1 Scientific Justification

The identity of the mysterious dark energy that is apparently accelerating the universe's expansion remains one of the leading scientific questions of our day, and the most direct current approach to this problem remains the measurement of the universe's expansion history using Type Ia supernovae (SNe Ia). Several large efforts are engaged in collecting hundreds of supernovae at the low redshifts, $z < 0.1$ where they can be calibrated (e.g., the Nearby SN Factory and the Lick Observatory Supernovae Search) and at the higher redshifts, $0.2 < z < 0.8$, where the acceleration is detected (the CFHT SN Legacy Survey and the ESSENCE project). The expansion history from $0.9 < z < 1.5$ completes the story by testing the cosmology in the epoch of deceleration, when the attraction of dark matter dominated over the "repulsion" of dark energy. In 1998, we first proposed and demonstrated the possibility of finding and studying supernovae in this epoch, using the Keck Telescope to discover SN 1998eq ("Albinoni") at $z = 1.2$ (Aldering et al. 1998).

Since this first SN Ia discovery in the decelerating epoch our team and other groups have performed ground- and space-based searches, but the faintness of these very distant supernovae makes them much more demanding of telescope time. Hence there are only about a dozen or so such supernovae in hand altogether (see Figure 1). Current HST work by both teams can yield only about 10 per year (and expends hundreds of HST orbits!). In a comprehensive 2002 observing campaign we used the wide-field Suprime-Cam imager on Subaru to discover ∼20 SN Ia candidates in this redshift range, and we were able to confirm less than half of them with spectroscopy of the supernova performed at the Keck Telescope and the VLT. Several were followed with HST photometry, and all were followed through their lightcurves with the Subaru Suprime-Cam. This past year we were able to obtain the final images of the host galaxies after the supernovae had faded, allowing the lightcurves for 14 SNe to be constructed, and the supernovae with known redshifts to be placed on the Hubble diagram (blue points in the lower inset of Figure 1). As shown in Figure 1, the 14 new SNe represents a doubling of the sample size in the decelerating epoch.

The points shown in red in Figure 1 are plotted at the redshifts estimated from the time dilation of their lightcurves, assuming that they share the tight lightcurve-width distribution of the other SNe Ia at this epoch. Their exact redshift is not yet known, and, since there is dispersion in the lightcurve timescale of SNe Ia, it can easily vary by the amount shown by the dashed open-circle data point on the lower inset of Figure 1. We here propose to complete the final necessary observations of this large campaign, and obtain the redshifts for the host galaxies of these nine supernovae.

The target SN sample.

Figure 2 shows the i'-band lightcurves for these nine supernova that were used to obtain the magnitudes and error bars – and estimated redshifts – plotted in Figure 1. For each of these SNe we also have R- and z'-band photometry near maximum light, to reject significantly reddened SNe and Type II SNe. The same SN II color-rejection technique is used in the HST-based searches that led to the SNe shown in the upper inset of Figure 1, and it has yielded good SN Ia selection. (It should be noted that the full compilation of Riess et al 2004 shown in Figure 1, which is drawn from several teams' SNe, included many supernovae that are not spectroscopically confirmed as SN Ia.)

One extra lightcurve is shown at the bottom of Figure 2, labeled "058." This lightcurve is more than a magnitude brighter at peak than would be expected from its time-dilation-inferred redshift, even if it were one of the slowest SNe Ia ever observed. Although this is lower priority than the other nine targets, it is a mysterious event for which a redshift would be key in studying its identity.

For example, in the unlikely event that its spectroscopically measured redshift were to match its time-dilation-inferred redshift, then this might be an interesting candidate for a gravitationally lensed supernova event.

At the other extreme of priority, the Fall 2005 observing program that we have proposed for HST would be expected to yield several additional $z > 1$ SNe Ia with well-measured lightcurves but no spectroscopic redshift. We would substitute the best of these (highest redshift, and highest quality lightcurves) for the lowest priority of the current nine target SNe (those with the lowest estimated redshift).

An exciting culmination of a major scientific program.

The proposed Keck observations would complete a comprehensive multi-telescope campaign that has yielded the largest-to-date sample of SNe Ia in the "decelerating" redshift range. This sample would more than double the number of such SNe Ia on the Hubble diagram, in this very poorly populated redshift range. This larger sample will make it possible to begin to look for a ridgeline and for outliers, providing tests for non-Ia contamination, and for a residual extinction tail (see Commins 2004). Measurements of asymmetry in the distribution about the Hubble line will permit limits to be set on the gravitational lensing that is statistically expected to skew the distribution, with frequent de-amplification and rare amplification of the SN magnitude (see Linder & Holz 2004). Finally, this statistically-significant sample size continues the exploration of this new redshift range, where future projects such as SNAP/JDEM will put much of their effort in constraining the dark energy's equation of state and its time variation.

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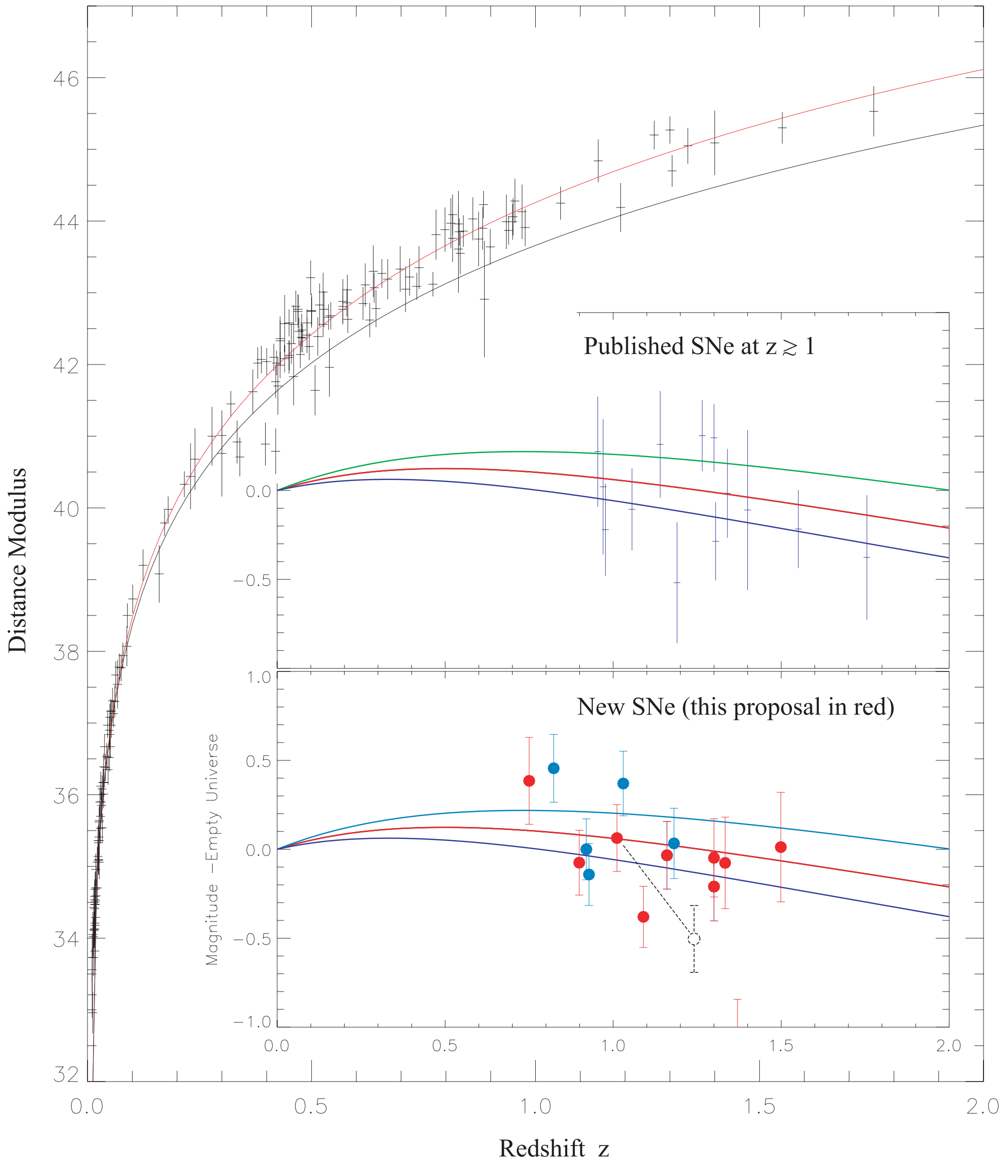

Figure 1. The Hubble plot for SN Ia, based on a compilation of SNe in the literature discovered primarily by both the Supernova Cosmology Project and the High-Z SN Search (Riess et al. 2004). The solid curves show flat cosmologies with $\Omega_M = 0.3$ (top) and 1.0 (bottom). At the highest redshifts – in the epoch of deceleration – the plot is very sparsely populated. *Upper Inset:* The magnitude residual from an empty universe ($\Omega_M = \Omega_\Lambda = 0$) for the SNe from this compilation at the highest redshifts. The solid curves show flat cosmologies with $\Omega_M = 0.2$, 0.3, and 0.4 (top to bottom). *Lower Inset:* The magnitude residual from an empty universe for the new SNe discovered in our Subaru-based search for SNe at these decelerating redshifts. The SN indicated by blue points have Keck-spectroscopically measured redshifts, while those indicated with red points are plotted using approximate redshifts estimated from the time-dilation of the lightcurve timescale. The dashed-line point shows the $\sim 1\sigma$ range of variation of this redshift estimate, based on the known dispersion of lightcurve timescales (from Perlmutter et al. 1999 and Knop et al. 2003). (This dashed-line point is at the same magnitude as its corresponding solid-line point, but the different assumed redshift gives a very different residual from the empty universe.) We here propose to obtain the exact spectroscopic redshift for the host galaxies of each of these SNe.

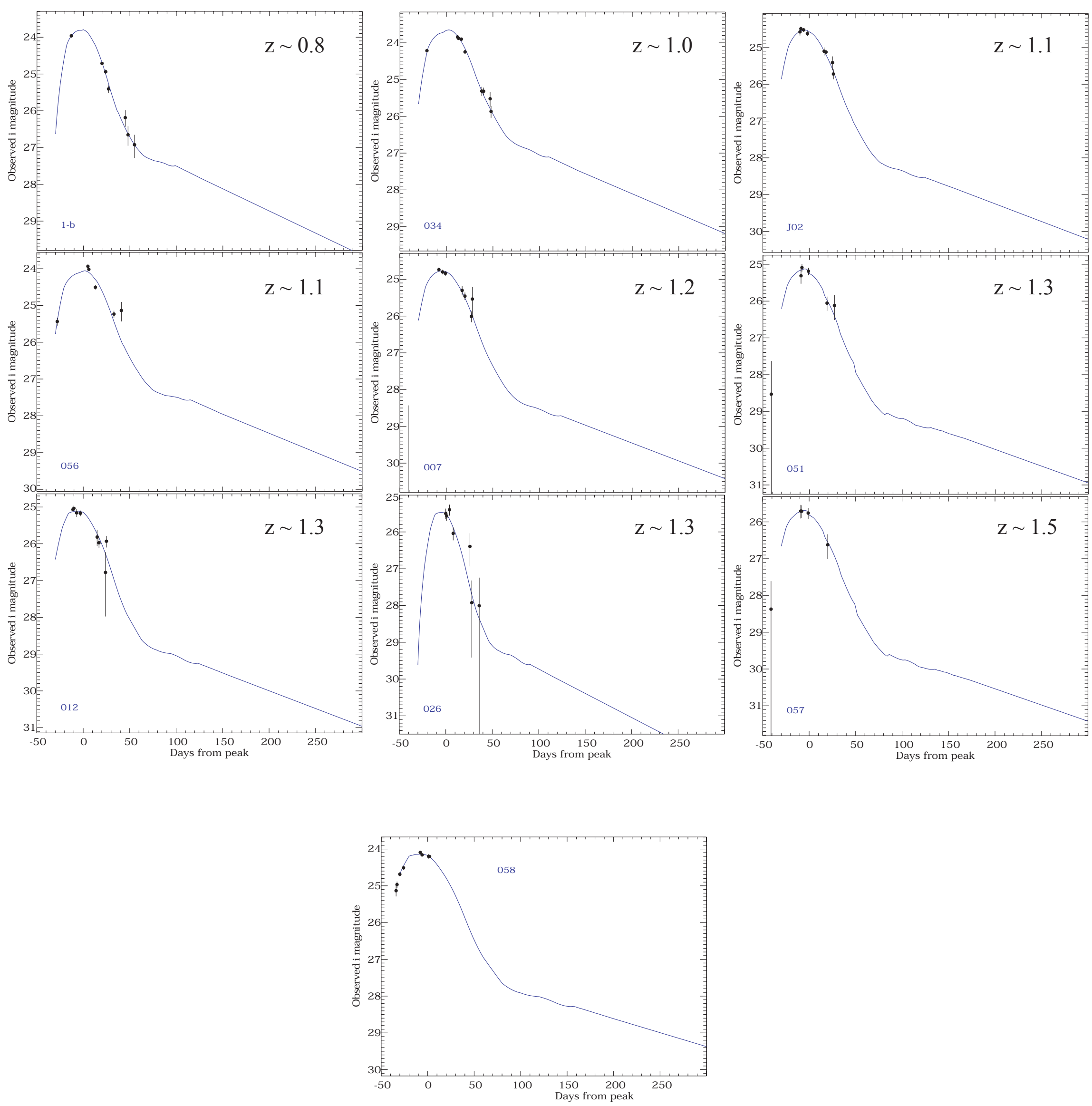

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Figure 2. *Upper Array of Plots:* The i′-band lightcurves for the nine supernovae targeted by this proposal (red points in the Figure 1 lower inset). Each of these SNe also has R- and z′-band photometry points near maximum light (not shown). Note that for these nine SNe the integraged host galaxy light in a 1′′ aperture is significantly brighter than the SN in almost every case. *Lower Panel:* The i′-band lightcurve for the unusual target "058." The peak magnitude of this target is over a magnitude brighter than expected for an SN Ia at the redshift ($z > 1.5$) indicated by its lightcurve time dilation.

2 Progress to Date

Prior to fall 1998 we concentrated on mid-redshift SNe Ia and we returned to that work with our SNLS/Keck program, begun in 2003A. The 1995-1997 portion of the mid-redshift cosmological program was published in Perlmutter *et al.* 1999 and the following portion, including 11 SNe Ia observed with Keck and *HST*, published in Knop *et al.* 2003. The cosmological results from the 11 SNe in Knop *et al.* are in close agreement with results from the first supernova results (Perlmutter *et al.* 1999) that gave direct evidence for a cosmological constant. In addition, the greatly improved color measurements of the *HST*-observed SNe allowed us to individually correct each SN for host-galaxy extinction and no anomalous negative E(B-V) values were found for the high-redshift SNe.

In addition to the recent Knop *et al.* paper, we have published results based on this project's Keck measurements on the study of SN Ia variations over time/redshift. In Sullivan *et al.* (2003) we presented new results on the Hubble diagram of SNe Ia as a function of host galaxy morphology that demonstrates that host galaxy extinction is unlikely to systematically dim distant SN Ia in a manner that would produce a spurious cosmological constant. This result was based on Keck spectroscopy and *HST* STIS "snapshot" images of SNe spanning the range $0.3 < z < 0.8$. In Hook *et al.* (2005 submitted), we presented spectra obtained primarily with Keck II/LRIS for 14 high redshift SNe used in the Perlmutter *et al.* 1999 analysis. In this paper, we also presented a comparison of these SNe with their low redshift counterparts. We found that the spectra time-sequence of Type Ia's at high and low redshift is indistinguishable. Based on this and also a comparison of the expansion velocities measured from blue-shifted Ca H&K, we found no evidence for evolution in SN Ia properties between a low and high redshift sample. In Pain *et al.* (2002) we presented the changing SN Ia rates in the redshift range $z \sim 0.65$, which constrain the models for SN Ia progenitors.

Between fall 1998 and fall 2002 we concentrated on the highest redshift SNe Ia. We built up the foundations for this work beginning in October 1998 with our very successful pilot study using Keck LRIS imaging and spectroscopy in order to demonstrate that SNe Ia up to $z = 1.2$ could be found and studied using existing facilities. SN 1998eq at $z = 1.200$ was the key discovery from this run, and we obtained its complete I-band and J-band light curves using *HST* (Fadeyev *et al.* 2004).

This work led to t a series of very high redshift supernova searches ($z > 0.9$ with i' = 23.8 to 25.2 at discovery) with Subaru/Suprime-Cam. We performed searches in spring 2001, spring 2002, and fall 2002. The supernovae whose hosts are the target of this proposal were discovered In the Fall 2002 run, which was done in collaboration with the Subaru-XMM Deep Survey project.

In addition to this high redshift work, we are continuing our long term program with the CFHT Legacy Survey SN component (SNLS) which targets intermediate redshift SNe Ia. The SNLS began in semester 2003A in pre-survey mode; the full survey commenced in August 2003. As of August 2004 (i.e. one full year of survey operation), SNLS has located *and spectroscopically confirmed* over 100 well-sampled type Ia SNe, with multi-epoch and multi-color light-curves. Our Keck 2004A time allocation made an invaluable contribution to the co-ordinated SNLS follow-up, screening 18 SN candidates in the Extended Groth Strip.

3 Technical remarks

Targets and Exposures

All of the targets in this proposal are the hosts of Supernovae that have very well sampled I-band light curves, with additional measurements, for measuring the colour, in the R- and z-bands, and all are likely to be above a redshift above 1. See figures 1 and 2. The co-ordinates of the 10 highest priority targets are listed in the following table. Typical magnitudes for the host vary from R=23 to R=26, with most targets brighter than 24th magnitude. For those targets that are fainter than 24th, we will be searching for the [OII] $\Lambda\,3727$ line, which is not uncommon in the spectra of galaxies that host high redshift supernova (Lidman et al. 2005).

```
SCP Name   Coordinates (J2000)
=============================================
SuF02-007   02:18:52.4  -05:01:14.0
SuF02-012   02:18:51.6  -04:47:25.7
SuF02-026   02:18:51.9  -04:46:57.3
SuF02-034   02:18:31.2  -05:01:24.5
SuF02-051   02:17:27.5  -04:40:45.2
SuF02-056   02:20:00.0  -04:44:20.7
SuF02-057   02:20:13.9  -05:07:36.2
SuF02-058   02:17:59.7  -04:52:27.0
SuF02-J02   02:18:42.9  -05:04:12.4
SXDS_1-b    02:17:09.7  -04:57:47.8
=============================================
```

Note that we might add a few high priority targets from our HST program (approval pending) to discover Type Ia in the ellipticals of distant ($z \sim 1$) galaxy clusters, in which case we would drop one or two of the low priority candidates in the above list.

Based on our extensive experience with real Keck observations, we request 1 to 3 hours per target. With this exposure time, we find that 80% of $z \sim 1$ Type Ia SN hosts have readily identifiable spectral features that lead to secure and accurate redshifts. At these redshifts, the most commonly identifiable features are the [OII] $\Lambda\,3727.$, calcium H and K, and, in some cases, Balmer absorption lines.

With an average of 2 hours per target and 10 targets, we therefore need 2 nights to execute our program.

Although we expect most of the spectral features will be around 8000 Angstroms, our targets are faint, so we cannot tolerate too much contamination from moonlight. In general, we have found that we can observe at most 5 days from new moon.

Fringing in the red will not be a limitation. We use frequent dithering along the slit and special reduction procedures (Lidman et al. 2005) to reduce the systematic error from fringing to negligible levels.

Instrumentation

In the past we have used LRIS, DIEMOS and ESI for SN spectroscopy work. We have found that each of these instruments has specific advantages depending on the target redshift range and the supernova-campaign strategy. For this program we request the LRIS instrument for two nights.

Its broad wavelength coverage is an advantage for this run. As in our previous LRIS observations, we will use the 400/8500 grating, centered at 7500 Angstroms in the red, the 600/4000 grism in the blue, and the 560nm dichroic.

Backup Program

If transparency or seeing precludes faint object spectroscopy, we will confirm lower redshift, and relatively bright supernova candidates from the SNLS survey which would otherwise be reserved for smaller telescopes.

Additionally, we are also pursuing studies of the host galaxies of other SNe we have discovered in the past in order to understand the relationship between SN Ia properties and global properties (metallicity, morphology, etc.) of the hosts. Several of these programs, such as measuring the gas-phase metallicity of the host of the hypernova SN 1999as using the [NII]/Hα ratio, determining the colors of the $M_B \sim -11$ host galaxy of SN 1999aw, or measuring the age and metallicity of the nearby ($z = 0.054$) Hubble-flow elliptical host galaxy of SN 1999av with high-resolution high S/N spectroscopy, can be carried out as back-up programs.

Supplementary Observations

There are no supplementary observations for this program. The lightcurve data, including the final references, have been taken and fully analysed. With these observations we are proposing here, we will obtain the necessary redshifts that will enable us to put these supernova on the Hubble diagram.

Status of Previously Approved Keck Programs

Semester 2005A: We have been awarded 4 nights for LRIS spectroscopy of SNLS follow-up. These observations have not yet taken place.

Semester 2004B: We did not apply for time in 2004B.

Semester 2004A: In 2004A we were awarded 3 nights, in March, April (both DEIMOS) and May (LRIS), for SNLS follow-up. The March night was completely lost due to poor weather conditions (note that even though March weather was exceptionally poor, the queue observed nature of SNLS ensured that candidates were still available in this month). For the April-DEIMOS run we observed 8 candidates in long-slit mode, and for the May-LRIS run a further 7 candidates. Our preliminary analysis indicated that 10 of these candidates are probable SNe Ia, one an SN Ib/c, one a SN II, and one non-SN spectrum (see Fig. 4 for examples of our spectra). Two candidates remain to be typed. During this sesmester, a trial collaboration with the DEEP team enabled us to observe 3 candidates on various DEEP EGS masks, resulting in one SN Ia, one SN II and one unidentified spectrum.

We also developed a new capability for long-slit observers using DEIMOS. By placing reflective tape on either side of the slit on a special long-slit mask it becomes possible to acquire significantly fainter targets. We tested and demonstrated this capability in semester 2004A.

Semester 2003B: We did not apply for time in 2003B.

Semester 2003A: In 2003A we were awarded 2 nights in May and 1 night in July for follow-up of SNLS supernova candidates. We concentrated on the SNLS field which encompasses the EGS. For both runs we observed with DEIMOS on Keck II in order to gain the experience needed to coordinate our follow-up with DEEP multi-object spectroscopy in the EGS. Conditions were marginal for the two nights in May, with excellent seeing accompanied by thick cirrus. During this run we demonstrated the feasibility of observing SNLS SNe in parallel with DEEP galaxy spectroscopy in the EGS. Conditions were good for the July run, and we were able to screen 5 high-redshift supernova candidates being followed by SNLS. As acquisition of faint targets is difficult with DEIMOS used in long-slit mode due to the low reflectivity of the long-slit mask, during this run we developed acquistion code patterned after our acquisition code for ESI.

Semester 2002B: We were awarded four Keck II/ESI nights in November 2002 which were used for spectroscopic confirmation of SNe discovered in an intensive search using Subaru. From this search, 18 SNe were reported in IAU Circulars, of which 9 had spectra taken with ESI, and 5 $z > \sim 1$ SNe Ia were followed with various combinatons of ACS photometry and slitless spectroscopy and NICMOS imaging as part of our 100-orbit cycle 10 program. Final reference images are being obtained now that NICMOS has been refurbished; analysis is proceeding.

Semester 2002A: We were awarded six nights for ESI spectroscopy of SNe from our spring 2002 search campaign which consisted of a "rolling" search at CFHT (a pilot-study for the SNLS) as well as "classical" searches at Subaru and CTIO. Essentially all the Keck time was lost due to bad weather, with the dome closed for most of the nights. Of our three nights in April, we were able to use about one half night. We observed two CFHT SNe (at $z \sim 0.3$) and two Subaru candidates (at $z = 0.56$ and $z = 0.88$). The three nights in May were completely lost due to weather.

Semester 2001A: In this highly successful six-night run we used one night of LRIS + Keck I and five nights of ESI + Keck II to obtain spectra of 17 SNe, including three SNe Ia at $z > 1$. Our strategy of observing for six nights in one semester paid off, as we were able to use the three poorer seeing (~ 1 arcsec) nights and one cirrusy night to confirm brighter targets, and use the two better seeing nights to study SNe at $z > 1$. The Keck spectra allowed us to classify the SNe, obtain redshifts, and select the highest redshift targets for *HST*. In addition, the spectra are being compared to low redshift SNe Ia to test for the effects of evolution in the high-z sample. This run also gave us extensive experience with ESI, enabling us to refine our reduction techniques to best exploit ESI's advantages (and compensate for small remaining problems). The required final reference images of the host galaxies for these SNe have very recently been obtained with the *HST* so analysis can now proceed.

Semester 2000A: The highlight of this two-night run at Keck was spectroscopy of 2000fr, supernova candidate (from our CFHT search) that turned out to be a Type Ia SN at $z = 0.54$ at a very early phase in its light curve (only ~ 6 days after explosion). This early discovery allowed us to begin an intensive monitoring campaign to study the supernova in great detail, including near-IR imaging with ISAAC on the VLT. This data set allows us to make a detailed comparison with nearby Type Ia supernovae to check for signs of evolution or extinction by dust (paper in preparation). These results have encouraged us to pursue detailed spectroscopy of another $z \sim 0.5$ SN Ia.

Semester 1999B: Three nights were awarded for the second week of October, 1999. The time was used for spectroscopy of candidate SNe that were discovered in a search at CFHT earlier that month. Out of the 10 candidates discovered, we were able to observe 6 of them, and two of those were found to have $z \sim 0.9$.

Semester 1999A: One night was awarded but was not usable.

Semester 1998B: Three nights were awarded for a pilot study to find very high-z SNe. Two nights were used for imaging and one for spectroscopy, resulting in three Type Ia SNe with $z = 1.2$, 0.84 and 0.11. The SN with $z = 1.200$ (1998eq) was at that time the highest redshift confirmed Type Ia SN (IAUC 7046). The discovery of this supernova demonstrates that it is feasible to find and obtain spectra for Type Ia events even for redshifts $z > 1$. The two highest redshift SNe from this run, both of which were discovered close to maximum light, were observed in I-band

and *J*-band with *HST* WFPC2 and NICMOS.

Semesters 1997B and 1998A: In December 1997 and March 1998 we carried out searches using the BTC on the CTIO 4-m. The resulting SN candidates were observed spectroscopically with Keck on approximately 4 usable nights (over the two semesters). A total of 36 candidates were observed and 26 were confirmed as Type Ia, with mean redshifts of approximately 0.6–0.7. These were followed-up from the ground with CTIO-4m, WIYN, ESO 3.6m, WHT and INT telescopes, and 11 of these were also followed photometrically with *HST* using WFPC2 and NICMOS. The corresponding final reference images have been obtained for these SNe and the results presented in Knop *et al.* (2003).

Earlier Semesters: Final host galaxy images have been obtained for nearly all the SNe discovered prior to the above semesters. These SNe have been analyzed and formed the basis of the analysis presented in Perlmutter *et al.* (1999), which highlights the evidence for a cosmological constant. In addition to that paper and the more recent Knop *et al.* (2003), nine additional papers based on our Keck work describe: (i) the first measurements of cosmological parameters based on the first seven SN discoveries (Perlmutter *et al.*, 1997); (ii) a measurement of the rate of Type Ia SNe at $z \sim 0.4$ (Pain *et al.*, 1996), (iii) the rate of Type Ia SNe at $0.35 < z < 0.85$ (Pain *et al.*, 2002), (iv) constraints on the spatial variation of the Hubble constant from our data (Kim *et al.*, 1997), (v) a study of the timescale stretch parameterization of type Ia supernova B-band light curves (Goldhaber *et al.*, 2001), (vi) the use of SN spectra for the determination of subtype and age of SNe Ia (Riess *et al.*, 1998), (vii) results on the $z = 0.83$ supernova 1997ap, and implications for cosmological measurements (Perlmutter *et al.*, 1998), (viii) the consistency of rise times measured for low and high-z supernovae (Aldering *et al.*, 2000), (ix) that our evidence for a non-zero cosmological constant is independent of host galaxy morphology (Sullivan, *et al.*, 2003).

Research is in progress which will result in additional papers. These include (i) a determination of the rates of SNe Ia at $z > 1$, (ii) an analysis constraining metallicity variations and evolution from our SN spectra, and (iii) new limits on the cosmological parameters and possible systematics (grey dust or evolution) from SN 1998eq at $z = 1.20$. All these papers use the results from Keck spectroscopy obtained as part of our supernova cosmology program. A number of papers on these topics have also appeared in conference proceedings.

4 Path to Science from Observations

As in the past, we will use spectral lines of the host galaxy to determine the redshift. These lines, whether seen in emission (e.g. OII 3727Å) or absorption (e.g. Ca II H & K), can be identified even when the SN and galaxy light are blended, because the galaxy lines are much narrower than the SN lines. (In cases where there is no significant light from the host, redshifts will come from the supernova spectrum itself.) The data are reduced using custom-written software, including an implemetation of the B-spline sky subtraction technique and, for LRIS, fringe removal. The SN spectra are then smoothed on a scale of ~ 20Å (after removing any lines due to the host galaxy and deweighting the spectral regions covered by OH lines) and compared with those of nearby SNe to ascertain the SN type (e.g. Fig 4).

The Keck redshifts will be used along with rolling photometry from the SNLS (Fig. 3) to plot the Keck SNe Ia on the Hubble diagram. This requires that the light-curve time of maximum, peak flux, and width, be measured. The light-curve width is strongly correlated with the intrinsic supernova brightness, and is used to standardize SNe Ia. K-corrections — which we have developed using the spectra of low-z SNe Ia (Nugent, Kim, & Perlmutter 2002) — must also be applied, followed by correction for dust extinction from the host galaxy and the Galaxy. The extinction correction requires a knowledge of the unreddened intrinsic SN colors, which we have determined from low-z SNe Ia in elliptical galaxies (and will improve with future low-redshift data) and do not result in overcorrection for extinction (as is the case for some other treatments in the literature). Once the SNe Ia have been standardized, we can solve for the confidence intervals for the cosmological parameters. We have and are continuing to develop extensive software to undertake such light-curve fitting, corrections, and parameter fitting.

The Keck spectroscopy will allow us to test for the effect on our cosmological fits due to any spectroscopically peculiar SNe Ia, and to set better limits on systematic uncertainties which could be caused by unrecognized spectroscopically peculiar SNe Ia. For our $z \sim 0.5$ (brighter) SN Ia where the host galaxy light does not significantly contaminate the SN spectrum, stronger tests, including comparison of the metallicity-dependent UV spectral features with our Cycle 9 and Cycle 11 *HST* UV spectra of nearby SNe Ia (from a separate program) will be possible.
sectionTechnical Concerns

Since some of our targets are faint, accurate offsetting is critical to take advantage of the narrow slit widths possible under the best seeing conditions. We have carefully pre-selected about half a dozen nearby stars with accurately computed offsets to offset between the star and the supernova host.

5 Experience and Publications

Our group has extensive experience with faint object spectroscopy on telescopes around the world and has had successful runs using LRIS, ESI, and DEIMOS on Keck each semester for the last eight years. To reduce and analyze the spectra, our group has developed techniques that are specific to high-redshift supernova work. Our group has also developed extensive techniques for the photometry of high-redshift SNe against the bright background of their host galaxies. A list of relevant publications appears at the end of this document.

6 Resources and Publication Timescale

The LBNL supernova group consists of three UC professors (PI Perlmutter is now also a UC Berkeley faculty member), three permanent staff scientists, a scientist/project coordinator, six postdocs and three graduate students. The group uses the extensive computing facilities available at LBNL.

We note that the all the data that is necessary to put these SNe on the Hubble diagram have already been obtained and reduced, with the exception of the redshifts, which is the subject of this proposal. So the publication timescale will be much shorter than has been traditionally been the case.

Nevertheless, for mid-redshift SNe Ia we have been able to get the results into press within roughly a year. As examples, SN1997ap was discovered in March 1997, and a paper describing the data and results from that supernova was published by *Nature* in January, 1998. The results from the first 42 SNe (data obtained from Spring 1995 to Spring 1998, including final follow-up photometry on the Spring 1997 SNe) was published in *ApJ* in Fall 1999.

7 Publicatons

(* = Keck data contributed to this publication.)

* New Spectra of High Redshift Type Ia Supernovae and a Comparison with their Low Redshift Counterparts, I. Hook, *et al.*, 2005, AJ submitted

* Restframe I-band Hubble Diagram for Type Ia Supernovae up to Redshift $z \sim 0.5$, S. Nobili, *et al.*, 2005, A&A submitted

Spectroscopic confirmation of high-redshift supernovae with the ESO VLT, C. Lidman, *et al.*, 2005, A&A 430, 843, 2005

* Cosmological Constraints from the First Supernova Discovered above Redshift of One., V. Fadeyev, *et al.*, 2004, AAS, 205

A Set of Nearby SNe Ia Lightcurves, M. Kowalski, *et al.*, 2004, AAS, 205

Spectroscopic Observations and Analysis of the Peculiar SN 1999aa, G. Garavini, *et al.*, 2004, AJ 128,387.

Low redshift type Ia supernovae calibration, V. Prasad, 2004, NewAR, 48, 633. (Proceedings of the Workshop on Supernovae and Dust)

* Very High Redshift Supernova Discoveries with Subaru/Surpime-Cam, N, Yasuda, 2003, *et al.*, AAS, 203

* New Constraints on Ω_M, Ω_Λ, and w from an Independent Set of Eleven High Redshift Supernovae Observerd with *HST*, R. A. Knop, *et al.*, 2003, ApJ, 598, 102.

* Hubble Diagram of Type Ia Supernovae as a Function of Host Galaxy Morphology, M. Sullivan *et al.*, 2003, MNRAS 340, 1057.

* The distant Type Ia supernova rate, R. Pain, *et al.*, 2002, ApJ 577, 120.

K-corrections and Extinction Corrections for Type Ia Supernovae, Peter Nugent, Alex Kim, Saul Perlmutter, 2002, PASP 114, 803.

*The Distant Type Ia Supernovae Rate, R.Pain, *et al.*, presented at the January 2002 AAS meeting.

*Verifying the Use of Type Ia Supernovae as Probes of the Cosmic Expansion, R.Ellis, *et al.*, presented at the January 2002 AAS meeting.

*Ω_M and Ω_Λ from 11 HST-Observed Supernovae at z=0.36-0.86, R.Knop, *et al.*, presented at the January 2002 AAS meeting.

*NICMOS Photometry of High Redshift Supernovae, S.Burns, *et al.*, presented at the January 2002 AAS meeting.

*Type Ia Supernovae: Tests for Evolution and Grey Dust.Ground and Spaced Based Follow up of a Type Ia Supernova at z=0.54, S.Nobili, *et al.*, presented at the January 2002 AAS meeting.

*Results from Recent high-redshift Type Ia Supernovae Searches, K.Schahmaneche, *et al.*, presented at the January 2002 AAS meeting.

*Interpretation of high-z SN spectra, P.Nugent, *et al.*, presented at the January 2002 AAS meeting.

A New Set of Nearby SN Ia Lightcurves, N.Regnault, *et al.*, presented at the January 2002 AAS meeting.

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