

JOINT DISCUSSION NO. 8

EXTRAGALACTIC HIGH ENERGY ASTROPHYSICS

(Commissions 28, 40, 44, 47, 48)

Edited by H. van der Laan

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INTRODUCTION

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In the summer of 1977 the IAU General Secretary requested proposals for Joint Discussions at the XVIIth General Assembly more than two years later. As President of Commission 40 I wrote to other Commission Presidents proposing a J.D. on Extragalactic High Energy Astrophysics. The motivation was as follows, and I quote from my July 22, 1977 letter:

"With the current advances in radio and optical techniques and the tremendous progress to be expected from the satellites HEAO-A and HEAO-B, to be launched respectively in the summer of 1977 and 1978, there should be a good deal of new material on high energy astrophysical phenomena in the extragalactic domain by the time of the 1979 General Assembly. Some of this will be of great cosmological significance and all of it will be astrophysically interesting. It is clear that the X-ray satellite results will get a lot of optical and radio follow-up and it therefore seems appropriate that a Joint Discussion of that topic be arranged at that time."

Obviously the proposal was precarious: both X-ray observatories mentioned still had to be launched and operated successfully. This did not dampen the response, which was immediate and enthusiastic, both from the other Commissions consulted and from the IAU Executive Committee.

A Scientific Organizing Committee was formed as follows:

For Commission 28:	W.L.W. Sargent
" "	40: H. van der Laan
" "	44: R. Giacconi
" "	47: G.R. Burbidge
" "	48: F. Pacini

For Local Organizing Committee liaison: N.W. Broten. Giacconi and van der Laan served as co-chairmen, the latter also as coordinator and editor of the proceedings.

High energy astrophysics is not a univocal term. Commonly it refers to processes that give rise to X- and γ -ray photons, but it may also designate mechanisms involving ultrarelativistic particles and/or

gravitational fields strong enough for general relativistic terms to be essential. The nonthermal aspects of extragalactic *X-ray astronomy* overlap to an important extent with the well established field of extragalactic *continuum radio astronomy* and in parts I, II and IV many contributions are striking analogues of radio astronomical developments of the early sixties. These last two decades have shown the decisive dependence of astronomical progress on multi-spectral observations: major advances came from interactive research using radio *and* optical telescopes. Now X-ray astronomy has come to enrich the field and this Joint Discussion presents an early perspective of this new era.

Each of the four sessions of the J.D. reported in these proceedings begins with an invited review, followed by one or two invited papers and one to several contributed papers. It is no accident that twelve of the twentyone papers depend largely or wholly on observations with HEAO-2, after launch called the EINSTEIN OBSERVATORY. This observatory has lifted X-ray work to the domain of imaging astronomy and the results reported here witness to the remarkable advances X-ray photometry and spectroscopy now bring to major problem areas of current astrophysics. From very direct observations of active, variable nuclei to the least indirect detection of massive stellar halos, from intracluster gas composition to quasar populations, the E.O. data shed new light on difficult questions. It is a tribute to the skills and energies of the E.O. team that these results were presented to the IAU only nine months after launch!

Editor's acknowledgements. - Many people helped to make this Joint Discussion an IAU Highlight. My special thanks go to Dr. Paul Gorenstein for his skillful coordination of the E.O. team contributions and to Drs Franco Pacini and Peter Scheuer for presenting their perceptive contributions on a weekend's notice after an invited speaker telegraphed his regrets. Preparing the manuscripts for publication was an arduous job cheerfully done by Sterrewacht secretaries. Mr. Wim Brokaar, Sterrewacht photographer, enhanced, reduced and enlarged many of the figures and tables to his own exacting standards. I thank them all for their patient professional work.