necessary. Training in science is a great thing. Part of our duty is to go out there and talk to the public. People love astronomy

– especially compared to physics. In any culture they love to hear about astronomy. How are NSF MoUs with NASA for joint funding of projects set up? When those decisions are made, how is it done?
Schiminovich: any projects funded should be inspirational. Some NASA missions, and even ground-based instruments, have overcome apparently impossible challenges. I don't agree with Ben that you can't cost things that haven't been done. I just completed a fixed cost contract almost w/o overrun.
Oppenheimer: So did we, but it's damn hard!
Schiminovich: At some level you need costs w/margins – boring but need to take into account. We do need to mix in a few extremely risky projects -- shoot the moon type stuff – with the understanding that failure may occur – there has to be a mix of some guaranteed return, some inspirational missions eg for young people.
Zurek, data collections manager/scientist, AMNH: Comment on archives – I believe in archives –they are the wave of the future – every telescope must have an archive in the future. Public funding must carry an obligation to archive, NSF must fund a permanent archive somewhere. NASA does better…
Hogg: But even there there is an argument every 3 years about what archives to maintain.
Zurek: Nevertheless, more and more can use archives to do work – why do you need new observations every time? If it is in archive, it should be in public after some reasonable delay.
Beichmann: one thing the committee at all different levels must do is examine very closely the question of ground vs space, make sure that space ONLY does what cannot be done from ground. As a major example, JDEM may not pass this test – it may be scooped by ground-based efforts that will get very very close. Yes, I'm happy to be quoted on this. Let me now make a pitch for something: to captivate public, we should pursue planets. People in the public are fascinated by them, and interested in pursuing further study.
Sokoloski: On European funding models—I had the chance to sit in on a presentation by a European funding agency representative speaking to a European audience. They emphasized how much better the *US* was doing.

For example, by the metric of refereed publications per research dollar, the US does far better. Public/private partnerships also done far better in US.
Hogg: We need to finish now. I've been very pleased with this interaction.
TH: Thank you to everyone for coming. This has been extremely stimulating. We were listening hard, will take comments extremely seriously.
Hogg: Thank you to committee members who traveled to NYC for this Town Hall meeting.