SUP 30 Summary Report

The Spitzer Users Panel (SUP) met for the 30th time May 22-23, 2013 at the Spitzer Science Center (SSC) in Pasadena. This meeting was the last to occur during the first decade of operation of the Spitzer Space Telescope. That decade has produced remarkable scientific variety and impact with observing time now nearly equally split between the cryogenic mission and continuing warm observations. The Spitzer mission and the SSC continue to be exemplary in service of maximizing the scientific output of the observatory and disseminating these results to the public in an accessible way. Effective access to the high-quality Spitzer data products through the IRSA archives, now including source extractions, guarantees an enduring, productive, and still-expanding legacy for Spitzer. In addition to online resources and a help desk, SSC provides community instruction in the availability and use of these databases through an active presence at AAS meetings, including a planned special session highlighting Spitzer's entry into its second decade at the upcoming AAS in January 2014. The ability of SSC staff to travel to support these activities, despite recent funding limitations, has been critical to the optimal scientific exploitation of the Spitzer observatory by the broader community. In lean and sequestered budget times the SUP hopes that this fundamentally important travel will remain outside of restrictions.

The Spitzer observatory continues to execute about 7000 hours of science observations each year. Given that there 8766 hours in a year, this science time proportion represents unparalleled efficiency for an observatory. The Cycle 10 proposal activity is in progress and the SUP endorses the plan of selecting 7000 hours of Priority 1 and 2 science along with 3000 hours of priority 3, the latter providing a bridge of scheduling reserve for Cycle 11 should Spitzer be extended beyond Cycle 10. For the Cycle 10 review both large and small proposals will be under consideration simultaneously. Since the staged large/small review of Cycle 9 created friction with (particularly small) proposers the return of the proposal process to contemporaneous review is welcomed by the SUP.

It is noteworthy that during this period the Spitzer Science Center received word that a substantial portion of FY2014 user support funding would be shifted into FY2015. Realizing the importance of maintaining user support, and thus observatory scientific productivity, the SSC has commendably called on project reserves and re-phasing of local funding to recover more than half of the loss.

Archive

The SUP continues to be impressed by progress being made in the Spitzer Heritage Archive (SHA) and was especially excited by new IRSA technology as shown in the demonstration of the results viewer software. While funding limits the level of effort available within the SSC, the close integration with IRSA will carry the Spitzer legacy into the future. Similarly, the Spitzer Enhanced Imaging Products (SEIP) and the Source List represent an important legacy resource for the future and it is good to see the level of maturity they have reached. The usage statistics for the source lists, however, suggest that many Spitzer users may not yet be aware of this resource, and/or the tools may not be sufficiently developed to allow users to interface with the source list efficiently (e.g., graphical overlays). The interface will, however, be dramatically enhanced in the future as demonstrated by the IRSA viewer demo. The SUP encourages aggressive advertising of the SEIP products and tools in order to expand usage and applauds plans for a PASP paper in late 2013 since this paper is likely to increase the potential audience dramatically. The SUP encourages the further development of documentation (e.g., use cases and FAQs) in a similar vein. It is good to see that the SHA is taking advantage of social media by using YouTube videos for training.

The great success of the development of the Super-Mosaics and Source List for the cryogenic mission begs the question of whether similar products can be generated for the warm mission observations. Despite resources likely being tightly constrained, much of the groundwork is in place to enable economical continuation of source list and mosaic production. The SUP encourages the SSC to explore means of producing, or facilitating the production of, SEIP products that incorporate warm mission data.

Spitzer involvement in the Frontiers Fields project is also a promising development in terms of integration of Spitzer with other telescopes. Nine hundred hours of Spitzer time (mostly DDT) will be combined with 720 HST orbits targeting several fields in which nearby galaxy clusters can provide lens amplification to probe the cosmological depths. We encourage the SSC (and IRSA) to explore other cross-instrument developments, in particular with ALMA and JWST.

Overall, a great deal of excellent work has already gone into the development of the SHA and SEIP. While resources are tight, it will be important in terms of the overall science that comes from Spitzer in future decades that sufficient attention be paid to the transition of the SHA, and associated products, to IRSA in the next few years.

User Feedback

Since the SUP is smaller than it has been in the past, making it difficult for the committee itself to serve as a comprehensive channel for feedback to SSC, the roughly 200 current users of Spitzer were polled for feedback via email prior to the meeting. Only about 5% of the users responded, most with glowing praise (presumably a proxy for the 95% who did not respond). Constructive criticism focused mainly on the trend toward larger and larger proposals and the corresponding difficulty in obtaining observing time for small projects. The SUP agrees with concern, but notes a practical consequence of running a full-time major observatory on a financial/FTE shoestring is seeking just these efficiencies. On the other hand, reservations about large project and their opportunity cost in displacing large numbers of smaller projects is certainly germane to the discussion of ultra-large projects below.

Senior Review and Large Programs

The Spitzer mission will be up for NASA Senior Review this year with the intent of continuing mission operations into the FY 2015-16 timeframe. User over-subscription of the facility, which ran 6:1 by hours in the last Cycle, indicates that the fundamental science yield of Spitzer is nowhere close to waning and continuation of the mission could be justified entirely on this explicit demand and ongoing scientific productivity. Nevertheless, the Senior Review environment will be more competitive than ever, particularly given the current federal funding situation, and the Senior Review case must be based as much on new opportunities despite a compelling status quo. At this meeting the SUP heard of enhanced astrometric capabilities for IRAC for example, so rather than being a static instrument Spitzer's ultimate capabilities continue to evolve and improve. Overall, the one, somewhat unique, capability at Spitzer's disposal is bulk hours. In a typical year Spitzer achieves 7000 science hour on sky, more than twice Hubble, and several times that of any ground-based observatory. To date the competitive review process has naturally limited the size of individual proposals and proposers are unwilling to “go big” knowing the prospects for TAC approval are slim. The SUP was asked to consider the merits of offering/enforcing "huge" proposal opportunities and their potential for opening up entirely new avenues of science. On the (slightly) negative side, the SUP noted that implementing this new policy would only increase program hours by a factor of a few and would thus unlikely

produce the "revolutionary" opportunities ordinarily associated with order of magnitude or more gains in capability. Also, some users had expressed concern, outlined above, that large projects at the expense of many modest projects may not be optimizing the science return from Spitzer. The SUP echoes that concern - the opportunity cost of huge programs may outweigh their benefits. Nevertheless the SUP believes that the final decision should lie with the time allocation committee and the opportunity should be available for programs more extensive than those to date. To control the impact on available hours to other programs in any annual cycle, and to make these large programs more appealing to the TAC, "huge" programs should be spread over multiple cycles. Thus, as is the case with Hubble, the SUP encourages SSC to consider the means of enabling multi-cycle proposal opportunities, possibly encouraging the submission of proposals by reserving TAC hours to enable at least one multi-cycle program. The SUP notes that the experience of Hubble, which has implemented a multi-cycle program, shows that scientific productivity of these large projects, measured in terms of publications, is tied directly to funding support for the proposing teams. Multi-cycle projects on a financial shoestring may not be effective.

In discussing ways to optimize the appeal of the next Spitzer proposal to NASA senior review the SUP concluded that the interaction of Spitzer with new, existing and recently operating facilities should be central to the discussion. More than "follow-up," Spitzer plays a synergistic role in enabling multi-facility science. The advent of the ALMA era is particularly compelling as the mid-infrared provides an essential complement to sub-millimeter observations (including the South Pole Telescope (SPT) as well) in a variety of scientific venues. The time domain is gaining increasing importance with projects like PanSTARRs, and with LSST on the horizon. Not only do interesting transient and variable sources require followup, but Spitzer itself has demonstrated excellent synoptic performance as evidenced by programs such as YSOVAR which monitored short- and intermediate-duration young star variability.

LCOGT

The SUP also discussed a suggestion to consider acquisition of time on the Las Cumbres Observatory Global Telescope Network, a growing network of 0.4m - 2m class telescopes. LCOGT, when completed, will offer full-time global sky access. While this new project could offer compelling synergies with, in particular, Spitzer-targeted exoplanet transit studies, the SUP did not see direct access to such a resource, managed by the Spitzer project itself, as vital. Interested users could, for example, use Spitzer or other funding to obtain LCOGT access directly, or procure targeted monitoring access on similar class telescopes for specific time sensitive events, without the need for 24hr coverage.

IRAC

Users are happy with IRAC performance. The SSC continues to refine the photometric and astrometric performance of this instrument's unique capabilities, particularly in the areas of pixel mapping and centroiding techniques. The SUP encourages continuing development of these capabilities and suggests that the IRAC team should engage the user community in these improvements to either help define "best practices" for the use of new/existing capabilities or provide a summary of ongoing discussions to aid in convergence to a final consensus. Doing so should permit the IRAC team to optimize their resources. Although there are some users who seem unwilling to consider methodologies outside of their own, there are plenty of users that are open to collaboration with the IRAC team and they should identify those individuals/groups (such as exploration science programs) and reach out to them.

For long stare observations gains in SNR can still be made if the 'y-drift' were eliminated all together. Doing so would increase the density of pointings at a specific location on the detector, which would overall reduce systematic effects due to intra-pixel sensitivity variations, but also allow for more detailed pixel maps of that specific location. This would permit exoplanetary research to study progressively smaller and dimmer planetary signals which are currently buried in residual red-noise.

Education and Public Outreach

As has been the case for the last decade, the Spitzer Science Center continues to be graced by a public outreach team possessing remarkable insight, cleverness, and capability – corporate knowledge that has been painstakingly constructed and honed over the past decade. The degree to which this group is able to engage and interest the public, taking full advantage of the proximity of Hollywood and of celebrities eager and enthusiastic to convey science to the public, is unparalleled. In addition, teacher outreach programs have given those most directly connected with developing STEM enthusiasm in our youth the opportunity to learn science and the scientific method from the scientists working with Spitzer. The SUP has noted this impressive capability in nearly every one of its reports. It is ironic in the saddest possible way that this meeting coincided with the White House mandate to consolidate all public outreach activity in a few locations. While seeming a sensible means of capturing efficiency and saving cost, the policy neglects the intimate relationship between EPO and the science mission at places like the SSC. EPO flourishes and is effective because it is coincident with in-house expertise and day-to-day excitement at SSC. The EPO group has optimized this relationship to incredible effect. If implemented this new plan would spontaneously dismantle what took more than a decade to build and refine. In general, the consequences of this action have not been lost on virtually the entire astronomical community and the response to date at the congressional level has been extensive. The SUP itself has little leverage except to express this commonly held visceral response to a seemingly rational but highly misdirected policy. We expect rationality will prevail, and desperately hope that as a result the SSC EPO group will survive.