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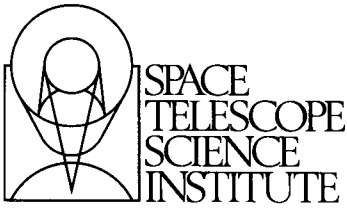

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THE ANALYSIS OF EMISSION LINES

A Meeting in Honour of the 70th Birthdays of D. E. Osterbrock & M. J. Seaton

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ROBERT WILLIAMS
Space Telescope Science Institute, Baltimore, MD

MARIO LIVIO
Space Telescope Science Institute, Baltimore, MD

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Participants

Peter Albrecht	Universitäts-Sternwarte
Nahum Arav	University of Colorado
Bruce Balick	University of Washington
Stephi Baum	Space Telescope Science Institute
Manuel Bautista	Ohio State University
Luc Binette	European Southern Observatory
William Blair	Johns Hopkins University
Bill Blass	NASA/Goddard Space Flight Center
Robert Blum	Ohio State University
Peng Bo	Dwingeloo Observatory, NFRA
Kazimierz Borkowski	University of Maryland
James Braatz	University of Maryland
Tomas Brage	NASA/Goddard Space Flight Center
Michael Brotherton	University of Texas at Austin
Monsignori-Fossi Brunella	Osservatorio Astrofisico di Arcetri
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William Parkinson	Center for Astrophysics
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Preface

Apart from stars and those objects which radiate reflected starlight, most of the objects in the Universe radiate an emission spectrum. It was the astronomers interest in analyzing the spectrum of the sun and other stars in the last century that motivated the development of radiative transfer, and with the newly formulated macroscopic relations of LTE early in this century, that led to our understanding of absorption spectra. The original observational stimulus for this activity had been Fraunhofer's study of the solar spectrum almost a century before.

Interest in emission-line spectra came later, when spectrographs coupled to telescopes enabled the spectra of fainter gaseous emission regions to be observed. They revealed a totally different type of spectrum than that which had been observed from stars. The fact that local thermodynamic equilibrium does not hold for emission regions has complicated the interpretation of their spectra. Huggins' initial discovery of 'nebulium' in gaseous nebulae and its subsequent identification with ionized oxygen by Bowen had demonstrated that rarefied conditions must pertain in nebulae. Stromgren's subsequent 1939 paper in the Astrophysical Journal was a landmark in demonstrating how far-UV continuum radiation from a hot star was absorbed by surrounding gas and converted into visible Balmer line radiation.

In the decades that followed, the realization that many interesting objects such as supernova remnants, active galactic nuclei, and quasars radiated an emission-line spectrum, motivated the analysis of emission regions. For the past 35 years two names have stood out amidst those who have been involved in the efforts to determine physical conditions in objects that emit emission lines. Don Osterbrock and Mike Seaton have both made important contributions to our understanding of emission-line analysis, not the least of which is the fact that they have inspired a generation of investigators who in turn have focussed on this topic. Observations have been one of the more important parts of Don Osterbrock's work, whereas Mike Seaton has concentrated on the atomic data and processes. However, each of them has drawn upon both the observations and data to interpret spectra so that important information could be deduced from the objects under study. The 1960 article "Planetary Nebulae" from Reports on Progress in Physics, and the book "The Astrophysics of Gaseous Nebulae" have been constant companions in the attache cases of many of us over the years.

Much of what we know about some of the more interesting objects in the sky come from analyses of their emission spectra. The reviews which constitute the current symposium on emission-line analysis are a testimony to the vitality and diversity of this subject, and they serve as an appropriate tribute to the dedicated efforts of the two scientists whom we honor. In appreciation of the fundamental contributions they have made to this field, we are pleased to dedicate this symposium and these proceedings to Profs. Donald E. Osterbrock and Michael J. Seaton in celebration of their 70th birthdays.

Bob Williams, Mario Livio
Space Telescope Science Institute
Baltimore, Maryland
May, 1995