IS THERE A COSMOLOGICAL CONSTANT?

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FINAL REPORT

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The Smithsonian Astrophysical Observatory
Is a member of the
Harvard-Smithsonian Center for Astrophysics
The grant contributed to the publication of 18 refereed papers and 5 conference proceedings. The primary uses of the funding have been for page charges, travel for invited talks related to the grant research, and the support of a graduate student, Charles Keeton. The refereed papers address four of the primary goals of the proposal:

1. the statistics of radio lenses as a probe of the cosmological model (#1),
2. the role of spiral galaxies as lenses (#3),
3. the effects of dust on statistics of lenses (#7, #8), and
4. the role of groups and clusters as lenses (#2, #6, #10, #13, #15, #16).

Four papers (#4, #5, #11, #12) address general issues of lens models, calibrations, and the relationship between lens galaxies and nearby galaxies. One considered cosmological effects in lensing X-ray sources (#9), and two addressed issues related to the overall power spectrum and theories of gravity (#17, #18). Our theoretical studies combined with the explosion in the number of lenses and the quality of the data obtained for them is greatly increasing our ability to characterize and understand the lens population. We can now firmly conclude both from our study of the statistics of radio lenses and our survey of extinctions in individual lenses that the statistics of optically selected quasars were significantly affected by extinction. However, the limits on the cosmological constant remain at $\Omega_0 < 0.65$ at a 2 $\sigma$ confidence level, which is in mild conflict with the results of the Type Ia supernova surveys. We continue to find that neither spiral galaxies nor groups and clusters contribute significantly to the production of gravitational lenses. The lack of group and cluster lenses is strong evidence for the role of baryonic cooling in increasing the efficiency of galaxies as lenses compared to groups and clusters of higher mass but lower central density. Sadly for the ultimate objective of the proposal, improved constraints on the cosmological constant, the next large survey for gravitational lenses did not release its results during the term of the proposal.

The research supported the career development of six graduate students (Dalal, Fletcher, Herold, Keeton, Peng and Rusin) and two post-docs (Lehar and Munoz).

Refereed Papers


[18] Strong Lensing Constraints on Small-Scale Linear Power, Dalal, N., & Kochanek,
Conference Proceedings


