

Sloan Digital Sky Survey  
**Quarterly Progress Report**  
**Second Quarter 2003**

Revised August 12, 2003

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## 1. SURVEY MANAGEMENT AND ADMINISTRATION

Several noteworthy management and administrative actions occurred during the second quarter of 2003. On June 30, Dr. John Peoples retired as Director of the SDSS. John served as Director for the past five years, during which time he led the project through the final phase of construction and commissioning, into full-scale production, and through two public data releases (EDR and DR1). Under John's leadership, the scientific potential of the SDSS has become a reality.

Dr. Richard Kron assumed the role of SDSS Director effective July 1. Rich has been deeply involved in the SDSS since its earliest days and most recently served as the SDSS Spokesperson. Rich's appointment as Director was strongly endorsed by the SDSS Advisory Council and the ARC Board of Governors and is for an initial term of three years.

In February, 2003, Dr. Donald Baldwin passed away after a brave battle with cancer. Don was the Secretary/Treasurer of ARC since its formation 19 years ago. He played a crucial role in the formation of the consortium, the establishment of consortium agreements and bylaws, the organization of the SDSS collaboration and management structure, and many other behind-the-scenes aspects of the SDSS project that form the backbone of the organization. In recognition of these contributions and to honor Don, ARC elected to name the Operations Building at Apache Point Observatory after him. This occurred in a brief ceremony at the observatory in June, in the presence of Don's immediate family and many colleagues and friends.

## 2. SURVEY PROGRESS

### 2.1 Summary

Q2 was spectacular in terms of imaging progress. We obtained 1549 square degrees of new "unique" imaging data, or 3.6 times the Q2 baseline goal of 434 square degrees. We also obtained ~79,300 spectra by completing 124 plates on the Northern Galactic Cap, 2 plates on the Southern

Survey, and 10 plates on the Southern Equatorial Stripe. The combined total of 136 plates substantially exceeds our baseline goal of 93 plates for all three areas combined.

To date, we have acquired 5,874 square degrees of “unique” imaging area on the Northern Galactic Cap (NGC). When compared against our baseline goal of 6,134 square degrees, we are now only 260 square degrees, or 4%, behind our baseline. With regard to spectroscopy, we are 135 plates behind our baseline goal on the NGC, in part because of the increased time in Q2 devoted to imaging. However, because good imaging conditions are rare, our policy remains to image whenever conditions permit. The following sections provide additional detail on imaging and spectroscopic progress.

## 2.2 Q2 Imaging

Table 2.1 compares the imaging data obtained in Q2 against the baseline projection.

Table 2.1. Imaging Survey Progress in Q2-2003

	<i>Imaging Area Obtained (in Square Degrees)</i>			
	Q2-2003		Cumulative through Q2	
	Baseline	Actual	Baseline	Actual
Northern Survey <sup>1</sup>	434	1549	6134	5874
Southern Survey <sup>1</sup>	0	0	745	738
Southern Equatorial Stripe <sup>2</sup>	0	0	2053	1911

1. “Unique” area
2. “Good minus Unique” area

In addition to imaging on the Northern Galactic Cap, we allocated 2.75 hours to oblique scans and 1.25 hours to Apache Wheel scans in Q2. The area imaged for oblique and Apache Wheel scans is not included in Table 2.1, since the former data are not part of the survey footprint and the latter are taken in binned scan mode.

Also excluded from Table 2.1 is imaging data collected in binned scan mode for a time domain study. During the April bright time, we obtained imaging data with the 2.5m telescope to demonstrate the feasibility of the using the SDSS observing hardware post-2005 for time domain studies. The bright time observations did not interrupt scheduled bright time engineering work. Data from the observations were partially analyzed and preliminary results were described in the white paper outlining the Synoptic Time domain Survey Science (STSS) futures plan. The white paper was submitted to the SDSS Futures Committee in May and a message describing the April data, and accessibility to it, was sent to the collaboration.

Figure 2.1 shows progress against the imaging baseline goal for the Northern Galactic Cap. In past reports, we have included progress graphs for the Southern Survey and the Survey of the Southern Equatorial Stripe. Since the Southern Survey is complete and the progress graph is not changing, we will not continue to include the Southern Survey graph in the quarterly reports. Additionally, since we did not obtain any imaging data on the Southern Equatorial Stripe, we have chosen not to include that graph in this quarter’s report. These graphs will be included in the annual report and updated versions will still be maintained on the SDSS website.

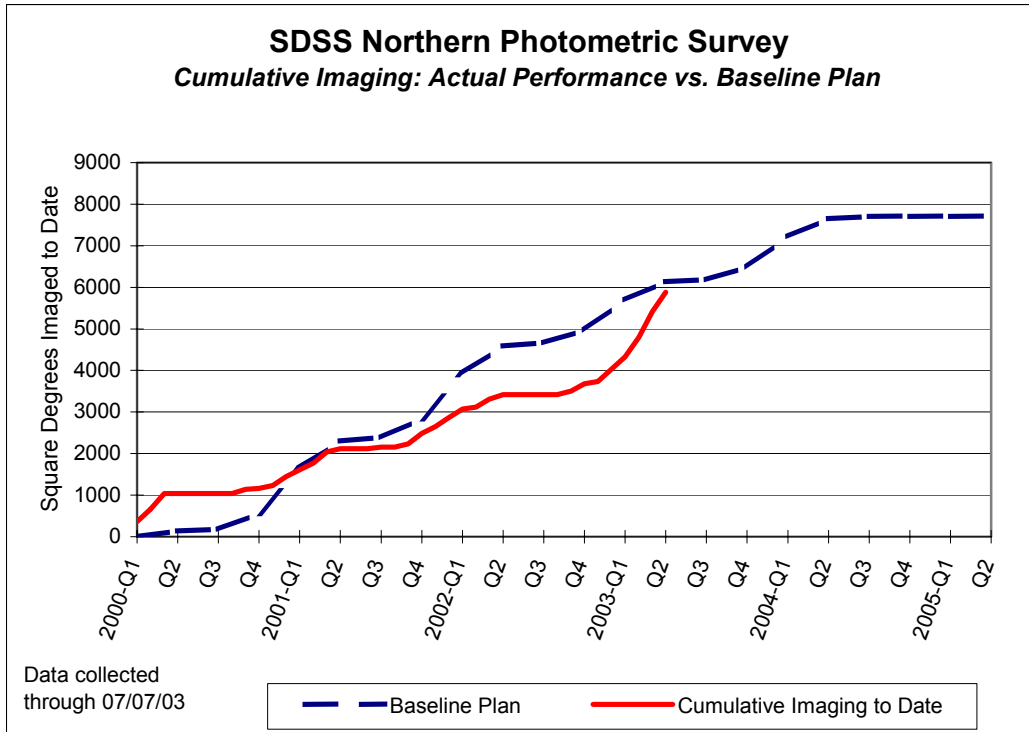


Figure 2.1. Imaging Progress against the Baseline Plan – Northern Survey

### 2.3 Q2 Spectroscopy

We report progress on spectroscopy in terms of the number of plates observed and declared done during a quarter. The successful observation of a plate typically yields 640 unique spectra. In Q2, we observed a total of 136 plates. Of these, two were southern survey plates and ten were obtained on the southern equatorial stripe. Table 1.2 compares the data obtained against the baseline projection.

Table 2.2. Spectroscopic Survey Progress in Q2-2003

	<i>Number of Plates Observed</i>			
	Q2-2003		Cumulative through Q2	
	Baseline	Actual	Baseline	Actual
North	93	124	807	672
South	0	2	148	155
Southern Equatorial	0	10	165	149
Total plates	93	136	1,120	976

The following graphs show spectroscopic progress against the baseline goal for the Northern Galactic Cap and the Southern Equatorial Stripe. As with the imaging graphs, since the Southern Survey is essentially complete, the Southern Survey graph will no longer be included in the quarterly report. All graphs will continue to be updated and maintained on the SDSS website, however.

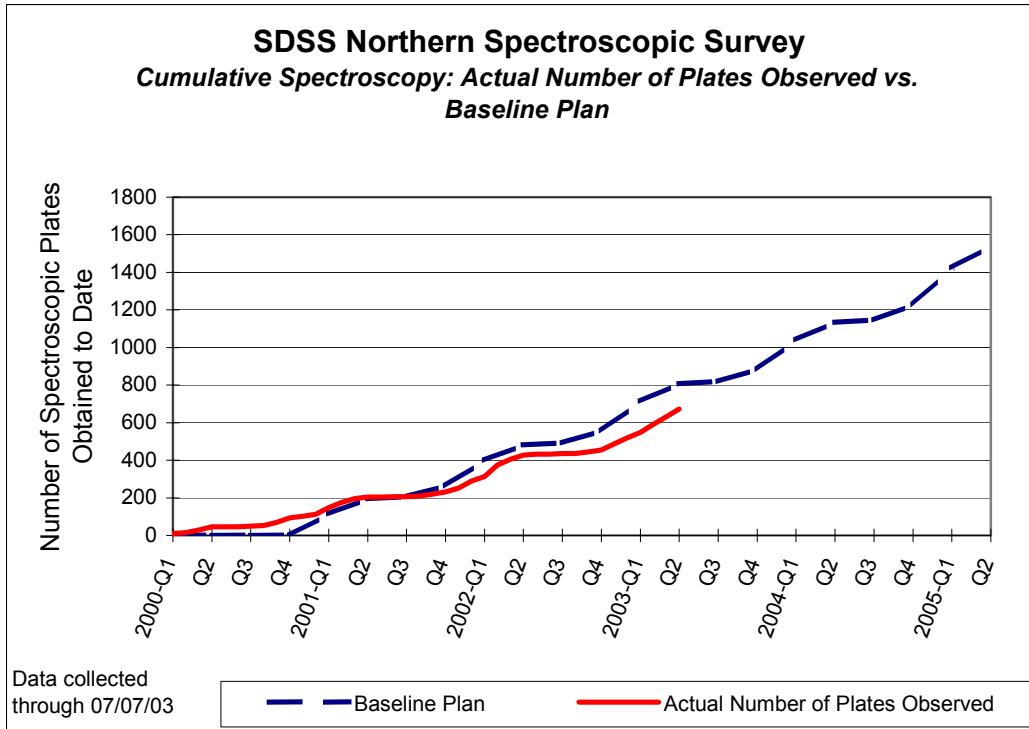


Figure 2.2. Spectroscopic Progress against the Baseline Plan – Northern Survey

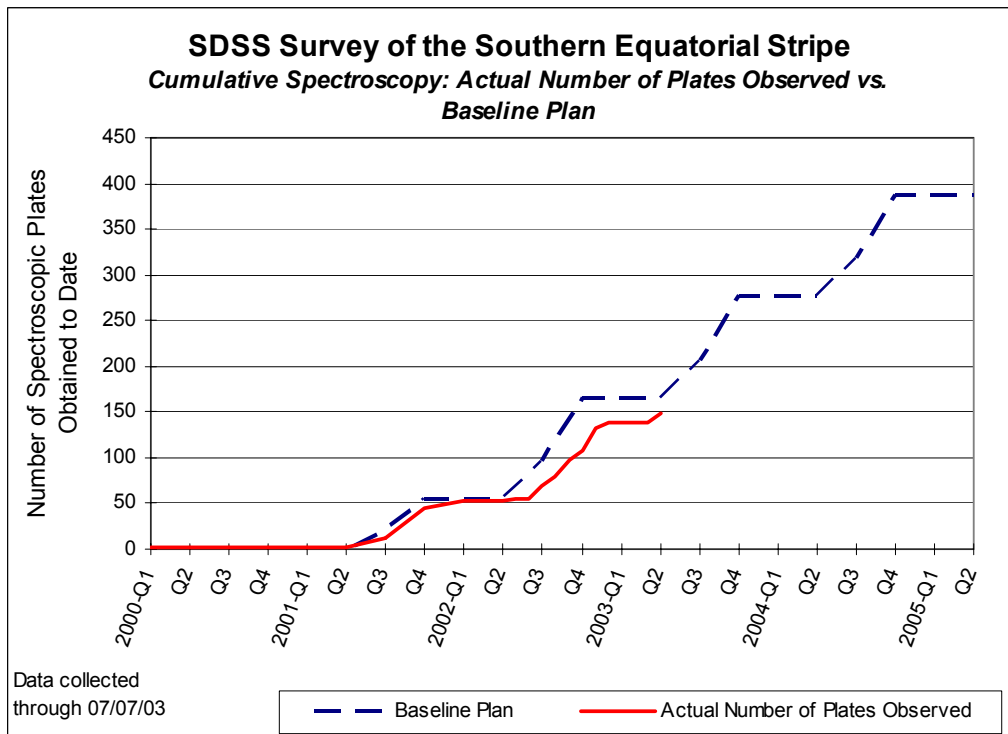


Figure 2.3. Spectroscopic Progress against the Baseline Plan – Southern Equatorial Survey

### 3.0 OBSERVING EFFICIENCY

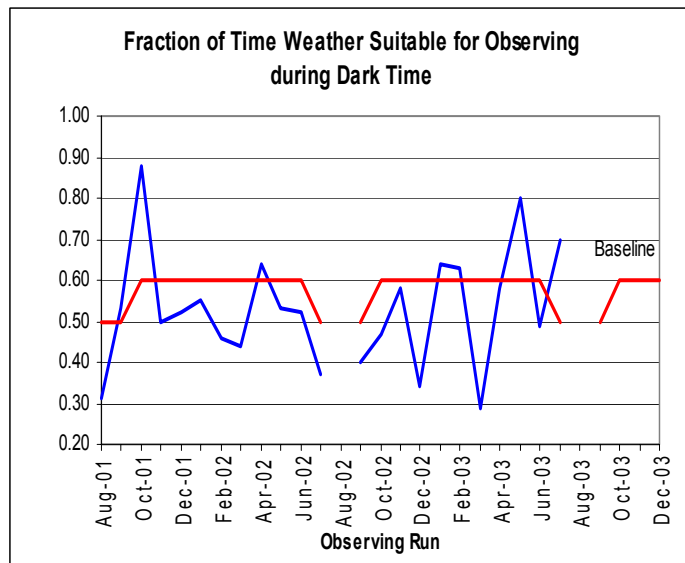
Table 3.1 summarizes the breakdown of observing time in 2003-Q2 according to the categories used to prepare the baseline projection. The full set of efficiency plots is posted on the SDSS website and updated monthly. From [www.sdss.org](http://www.sdss.org), click on Survey Ops => Survey Management => Observing Metrics.

Table 3.1. Comparison of Efficiency Measures to the Baseline

Category	Baseline	<i>Run starting Mar 23</i>		<i>Run starting Apr 21</i>		<i>Run starting May 20</i>		<i>Run starting Jun 20</i>	
		Dark	Dark + Gray	Dark	Dark + gray	Dark	Dark + gray	Dark	Dark + gray
Total time (hrs)	Mar: 126:35 Apr: 110:52 May: 98:57 Jun: 92:29	126:35	166:59	110:52	132:53	98:57	125:44	92:29	120:24
Imaging fraction	0.27	0.43	0.38	0.43	0.42	0.34	0.33	0.36	0.36
Spectro fraction	0.63	0.54	0.61	0.54	0.58	0.60	0.66	0.54	0.58
Weather	0.60	0.58	0.55	0.80	0.78	0.49	0.47	0.70	0.64
Uptime	0.90	1.00	0.99	0.99	0.99	0.98	0.98	0.92	0.94
Imaging efficiency	0.86	0.90	0.90	0.90	0.90	0.79	0.79	0.86	0.86
Spectro efficiency	0.65	0.60	0.59	0.60	0.56	0.55	0.56	0.61	0.61
Operations	0.90	0.96	0.96	0.97	0.97	0.95	0.94	0.97	0.96
Hours lost to problems		0:10	1:24	1:18	1:18	1:56	2:30	7:17	7:17
Hours lost to weather		52:50	75:00	22:11	29:38	50:18	66:20	22:17	37:59

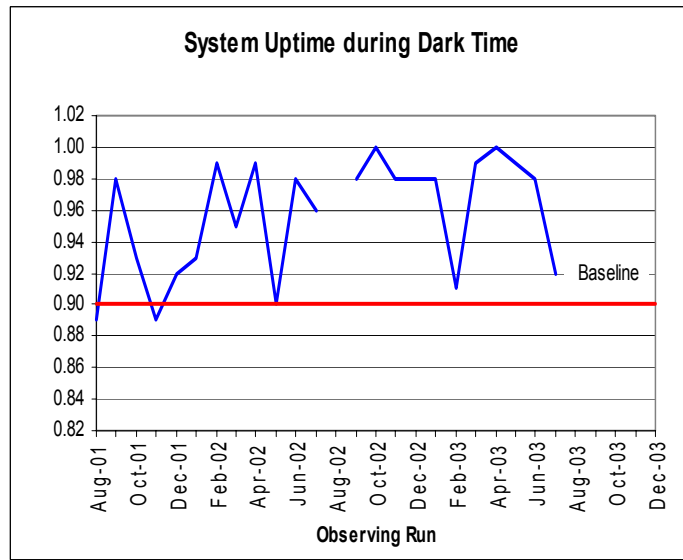
#### 3.1. Weather

The weather category represents the fraction of scheduled observing time when the weather is suitable for observing. In Q2, good weather matched the baseline forecast in April and exceeded the baseline during the May and June/July dark runs. Moreover, conditions were often photometric with good seeing, which allowed us to exceed baseline imaging goals for the quarter.



### 3.2. System Uptime

System uptime measures the availability of equipment when conditions are suitable for observing. Although we exceeded the baseline goal throughout the quarter, we did experience a couple of problems that resulted in lost time on the sky. We lost a couple of hours in early June to an unreliable spectrograph power supply and slightly more than seven hours in late June to a failed microprocessor in the same spectrograph. After replacing the faulty microprocessor, which controls RS-232 communications with the spectrograph, we finished the run with no further problems. It is still not clear whether the microprocessor fault was related to the earlier power supply problem, but we suspect the problems may have been related.



### 3.3. Imaging Efficiency

The imaging efficiency ratio provides a measure of observing efficiency and is defined as the ratio of science imaging time to the sum of science imaging time plus imaging setup time. The baseline plan established the imaging efficiency ratio to be 0.86; in Q2, our measured efficiency ratio averaged 0.88. Monthly imaging efficiency ratios are plotted in the graph to the right and the ratios for Q2 are listed in Table 3.2. Observing procedures have become quite stable, so variations in efficiency are typically the result of scan length as opposed to operational variations.

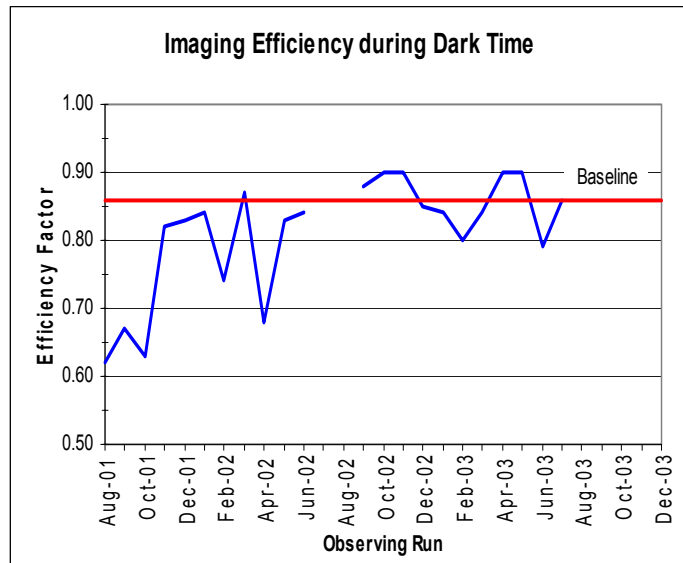


Table 3.2. Imaging Efficiency Ratios for Q2-2003

	<i>Run starting Mar 23</i>	<i>Run starting Apr 21</i>	<i>Run starting May 20</i>	<i>Run starting Jun 20</i>	<i>Aggregate over the quarter</i>
Imaging Efficiency Ratio	0.90	0.90	0.79	0.86	0.88
Baseline	0.86	0.86	0.86	0.86	0.86
Efficiency relative to baseline	105%	105%	92%	100%	102%

In addition to trending efficiency, we also measure imaging efficiency by tracking an imaging effectiveness ratio. The imaging effectiveness ratio measures how effectively we use available imaging time to acquire new survey quality data and is defined as the ratio of imaging area obtained to the science imaging time. The baseline is 18.6 square degrees per hour and is set by the physical properties of the imaging camera and data acquisition system. In Q2, our imaging effectiveness ratio was 16.4 square degrees per hour, which indicates that some of the imaging data obtained during the quarter failed to meet survey quality requirements during data processing. This is acceptable, as it means that the observers are being aggressive in pursuing imaging data. We would rather push the limits of imaging and discard a small amount of data, as opposed to being too conservative and missing out on imaging opportunities.

### 3.4. Spectroscopic Efficiency

Spectroscopic efficiency is derived by assessing the time spent performing various activities associated with spectroscopic operations. Table 3.2 provides the median time, by dark run, for various overhead activities associated with spectroscopic operations. Units for all categories are minutes except for efficiency, which is given as the ratio of baseline science exposure time (45 minutes) to total time required per plate. Using these measures, spectroscopic efficiency averaged 58% in Q2. Over the 2002-2003 observing season, spectroscopic efficiency averaged 57%.

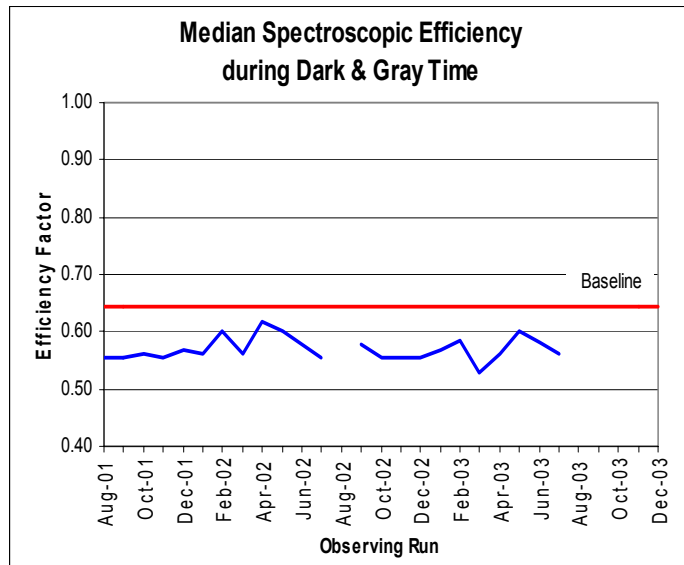


Table 3.2. Median Time for Spectroscopic Observing Activities

<i>Category</i>	<i>Baseline</i>	<i>Run starting Mar 23</i>	<i>Run starting Apr 21</i>	<i>Run starting May 20</i>	<i>Run starting Jun 20</i>
Instrument change	10	5	4	4	5
Setup	10	14	10	13	15
Calibration	5	13	13	13	13
CCD readout	0	3	3	3	3
Total overhead	25	35	30	33	36
Science exposure (assumed)	45	45	45	45	45
Total time per plate	70	80	75	78	81
Efficiency	0.64	0.56	0.60	0.58	0.56

## 4. OBSERVING SYSTEMS

In Q2, we had two serious problems with one of the spectrographs but no other significant hardware or software problems. In addition to correcting the spectrograph problems, we completed a number of planned engineering tasks and preventive maintenance activities.

### 4.1. The Instruments

The imaging camera worked well throughout the quarter. The spectrographs worked well early in the quarter, but then we experienced two possibly related problems with Spectrograph #1 in June. At the beginning of the month, we had a power supply fail; the faulty supply was quickly replaced with a unit from our spares pool. At the end of the month, we started having problems with Spectrograph #1 again. At first we suspected the power supply, but further troubleshooting identified the problem as a failed microprocessor that controls RS-232 communications with the spectrograph. The faulty microprocessor was replaced with a unit from the spares pool.

### 4.2. The 2.5m Telescope

There were no significant problems with the 2.5m telescope or associated hardware systems. However, with the spring came the advent of the Miller moth season at the observatory and this year the density of moths has been particularly bad. In late May we began experiencing slippage of the telescope altitude drive capstans as a result of moths climbing into the drive mechanisms and getting smashed between the drive capstans and drive disks. Increased vigilance and cleaning by the site engineering crew helped minimize the impact on observing operations. It turns out that the moths also like to climb into warm electronic enclosures to the extent that they cause power supplies to overheat and electronic circuits to short. To prevent this, moth barriers were constructed and installed on critical electronics racks.

In early July, we experienced oscillations in the secondary mirror drive system. As of this writing, we have yet to positively identify the cause of the oscillation. One suspect is the piezo drive controller, which is currently undergoing inspection and testing.

In addition to the above, we completed a number of engineering projects, minor repairs and planned maintenance tasks in Q2. Examples of work performed include the following:

- DIMM installation was finished and the telescope turned over to the observers for testing and commissioning. Minor problems encountered with the telescope drive assembly were being debugged as the quarter ended.
- New flat field lamps for the imager were designed, fabricated and delivered to the observatory for installation and testing during the summer shutdown.
- The guide camera shutter failed and was replaced with its spare. The original shutter was sent back to the vendor, refurbished, and returned to the spares pool. Cause of the failure was dust and dirt sucked in through the cooling fan, so inspection and cleaning has now been added to the preventive maintenance program.
- The starter solenoid on the emergency generator failed to work during one of the monthly generator readiness tests. Given the importance of this system, the solenoid was replaced with a more robust and reliable unit. Spares were also purchased for the spares pool.
- New pressure sensors were installed on the imager and spectrograph LN2 fill systems to aid in system monitoring.



- A large access door was installed on the back of the panel of the imager enclosure, making it easier to perform some imager maintenance tasks without having to remove the imager from its enclosure.
- All four telescope counterweights were upgraded with new drive nuts and nut mounting hardware to improve system reliability.

#### 4.3. The Photometric Telescope

Over the past year we have been plagued with occasional runaways of the Photometric Telescope (PT) filterwheel that resulted in lost PT data. In Q2 we completed the installation and commissioning of the new filterwheel controller. We have not had a single runaway since the new controller was put into operation.

We also modified the aluminizing fixture for the PT primary mirror to improve how the mirror is handled during transport and held in place during aluminizing.

#### 4.4. Operations Software and the Data Acquisition System

There were no problems with the data acquisition system in Q2 that prevented us from acquiring data. We may be a little closer to understanding the source for some of our PTVME link problems. It was noticed that wiggling some of the cables that daisy chain the PTVME link cards to each other and to the control computer, `sdsstest`, resulted in PTVME link failures. Closer inspection showed a damaged section of cable. We subsequently inspected and replaced all interconnect cables.

During the process of upgrading the cabling, we discovered a bad power switch on one of the DA rack power supplies. An inspection of the all five DA power supplies and their two spares uncovered many problems, including bad wiring connections and flaky power switches. All seven units were promptly refurbished.

All observing software remains under formal version control and all changes are reviewed, approved, and planned during the bi-weekly observing software meetings. Observing software work in Q2 was focused mainly on troubleshooting and improving the TPM alarm system. Some effort went into testing and commissioning the new guider centroiding code, but poor weather during shakedown nights prevented us from acquiring the on-the-sky data needed to fully test and troubleshoot the new code. This effort will re-commence with the fall observing season.

#### 4.5. APO Facility Improvements

In last quarter's report, we discussed the possibility of purchasing a truck to transport the 2.5m primary mirror to Kitt Peak for its annual re-aluminizing. During Q2, budgetary quotes were solicited but the results were not favorable. We only received one quote; it was for a new truck at a cost of \$70K. Since we clearly cannot justify the purchase at this price, and since we are having trouble obtaining vendor quotes for acceptable used trucks, we have decided to continue renting a truck to transport our mirror.

## 5. DATA PROCESSING AND DISTRIBUTION

### 5.1. Data Processing

#### 5.1.1. Pipeline Development and Testing

No changes to the spectroscopic pipelines were introduced into the data processing (DP) factory in Q2. Spectro activities included manual inspection of spectroscopic plates for the upcoming DR2 data release. Quality procedures were established and quality tests performed on the spectro data, following the previous reworking of the spectro requirements. In addition, the robustness of the spectro1D line fitting algorithm was improved, particularly for the broad lines of QSOs. Several small bug fixes and improvements will be implemented in the upcoming spectro rerun 23, which will mainly incorporate changes to idlspec2d.

Version 5\_4\_18 of the photometric pipeline, photo, was delivered and tested at the beginning of the quarter. This version corrected all known problems described in previous reports. During the quarter, testing revealed a number of additional, mostly minor bugs that were quickly fixed; the most serious showed itself when, for one reason or another, the sky level in the PSP postage stamps from which the KL decomposition of the PSF was determined was not quite right. In such cases (which are quite rare) the incorrect sky level couples in nasty ways with terms describing the core of the PSF, causing undesirable behavior. This is now controlled by explicitly forcing the PSF postage stamps to zero at their edges; tests showed superior results as a consequence.

Improvements were also made to photo to deal with data obtained under superb (and therefore somewhat undersampled) seeing conditions. This caused a series of problems in the SSC and PSP, causing many good PSF stars to be rejected as cosmic rays. After a fair amount of work to improve the book-keeping and logic in SSC accordingly, the results are dramatically better in regions of excellent seeing (which are quite rare). By late in the quarter, photo v5\_4\_25 had been delivered, tested, and declared production-ready. Photo v5\_4\_25 corrects all of the recently uncovered problems and is the version currently being used to process imaging data in the DP factory.

Work went into improving the documentation of the imaging pipeline QA tools in Q2. Efforts in Q3 will focus on improving the imaging QA outputs, documentation and procedures to clarify how to declare a given run acceptable and how to effectively document QA test results.

#### 5.1.2. Data Processing Operations

In Q2 we processed 1021 square degrees of imaging data (including some reprocessing), as well as data from 109 spectroscopic plates and 106 PT patches. The imaging data take up roughly 1 terabyte of disk space. The median turnaround time to process data was 13 days (including calibrations) for imaging data, 1 day for spectroscopic data, and 5 days for PT data. As of this writing, we are current with data processing on all new imaging, spectroscopy and PT data. In addition, we are 80% finished with imaging reprocessing for Data Release 2. The “best” imaging data released with Data Release 1 was processed with photo v5\_3. For DR2, we are reprocessing this data, as well as new data, with the latest version of the photometric pipeline, photo v5\_4\_25. We anticipate finishing this reprocessing by mid-August.

A current snapshot of data volume obtained and processed can be found on-line. Imaging history is summarized at <http://das.sdss.org/skent/runHistory.html>; spectroscopy history is summarized at <http://das.sdss.org/skent/specHistory.html>; and target and tile runs are summarized at <http://das.sdss.org/targetlink/target.html>.

Several improvements were made to data processing operations in Q2. We commissioned seven new machines (sdssdp30 through sdssdp36) that will eventually replace sdssdp2 and sdssdp3. This replacement is necessitated by the performance of PSP for very long runs. The hardware is in place and working. Software and configuration changes have been made and are being tested. We also physically moved all data processing computers from Wilson Hall to Feynman Computing Center, where they are all on an uninterruptable power supply.

Our data processing goals for 2003-Q3 are as follows:

1. Transition all data and processing to use sdssdp30 through sdssdp36, and decommission sdssdp2+3;
2. Keep current on all new data collected;
3. Complete imaging processing for DR2;
4. Complete spectro processing for DR2;

## 5.2. Data Distribution

The Data Archive Server (DAS), loaded with DR1 data, was released to the astronomy community on April 4. The Catalog Archive Server (CAS), loaded with the same data, was released to the astronomy community on June 11. With the release of the DR1-DAS and DR1-CAS, we have fulfilled our commitment for Data Release 1. DR1 contains two versions of the imaging data: *Target* and *Best*. The *Best* version contains images and photometric catalogs with the highest quality data at the time of the data release. For DR1, the *Best* imaging data was processed with photo v5\_3, with the majority of data processed with photo v5\_3\_47. The *Target* version contains those imaging data at the time the target selection algorithm was run for that part of the sky. *Target* data was processed with the version of photo current at the time the target selection algorithm was run.

In earlier reports, we discussed the possibility of replacing the *Best* imaging data in the initial DR1 release with data reprocessed with photo v5\_4. We are no longer planning to do this. Rather, the DR1 release is considered final and imaging data reprocessed with photo v5\_4 will be released as part of DR2.

### 5.2.1. Data Archive Server

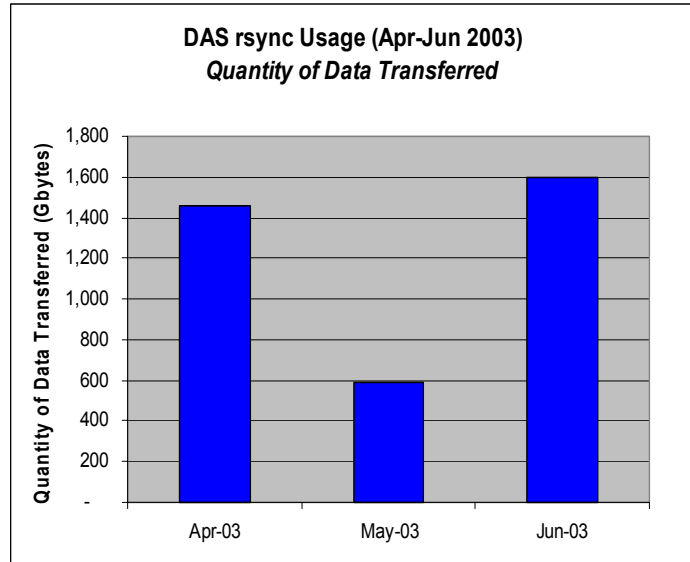
No improvements were necessary or made to the Data Archive Server (DAS) hardware or software in Q2. The DR1-DAS remained available to the SDSS collaboration and general astronomy community throughout the quarter, with only minimal downtime due to scheduled maintenance. Helpdesk support was provided by Fermilab as planned; the helpdesk received and responded to an average of 3 help requests per week.

Approximately 3.65 terabytes of data were transferred from the DAS by users accessing the rsync server in Q2. The following graph shows the rate of data rsync'd from the DR1-DAS in Q2. The full set of usage statistics is available online at [http://das.sdss.org/data/dp7.a/crw/rsync\\_usage/](http://das.sdss.org/data/dp7.a/crw/rsync_usage/).

In Q3, the DAS will be loaded with reprocessed imaging and spectro reductions (photo v5\_4 and spectro rerun 23) in preparation for DR2. Specific activities will include loading the data, verifying its integrity, updating documentation, and making the DR2-DAS available to the collaboration. In addition, improvements may be made to the DR2-DAS based on experience serving the DR1-DAS.

### 5.2.2. Catalog Archive Server

The Catalog Archive Server (CAS) was fully loaded with the DR1 data set (Photo v5\_3 and spectro 19 reductions) and made available to the collaboration on April 11. After two months of testing, evaluation and use by the collaboration, the DR1-CAS was made available to the general astronomy community on June 11. The DR1-CAS is being served from JHU. In addition to development work on the CAS proper in Q2, we also updated the SDSS DR1 web pages and created the documentation required to support the CAS release. Usage statistics on the DR1-CAS will be reported in the Q3 report, after the DR1-CAS has been available for several months.



Once the DR1-CAS was made available to the collaboration, we began working on transferring the production CAS loading process from the development environment at JHU to the production environment at Fermilab. Activities included solving several computer hardware and software configuration and security issues, installing the necessary operating system and applications software, installing and testing comma-separated value (CSV) file generation scripts, generating CSV files from binary data files, loading the files into a CAS SQL Server database, verifying data load integrity, and developing adequate process documentation. While a great deal of progress was made in Q2, integrating the CAS loading operation into a production environment is still under development. By the end of Q2, a test load was completed in the production environment, albeit with a substantial amount of effort by both the development and production teams.

CAS work in Q3 will focus on completing the integration of the CAS into the production environment at Fermilab, automating the loading process where reasonable, and completing the CAS system documentation. Once these steps are complete, we will be in a position to declare the CAS production ready and commence data loading in preparation for DR2.

### 5.2.3. Data Distribution Goals for 2003-Q3

The following goals have been established for data distribution during the third quarter of 2003:

1. Finish the integration of the CAS database tools into the production operation at Fermilab and train the production staff in their use;
2. Fully document that CAS loading operation;
3. Demonstrate that the CAS is ready for operations at Fermilab by completely reinstalling all software and configurations on the machines, from documents and files under version control.

4. Load the DR2-DAS with the full set of DR2 imaging, spectro, and tiling data;
5. Make the DR2-DAS available to the collaboration for evaluation, testing and use;
6. Load the DR2-CAS with the full set of DR2 imaging, spectro, and tiling data;
7. Make the DR2-CAS available to the collaboration for evaluation, testing and use;
8. Begin developing the DR2 web site and preparing documentation to support the DR2 release. An initial version of the website and documentation will be available for use and evaluation by the collaboration in conjunction with the release of the DR2 data set.

## 6. SURVEY PLANNING

### 6.1. Observing Aids

Several programs are used to aid in planning and carrying out observations.

HoggPT is a data processing robot that reduces data from the PT and the cloud camera in real time to provide information about photometricity during a night. The software is still being tuned to handle data from the new cloud camera. A new version was installed in June. Analyzed data from the cloud camera data are used by the observers to assess the quality of observing conditions.

### 6.2. Target Selection

For this quarter, 101 plates were designed and drilled in three drilling runs. All were for the northern survey area. About half the plates are intended for observing next year. We now have a sufficiently large backlog of plates at APO that we are juggling incoming plates with outgoing plates that have already been observed.

### 6.3. Survey Planning

The software that is used to track survey progress is also used to prepared monthly survey plans. The only significant activity has been to fix bugs. The amount of data to track is large enough that the operational database software runs into memory problems when running large queries. The software was reorganized to alleviate these problems.

Code was written to define the Data Release 2 data products automatically. This code relies on the outputs of the survey progress software.

## 7. COST REPORT

The operating budget that the Advisory Council approved in November 2002 for the year 2003 consists of \$1,800K of in-kind contributions from Fermilab, US Naval Observatory (USNO), Los Alamos National Laboratory (LANL), and the Japan Participation Group (JPG); and \$3,400K for ARC funded expenses.

Table 7.1 shows the actual cost performance by project area for ARC-funded cash expenses in Q2 2003. A more complete table comparing actual to baseline performance is included as an attachment to this report.

Table 7.1. ARC-Funded 2nd Quarter and Forecast for 2003 (\$K)

Category	2003 – 2nd Quarter		2003 – Total	
	Baseline Budget	Actual Expenses	Baseline Budget (Nov 2002)	Current Forecast
1.1. Survey Management	69	66	245	316
1.2. Collaboration Affairs	4	2	16	10
1.3. Survey Operations				
1.3.1. Observing Systems	212	184	769	735
1.3.2. Data Processing & Dist.	132	133	533	564
1.3.3. Survey Coordination	0	0	0	0
1.3.4. Observatory Support	362	373	1,447	1,440
1.4. ARC Corporate Support	49	11	189	130
Sub-total	828	770	3,199	3,194
1.5. Management Reserve	50	0	201	201
Total	878	770	3,400	3,395

#### 7.1. Q2 Performance - In-kind Contributions

The sum of in-kind contributions for the second quarter was \$477K against the baseline forecast of \$439K and was provided by Fermilab, Los Alamos, the U.S. Naval Observatory (USNO), and the Japan Participation Group (JPG).

Fermilab provided telescope engineering and maintenance support, and the data processing systems at Fermilab, as agreed. Details of other Q2 in-kind contributions are as follows:

- The level of support required for survey management was less than anticipated in the baseline plan; administrative support for the project management office was slightly below the baseline forecast.
- Although Fermilab provided the agreed-to level of support for Observing Systems Support in Q2, the value reported for this support in Q2 appears to exceed the baseline forecast. This is result of an accounting adjustment made to correct a data entry error made when March 2003 efforts were reported. The level of effort for one individual had been entered as 1% of time worked instead of 100%. The error was corrected in the Q2 accounting reports such that when Q1 and Q2 are taken together, the total value of in-kind support agrees closely with the baseline forecast for the six-month period.
- In-kind support provided for Observers' Programs and DA Support consists mainly of support for the DA system at APO. The Q2 contribution was substantially less than forecast because minimal support was actually required.
- The level of in-kind support for Software and Data Processing is higher than the baseline and reflects a slight increase in the amount of effort going into the support of DR1, the processing of new data, and the reprocessing of existing data in preparation for DR2.

Los Alamos provided programming support for the Telescope Performance Monitor and testing support in preparation of DR1. The level of in-kind support provided in Q2 was greater than anticipated in the baseline forecast; the baseline did not include the additional effort Los Alamos

has made available to support the DR1 testing effort. Since these individuals will continue to provide testing support in preparation for DR2, the forecast for the remainder of the calendar year has been revised upward accordingly.

USNO provided support as required for the astrometric pipeline and other software systems they maintain. Q2 activities were focused on quality assurance testing and support in preparation of DR1. The value of in-kind support remains slightly higher than the baseline due to cost of living and other salary adjustments. As salary costs will remain at this level through the remainder of the year, the forecast has been revised upward.

No in-kind support was provided by the JPG in Q2 because no support was required for the imaging camera filters or calibration system. We do not anticipate needing support in these areas through the remainder of the year. However, the forecast for Q3-Q4 remains unchanged at \$5K per quarter to indicate that the JPG remains committed to provide this level of support should it be required to support observing operations.

## 7.2. Q3 Performance – ARC Funded Expenses

The sum of ARC-funded expenses for the second quarter was \$770K, or \$108K (12%) below the second quarter budget of \$878K.

Survey management costs were within \$3K (4%) of the Q2 budget. Travel expenses related to the Office of the Project Scientist were lower than anticipated. Expenses related to ARC Support for Public Affairs were also slightly lower than anticipated. These under-runs were partially offset by unbudgeted costs associated with the time domain feasibility study, which was discussed in the Q1 report. For the year, survey management costs are forecast to be \$316K, or \$71K (29%) above the baseline budget of \$245K. This is due in part to the time domain study and in part to the addition of a budget to support the new SDSS Director. The forecast has been revised to include funds in Q3 and Q4 to cover salary, travel, and miscellaneous expenses for the new Director. To offset these new costs, funds have been transferred from the ARC account for Additional Scientific Support. In doing so, we avoid drawing down the management reserve.

The budget for Collaboration Affairs provides for Working Group travel and technical page charges and is held in an ARC corporate account. Q2 expenses covered travel costs for two working group co-chairs to attend the SDSS collaboration meeting in Flagstaff. Keeping the Q3 and Q4 forecast as budgeted, the revised forecast for Collaboration Affairs is \$10, or \$6K (39%) below the baseline budget of \$16K.

Observing Systems costs were \$28K (13%) below the Q2 budget. Funds had been allocated to the ARC Observing Systems Support account to cover the cost of repairs or other unanticipated engineering needs that might arise over the course of the year. Since these funds were not required in Q2, the ARC budget appears under spent; the unspent funds have been moved forward in the forecast. The UW Observing Systems Support budget is slightly over budget because work on the plug plate fixture that had been scheduled for Q1 actually occurred in Q2. The Princeton Observing Systems Support budget appears overspent because the budget had distributed personnel costs over the year in a manner different from what is actually occurring. The total level of effort for the year, however, is expected to be within the approved budget. For the year, the revised forecast for Observing Systems is \$735K, or \$34K (4%) below the baseline budget of \$769K.

Data Processing and Distribution costs were within \$1K (1%) of the Q2 budget. No exceptional or unusual expenses were incurred in Q2. Variations on the data processing and distribution SSP accounts were at the \$1-2K level. For the year, the revised forecast for Data Processing and Distribution is \$564K, or \$31K (6%) above the baseline budget of \$533K. The increase reflects adjustments in support costs at Princeton and the University of Chicago as a result of salary increases and cost of living adjustments.

Observatory Support costs were slightly above the baseline forecast. Travel expenses were slightly higher than forecast because some costs encumbered in Q1 were paid in Q2 and because travel costs related to engineering and collaboration meetings were higher than anticipated. Because we are forecasting reduced travel requirements in Q3 and Q4, we do not expect to exceed the travel budget for the year. Expenses for observatory operations, maintenance, and equipment are just slightly below budget through the end of Q2. For the year, the forecast for Observatory Support is within 1% of the baseline budget of \$1,447K.

Total ARC Corporate Support costs were \$38K (77%) below the Q2 budget. Miscellaneous ARC corporate expenses (petty cash, insurance) were as expected. The account is under spent in part because there were no director review expenses in Q2 as anticipated when the budget was prepared. There were also no expenses incurred for relocation or additional scientific support in Q2; a fraction of the unspent funds have been moved forward into Q3-4. The remainder has been re-allocated to cover the budget for the new Director. The observers' research support fund was slightly underspent; the balance was shifted forward into Q3-Q4. For the year, the forecast for ARC Corporate expenses has been revised downward from \$189K to \$130K, which reflects the reallocation of funds from Additional Scientific Support to cover new Director expenses. By making this reallocation, we avoid drawing down the management reserve at this time.

### 7.3. Management Reserve

No management reserve funds were expended in Q2. All unspent funds have been moved forward and spread evenly between Q3 and Q4. There is a strong possibility that we will need to draw down the management reserve to cover the cost of computer hardware that was not in the approved budget but is needed to support data processing activities and the DR2 data release. In particular, we anticipate needing approximately \$9K to support reorganization of the computer hardware used to support data processing operations and the Data Archive Server. We also anticipate needing \$20-25K to purchase additional hardware for the DR2-CAS. Where possible, we will reallocate funds from within the existing budget to cover these costs. However, it is not clear at this time that we will be able to cover the entire \$30-35K without drawing on the management reserve. We will have a better picture of this at the end of Q3.

## 8. PUBLICATIONS IN 2003-Q2

The Sloan Digital Sky Survey Quasar Catalog II. Data Release 1  
AJ submitted - D.P. Schneider, et al.

SDSS J0903+5028: A New Gravitational Lens  
ApJ submitted - David E. Johnston, et al.



Stellar and Dynamical Masses of Ellipticals in the Sloan Digital Sky Survey  
New Astronomy submitted - Nikhil Padmanabhan, et al.

Star formation rate indicators in the Sloan Digital Sky Survey  
ApJ submitted - Andrew Hopkins, et al

The dependence on environment of the color--magnitude relation of galaxies  
ApJL submitted - David Hogg, et al.

Candidate Type II Quasars from the Sloan Digital Sky Survey: I. Selection and Optical Properties of a Sample at  $0.3 < Z < 0.83$   
AJ accepted - Nadia L. Zakamska, et al.

Galaxy Types in the Sloan Digital Sky Survey Using Supervised Artificial Neural Networks  
MNRAS submitted - Nick Ball, et al.

Double-Peaked Low-Ionization Emission Lines in Active Galactic Nuclei  
AJ submitted - Iskra V. Strateva, et al.

SDSS White Dwarfs with Spectra Showing Atomic Oxygen and/or Carbon Lines  
AJ submitted - Jim Liebert, et al.

Selection and photometric properties of K+A galaxies  
ApJ submitted - Alejandro Quintero, et al.

Continuum and Emission Line Properties of Broad Absorption Line Quasars  
AJ submitted - Timothy Reichard, et al.

The 3D Power Spectrum of Galaxies from Early SDSS Data  
ApJ submitted - Max Tegmark et al

Discovery of Eight New Extremely Metal-Poor Galaxies in the Sloan Digital Sky Survey  
ApJL submitted - Alexei Kniazev, et al

Magnetic White Dwarfs from the SDSS. The First Data Release  
ApJ submitted - Gary Schmidt, et al

Minkowski Functionals of SDSS galaxies I: Analysis of Excursion Sets  
PASJ submitted - Chiaki Hikage, et al

The Host Galaxies of AGN  
MNRAS submitted - G. Kauffmann, et al

A Large, Uniform Sample of X-ray Emitting AGN: Selection Approach and an Initial Catalog from the ROSAT All-Sky and Sloan Digital Sky Surveys  
AJ submitted - S.F. Anderson, et al

A Merged Catalog of Clusters of Galaxies from Early SDSS Data: BH1  
ApJ submitted - Neta A. Bahcall, et al

Distributions of Galaxy Spectral Types in the Sloan Digital Sky Survey  
AJ submitted - Ching-Wa Yip, et al

### **Based on Public Data**

Measurements of Cosmic Damped Ly-a Gas Metallicities at Redshifts  $z=0.9-2.0$  from SDSS Spectra

ApJL submitted - Daniel B. Nestor, et al

Large Scale Structure in the SDSS Galaxy Survey  
MNRAS submitted – A. Doroshkevich, et al.

Multicolor Photometry of the Galaxies in Abell 2255 by the BATC and SDSS Surveys  
ApJS accepted – Qirong Yuan, et al.

Long Term Variability of SDSS Quasars  
AJ accepted – Wim de Vries, et al.

Multiplicity of Nearby Free-floating Ultra-Cool Dwarfs: a HSTWFPC2 Search for Companions

AJ accepted – Herve Bouy, et al.

SDSS J1650+4251: A New Gravitational Lens  
AJ submitted – Nicholas Morgan, et al.

Modeling the two point correlation function of galaxy clusters in the Sloan Digital Sky Survey

MNRAS submitted - S. Basilakos, et al.

Constraining Photon-Axion Oscillations Using Quasar Spectra  
JCAP 04 003 (2003) - E. Mortsell, et al.

Probing the Ionization State of the Universe at  $z>6$   
AJ accepted - R. White, et al.

A  $3 \times 10^9$  Solar Mass Black Hole in the Quasar SDSS J1148\_5251 at  $z=6.41$   
ApJ 587:15 (2003) - C. Willott, et al.

Shape Statistics of Sloan Digital Sky Survey Superclusters  
MNRAS accepted - S. Basilakos, et al.