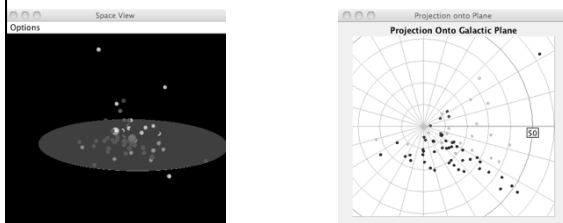


Astronomy, History, and Computer Simulations

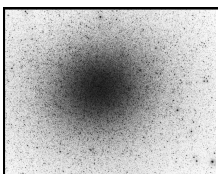
An Approach to Teaching the Nature of Science

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My Approach

- Two courses that examine the historical development of planetary and galactic/cosmological astronomy.
- Focus: understanding the Nature of Science.
- Pedagogy: groups of students work through some of the steps in the development of astronomy. Many activities use computer simulations.



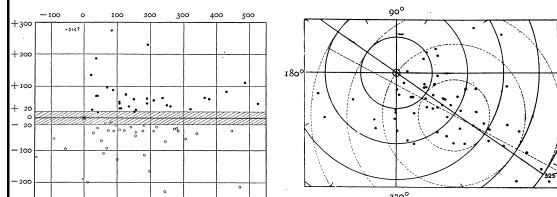
**Example:
Shapley's
Big Galaxy**



- Goal: Trace out the distribution of the globular clusters in space.
- Assumptions:
 - There is no interstellar absorption (so dimness of stars is due solely to distance).
 - Valid Cepheid period-luminosity relation (measure period, P-L relation gives luminosity, compare to apparent brightness to get distance).
- Building on assumptions
 - Cepheid distances \rightarrow magnitudes of brightest stars \rightarrow more distances
 - Relation between apparent diameter and distance \rightarrow more distances

Shapley's Globular Clusters

- Results: Milky Way system is outlined by ellipsoidal distribution of globular clusters. Diameter of system is 100 kpc, with center 20 kpc from Sun in direction of 325° galactic longitude.



Coherence

- Shapley's results disagreed with results from studies of differential galactic rotation which placed the sun only 10 kpc from the center, but in the same direction indicated by Shapley's model.
- Absorption of starlight accounted for discrepancy and brought coherence to our picture of the Milky Way. Absorption also explained the smaller, sun-centered system that had emerged from statistical studies.

Teaching Materials

- My stuff: computer simulations and activity/lab handouts available at facultyweb.berry.edu/ttimberlake/copernican and facultyweb.berry.edu/ttimberlake/galaxies
- Textbooks: instructors can obtain pre-publication versions for review and possible use by emailing me: ttimberlake@berry.edu.
- More free astronomy simulations at www.compadre.org/osp/.
- If you use any of these, please give me feedback (ttimberlake@berry.edu).