TABLE 1

ERROR BUDGET THE CEPHEID DISTANCE TO NGC1365

Source of Uncertainty on the Mean	Description of Uncertainty	Percentage Error	
LMC	**CEPHEID PL CALIBRATION**		
[A] **LMC True Modulus**	Independent Estimates = 18.50 ±0.10 mag	5%	
[B] **V PL Zero Point**	LMC PL $\sigma_V = (0.27)/\sqrt{31} = \pm 0.05$ mag	3%	
[C] **I PL Zero Point**	LMC PL $\sigma_I = (0.18)/\sqrt{31} = \pm 0.03$ mag	2%	
[SC] **Systematic Uncertainty**	[A] + [B] + [C] combined in quadrature		6%
NGC 1365	**CEPHEID TRUE DISTANCE MODULUS**		
(D) **HST V-Band Zero Point**	On-Orbit Calibration: ±0.05 mag	3%	
(E) **HST I-Band Zero Point**	On-Orbit Calibration: ±0.05 mag	3%	
(M1) **Cepheid True Modulus**	(D)(E) are uncorrelated, but coupled by reddening law: $\sigma_{\mu_o} = \pm 0.15$ mag	7%	
(F) **Cepheid V Modulus**	NGC 1365 PL $\sigma_V = (0.32)/\sqrt{37} = \pm 0.05$ mag	3%	
(G) **Cepheid I Modulus**	NGC 1365 PL $\sigma_I = (0.31)/\sqrt{37} = \pm 0.05$ mag	3%	
(M2) **Cepheid True Modulus**	(F)(G) are partially correlated, giving $\sigma_{\mu_o} = \pm 0.06$ mag	3%	
(P1) **V-Band Ap. Corr.**	Silberman *et al.* (1998) give ±0.067 mag	3%	
(P2) **I-Band Ap. Corr.**	Silberman *et al.* (1998) give ±0.061 mag	3%	
(M3) **Cepheid True Modulus**	(P1)(P2) are uncorrelated, but coupled by reddening law: $\sigma_{\mu_o} = \pm 0.15$ mag	7%	
[Z] **Metallicity**	M31 metallicity gradient test gives $\sigma_{\mu_o} = \pm 0.08$ mag	4%	
	M101 calibration gives +0.14 mag of $\Delta\mu_o/\Delta[Fe/H] = -0.25$ mag/dex	7%	
[H] **Reduction Package**	Systematic differences in aperture corrections (achromatic)	4%	
(J) **Random Errors**	(M1) + (M2) + (M3) combined in quadrature		10%
[K] **Systematic Errors**	[SC] + [Z] + [H] combined in quadrature		10%
	D = 18.6 Mpc ± 1.9 (random) ± 1.9 [systematic]		

Note: There are 32 Cepheids in the LMC with published VI photometry (Madore & Freedman 1991.) The measured dispersions in the period-luminosity relations at V and I are ±0.27 and ±0.18 mag, respectively.

TABLE 2

ERROR BUDGET ON THE HUBBLE CONSTANT

Source of Uncertainty on the Mean	Description of Uncertainty	Percentage Error	
FORNAX CLUSTER	**EXPANSION VELOCITY AND INFERRED DISTANCE**		
(L) **Velocity Dispersion**	± 31 km/sec $= \pm 310/\sqrt{N-1}$ (No. of gals = 111) at $< V >=$ 1,267 km/sec	2%	
(M) **Geometry of Cluster**	± 0.4 Mpc at 18.6 Mpc	2%	
[N] **Virgocentric Flow**	± 22 km/sec on -44 km/sec along the Local Group line of sight	2%	
[O1] **Bulk Flow**	± 300 km/sec	24%	
Random Errors	(J) + (L) + (M) combined in quadrature		10%
Systematic Errors	[K] + [N] + [O1] combined in quadrature		26%
	$H_\circ = 68$ km/sec/Mpc $\pm$ 7 (random) ± 18 [systematic]		
LOCAL FLOW	**M81, M101, N1023, N2090, N3621, N7331, LEO, VIRGO, FORNAX**		
(P) **Random Motions**	± 4 km/sec/Mpc $= \pm 12/\sqrt{N-1}$ (No. of samples = 9)	6%	
[O2] **Bulk Flow**	± 300 km/sec at $V(max) = +1{,}400$ km/sec	21%	
Random Errors	(P) = total observed scatter on the mean		6%
Systematic Errors	[SC] + [Z] + [O2] combined in quadrature		23%
	$H_\circ = 72$ km/sec/Mpc $\pm$ 4 (random) $\pm$ 17 [systematic]		
DISTANT FLOW	**I. TULLY-FISHER: 16 CLUSTERS TO 10,000 km/sec**		
(S) **Observed Scatter**	$\pm$ 0.04 mag $= \pm$ 0.16/$\sqrt{N-1}$ (No. of clusters = 16)	2%	
[R] **TF Zero Point**	$\sigma(mean) = \pm$ 0.13 mag $= \pm$ 0.40/$\sqrt{N-1}$ (No. of calibrators = 11)	6%	
[O3] **Bulk Flow**	± 300 km/sec evaluated at 10,000 km/sec	3%	
Random Errors	(S)		2%
Systematic Errors	[SC] + [Z] + [R] + [O3] combined in quadrature		11%
	$H_\circ = 76$ km/sec/Mpc $\pm$ 2 (random) $\pm$ 8 [systematic]		
DISTANT FLOW	**II. HYBRID METHODS: 17 CLUSTERS TO 11,000 km/sec**		
(U) **Observed Scatter**	± 0.02 mag $= \pm 0.06/\sqrt{N-1}$ (No. of clusters = 17)	2%	
[O4] **Bulk Flow**	± 300 km/sec evaluated at 11,000 km/sec	3%	
[T] **Fornax Distance**	[SC] + [Z] combined in quadrature	9%	
Random Errors	(U)		2%
Systematic Errors	[T] + [Z] combined in quadrature		10%
	$H_\circ = 72$ km/sec/Mpc $\pm$ 1 (random) $\pm$ 7 [systematic]		
DISTANT FLOW	**III. Type Ia SN: 20 EVENTS OUT TO 20,000 km/sec**		
(T1) **Peak Luminosity**	± 0.11 mag $= \pm 0.45/\sqrt{N-1}$ (No. of SNIa = 16)	6%	
(V1) **Random Motions**	± 300 km/sec at 5,000 km/sec	6%	
[O5] **Bulk Flow**	± 300 km/sec at 20,000 km/sec	2%	
[Q1] **SNIa Zero Point**	$\sigma(mean) = \pm 0.18$ mag $= \pm 0.45/\sqrt{N-1}$ (No. of calibrators = 7)	9%	
Random Errors	(T1) + (V1) combined in quadrature		8%
Systematic Errors	[SC] + [O5] + [Q1] combined in quadrature		12%
	$H_\circ = 68$ km/sec/Mpc $\pm$ 5 (random) $\pm$ 8 [systematic]		

TABLE 3

SUMMARY

Method	Hubble Constant	(Random)	[Systematic]
Fornax Cluster	68 km/sec/Mpc	±7 (random)	±18 [systematic]
Local Flow	72 km/sec/Mpc	±4 (random)	±17 [systematic]
Tully-Fisher	76 km/sec/Mpc	±2 (random)	± 8 [systematic]
Hybrid Methods	72 km/sec/Mpc	±1 (random)	± 7 [systematic]
Type Ia SNe	68 km/sec/Mpc	±5 (random)	± 8 [systematic]
Modal Average:	72 km/sec/Mpc	±5 (random)	±12 [systematic]
Major Systematics:	±11% [FLOWS]	±5% [LMC]	±4% [Fe/H]

Notes: (1) The measured scatter of the $N = 5$ tabulated values of the Hubble constant about the derived mean of 72 km/sec/Mpc is ±3.1 km/sec/Mpc; the formal error on the unweighted mean (due to random errors between methods) is then $3.1/\sqrt{N-1} = 1.6$ km/sec/Mpc.

(2) The systematic error due to large-scale flows is the average of the ±300 km/sec term on each of the five methods. (24%, 21%, 3%, 3% and 2%, respectively, as given in Table 2)

(3) Calculated for differences in the five Hubble constants with respect to the mean, and scaled to their externally quoted errors, the reduced $\chi^2 = 0.78$. This is only slightly smaller than expected by chance, and suggests that the random errors on the individually determined values of the Hubble constant are realistic.

(4) The concordance between the local and far-field values of the the Hubble constant argue that there is no large flow of the local supercluster with respect to the 20,000 km/sec volume probed by the SNe. At face value the differences in Hubble constants admit a local flow of ∼100 km/sec. If so, the (averaged) systematic error due to large scale flow perturbations drops from a dominant 10% down to <3-4%, leaving the LMC distance as the leading source of systematic error on H_o.

(5) The systematic uncertainty due to metallicity is derived from the work on M31 (Freedman & Madore 1990) which reports a marginal detection of a dependence of Cepheid luminosities on metallicity, at the level of ∼0.2 mag/dex. A similar test using Cepheids at various radii in M101 has been undertaken by the Key Project Team (Kennicutt, *et al. 1998), and gives a slightly larger dependence of ∼0.25 mag/dex.*