THE 1990 CALAN/CTIO SUPERNOVA SEARCH

M. Hamuy[1], J. Maza[2], M.M. Phillips[1], N.B. Suntzeff[1], M. Wischnjewsky[2], R. Antezana[2], L.A. Wells[1], L.E. González[1,2], P. Gigoux[1], M. Navarrete[1], F. Barrientos[2], R. Lamontagne[3], M. Della Valle[4], J.E. Elias[1], A.C. Phillips[5], S.C. Odewahn[6], J.A. Baldwin[1], A.R. Walker[1], T. Williams[7], C.R. Sturch[8], F.K. Baganoff[9], B.C. Chaboyer[10], R.A. Schommer[1], H. Tirado[1], M. Hernández[1], P. Ugarte[1], P. Guhathakurta[11], S.B. Howell[12], P. Szkody[5], P.C. Schmidtke[13], and J. Roth[14]

We started in 1990 a search for type Ia supernovae as a collaboration between the U. of Chile and CTIO, to populate the Hubble diagram for this class of objects and to study them as distance indicators. We report the 1990 discoveries, and the spectroscopic and photometric observations gathered for them; they were obtained with CCDs, with the extensive collaboration of visiting astronomers. Of the four supernovae found in 1990, three of them proved to be of the type Ia class at redshifts $0.04 < z < 0.05$. In particular, SN 1990af was found in the elusive pre-maximum phase at a redshift of $z = 0.0503$, and was observed at maximum light through the B and V filters. Although the other two SNe Ia were not observed at maximum light, their light curves match reasonably well the average curves of their class, and we can estimate their peak magnitudes. We have used the date of the three SNe in order to estimate the value of the Hubble constant as a function of the absolute B magnitude of SNe Ia at maximum light. We found that each SN yielded a value of H_0 with a typical accuracy of 10%, consistent with the other two objects, providing support to the claim that SNe Ia are good standard candles. Finally, we estimated H_0 assuming two values for M_B obtained from SN 1972E in NGC 5253, namely, $H_0 = 76.7$ (± 4.3) km s^{-1} Mpc^{-1} for $M_B = -18.7$, and $H_0 = 44.0$ (± 2.5) km s^{-1} Mpc^{-1} for $M_B = -19.9$, respectively. These results are within the current acceptable range of values for H_0, but reflect the lack of a precise determination of M_B.

1. NOAO, Cerro Tololo Inter-American Obs., Chile. 2. Depto. de Astronomía, Universidad de Chile. 3. Depart. de Physique, Univ. of Montreal, Canada. 4. La Silla Observatory, ESO, Chile. 5. Dept. of Astronomy, University of Washington, U.S.A. 6. Dept. of Astronomy, University of Minnesota, U.S.A. 7. Phys. and Astron. Dept., Rutgers University, U.S.A. 8. Space Telescope Science Institute, U.S.A. 9. Dept. of Astronomy, University of California, U.S.A. 10. Dept. of Astronomy, Yale University, U.S.A. 11. Institute for Advanced Study, U.S.A. 12. Planetary Science Institute, U.S.A. 13. Dept. of Phys. & Astron., Arizona State Univ., U.S.A. 14. California Institute of Technology, U.S.A.

THE 1992 OUTBURST OF THE SU UMA-TYPE DWARF NOVA HV VIRGINIS[1]

Elia M. Leibowitz and Haim Mendelson
Wise Observatory, Tel Aviv University, Israel
Albert Bruch, Hilmar W. Duerbeck, and Waltraut C. Seitter
Astronomisches Institut
Universität Münster, Germany
and
Gerold A. Richter
Sternwarte Sonneberg, Germany

The results of 14 nights of photometric monitoring the cataclysmic variable HV Vir, following its outburst in April 1992, were analyzed. The star displays all major features of the superhump phenomenon which characterizes the SU UMa class of dwarf novae. In particular, we find a coherent oscillation with the period 84.504 min (or its alias, 84.946 min), showing a stable double peaked hump. It was clearly developed 8 days after maximum light and persisted in the light curve of the high state for about 20 days, i.e., during the major outburst phases. The oscillation developed from a shorter, less stable "early superhump period" of about 39.86 min or, more probably, 79.72 min. A third periodicity of 83.512 min, which we interpret as the orbital period, characterizes the photometric behaviour of the star during final decline from about 2^m to 1^m above minimum. Additional outburts of HV Vir took place in 1929, 1939, 1970 and 1981.

We underline the similarities and differences between HV Vir and two other extreme members of the SU UMa group, compare the photometric behaviour of HV Vir with published numerical simulations and theoretical models of the superhump phenomenon, and point out observable features which will have to be explained by refined models of the superhump phenomenon.

[1] Based on observations collected at Wise Observatory, Tel Aviv University, Israel, European Southern Observatory, La Silla, Chile, and Sternwarte Sonneberg, Germany.

SEARCHING FOR EXTRAGALACTIC SUPERNOVA REMNANTS

R. Chris Smith, William P. Blair, Robert P. Kirshner, Knox S. Long, and P. Frank Winkler
Cerro Tololo Inter-American Observatory, Chile

Large samples of supernova remnants (SNRs) can be used to investigate topics ranging from SNR evolution and SN rates to interstellar abundance

and galactic abundance gradients. Extragalactic samples of SNRs offer several advantages over the galactic sample, including less ambiguous diameter estimates and less interference by interstellar extinction. We have used optical narrow-band imaging in Hα and [S II] to identify SNR candidates in several galaxies, including M33, NGC 2403, and M83. In M33, we have completed spectroscopic observations of the candidates, confirming that the candidates are indeed SNRs. The derived galactic nitrogen and oxygen abundance gradients in M33 compare well with those derived from H II region work, although the nitrogen gradient shows a 0.5 dex offset, simiilar to that found in other studies. The evolutionary trends in the sample are consistent with Sedov-Taylor expansion, although we cannot rule out a free expansion hyphothesis.

OBSERVATIONS OF SN 1987A FROM 0.15 TO 2.00 MeV

T. Villela, R.C. Cesta
N. Figueiredo[1], and U.B. Jayanthi
Instituto Nacional de Pesquisas Espaciais, Brazil

We present data from two balloon flights in 1988 to observe SN 1987A from 0.15 to 2.00 MeV. The telescope consisted in two NaI(Tl) crystals with approximately 658 cm^2 total area coupled to 3 photomultipliers each. It was mounted on a stabilized platform capable of pointing and stabilization within 2 degrees. The field of view was about 25 degrees (FWHM). The typical altitudes were 5.5 mb for the June flight and 4.5 mb for the December flight. The observations times were 6 hours and 12 hours, respectively. We place a 2 sigma upper limit for the continuum of 5.42×10^{-6} photons cm^{-2} s^{-1} keV^{-1} and 2.5×10^{-6} photons cm^{-2} s^{-1} keV^{-1}, for the first flight in the range 0.15–0.30 MeV and 0.30–1.00 MeV, respectively, and a 3 sigma upper limit of 2.1×10^{-6} photons cm^{-2} s^{-1} keV^{-1} in the range 0.15–2.00 MeV for the second flight.

[1] Escola Federal de Engenharia de Itajubá, Brazil.

THE TRANSVERSAL MOTION OF THE LARGE MAGELLANIC CLOUD

Claudio Anguita and José Maza
Depto. de Astronomía, Universidad de Chile

Liu & Lynden-Bell, in 1982, predicted the tangential motion of the Large Magellanic Cloud to be 2,0 milliarcsec (mas) or 1.5 mas per year due east, for a model of our Galaxy with or without a massive halo, respectively. Various observational programs are currently in progress devoted to measuring the motions of the Clouds with respect to faint galaxies using photographic techniques (Jones et al. 1989; Tucholke & Hiesgen 1991). Preliminary results from the Lick group (Jones et al. 1989) indicate a motion less than half that predicted by Liu & Lynden-Bell in right ascension, for a subset of red subgiant stars taken from a photometric survey by Stryker (1984) in the remote LMC halo field surrounding the cluster NGC 2257. Later on, Tucholke & Hiesgen (1991) reported a similar result based on preliminary reductions of ESO Schmidt Telescope plates of a LMC field corresponding to ESO/SRC field No. 57, due east of the LMC bar.

In January 1989, we begun an observational program using CCDs attached to the CTIO 1.5-m telescope f/13 Cassegrain focus (scale: 10.03 arcsec per mm), with the aim of measuring the tangential motion of background QSOs with respect to LMC stars. In this way, we determine the motion of the Cloud as a reflex motion.

Searching objective-prism plates taken with the CTIO Curtis-Schmidt telescope, five QSOs were discovered in the direction of the Large Magellanic Cloud, which added to the one discovered by Blanco & Heathcote (1986) make our six QSOs observing list.

Our preliminary reductions of the CCD frames and our experience in a CCD Parallax Program show that we can measure relative tangential motions (or proper motions) with a precision of 1.5 mas per year with an epoch difference of one year in the observed positions. In seven years, by early 1996, we expect to reach a precision of 0.2 mas per year.

SOME REFINEMENTS IN CHEMICAL EVOLUTION MODELS. I. A DERIVATION OF THE PRODUCTION TERM

Lilia I. Arany-Prado
Observatório do Valongo, UFRJ, Brazil

We have derived general equations for the production rate of any nuclide in the context of a general mass conservation equation for the chemical evolution of the Galaxy. The equation for the conservation of metals of Tinsley (1980, Fund. Cosmic Phys., 5, 287) can be recovered from our equations by the application of a number of simplifications. This approach throws some light on the approximations usually performed in the models.

This work was partially supported by UFRJ, ON/CNPq and IAU.