Binary Adaptive Optics A Status Report Spie Digital Library

This volume presents results from the ESO workshop Multiple Stars across the H-R Diagram, held in Garching in July 2005. It covers observations of multiple stars from ground and space, dynamical and stellar evolution in multiple systems, formation and early evolution of multiple stars, and special components of multiple stars. The book reviews the current state of observational and theoretical knowledge and discusses future studies for further progress in the field.
This proceedings volume presents the very latest developments in non-astronomical adaptive optics. This international workshop, the sixth in a biennial series, was the largest ever held and boasted significant involvement by industry. Adaptive optics is on the verge of being used in many products; indeed, at this meeting, the use of adaptive optics in DVD players was disclosed for the first time. Sample Chapter(s). Liquid Crystal Lenses For Correction Of Presbyopia (586 KB). Contents: Wavefront Correctors and Control: Liquid Crystal Lenses for Correction of Presbyopia (G Li & N Peyghambarian); Woofer-Tweeter Adaptive Optics (T Farrell & C Dainty); Wavefront Sensors: A Fundamental Limit for Wavefront Sensing (C Paterson); Direct Diffractive Image Simulation (A P Maryasov et al.); Adaptive Optics in Vision Science: A Study of Field Aberrations in the Human Eye (A V Goncharov et al.); Characterization of an AO-OCT System (J W Evans et al.); Adaptive Optics in Optical Storage and Microscopy: Commercialization of the Adaptive Scanning Optical Microscope (ASOM) (B Potsaid et al.); Towards Four Dimensional Particle Tracking for Biological Applications (H I Campbell et al.); Adaptive Optics in Lasers: New Results in High Power Lasers Beam Correction (A Kudryashov et al.);

Adaptive Optics Control of Solid-State Lasers (W Lubeigt et al.); Adaptive Optics in Communication and Atmospheric Compensation: Fourier Image Sharpness Sensor for Laser Communications (K N Walker & R K Tyson); Adaptive Optics System for a Small Telescope (G Vdovin et al.); and other papers. Readership: Industry- and university-level researchers in optics and laser physics.

This book, written by one of the leaders in the field, covers the principles and theory of adaptive optics, and describes in detail how this technology can be applied to large ground-based telescopes to conmpensate for the effects of atmospheric turbulence. In addition to information on basic adaptive optics components and technology, there are chapters on atmospheric turbulence, optical image structure, laser beacons, and overall system design. The overall design ofadaptive optics systems, including performance estimation and optimization, receives detailed treatment. This book provides a fundamental understanding of the physical principles of adaptive optics technology, so that it will have lasting value as a complete and accessible source ofreference.

IAU S240 focuses on recent advances across the broad field of binary star research.

Wavefront sensors have been used to make measurements in fluid- dynamics and for closed loop control of adaptive optics. In most common Shack-Hartmann wavefront wavefront sensors, the light is broken up into series of rectangular or hexagonal apertures that divide the light into a series of focal spots. The position of these focal spots is used to determine the wavefront slopes over each subaperture. Using binary optics technology, we have developed a hierarchical or fractal wavefront sensor that divides the subapertures up on a more optimal fashion. We have demonstrated this concept for up to four tiers and developed

the wavefront reconstruction methods for both segmented adaptive optics and continous wavefront measurement.
Focussing on the formulation of mathematical models for the light curves of eclipsing binary stars, and on the algorithms for generating such models, this book provides astronomers, both amateur and professional, with a guide for - specifying an astrophysical model for a set of observations - selecting an algorithm to determine the parameters of the model - estimating the errors of the parameters. It is written for readers with knowledge of basic calculus and linear algebra; appendices cover mathematical details on such matters as optimisation, co-ordinate systems, and specific models. While emphasising the physical and mathematical framework, the discussion remains close to the problems of actual implementation. The book concludes with chapters on specific models and approaches and the authors'views on the structure of future light-curve programs.
Advance praise for Philip Plait s Bad Astronomy "Bad Astronomy is just plain good! Philip Plait clears up everymisconception on astronomy and space you never knew you sufferedfrom." --Stephen Maran, Author of Astronomy for Dummies and editorof The Astronomy and Astrophysics Encyclopedia "Thank the cosmos for the bundle of star stuff named Philip Plait,who is the world s leading consumer advocate for quality science inspace and on Earth. This important contribution to science willrest firmly on my reference library shelf, ready for easy accessthe next time an astrologer calls." --Dr. Michael Shermer,Publisher of Skeptic magazine, monthly columnist for ScientificAmerican, and author of The Borderlands of Science "Philip Plait has given us a readable, erudite, informative,useful, and entertaining book. Bad Astronomy is Good Science. Verygood science..." --James "The Amazing" Randi, President, JamesRandi Educational Foundation, and author of An Encyclopedia

ofClaims, Frauds, and Hoaxes of the Occult and Supernatural "Bad Astronomy is a fun read. Plait is wonderfully witty andeducational as he debunks the myths, legends, and 'conspiraciesthat abound in our society. 'The Truth Is Out There' and it's inthis book. I loved it!" --Mike Mullane, Space Shuttle astronaut andauthor of Do Your Ears Pop in Space?

A comprehensive and authoritative review of what has been achieved in astronomy during the years 2006 to 2009.

In the mid-1990s, astronomers made history when they began to find planets orbiting stars in the Milky Way. More than eight hundred planets have been found since then, yet none of them is anything like Earth and none could support life. Now, armed with more powerful technology, planet hunters are racing to find a true twin of Earth. Science writer Michael Lemonick has unique access to these exoplaneteers, as they call themselves, and Mirror Earth unveils their passionate quest. Unlike competitors in other races, Geoff Marcy, Bill Borucki, David Charbonneau, Sara Seager, and others actually consult and cooperate with one another. But only one will be the first to find Earth's twin. Mirror Earth tells the story of their competition.

"The Third International Meeting of Dynamic Astronomy in Latin America, (Tercera Reunion sobre Astronom?a Dinamica en Latino-America) which we named ADeLA-2004, was held on November 22-24, 2004 in Merida. It represents the consolidation and continuity of a series of meetings about Astrometry and related topics. The first meeting took place in 2001 in San Juan (Argentina), followed by the second meeting in 2002 in

Araraquara (Brazil). Astrometry, after an original and basic contribution not only to Astronomy as a branch of science but also to the direct development of society, starts declining when in the middle of the twentieth century it gets far from astrophysical research and the human mind finds alternative ways to solve the upcoming development problems. This fact has progressively made the financing models for scientific projects focus on and expandtowards the more "productive" areas of Astronomy, leaving aside Astrometry, which we consider a vital area. Even when preparing themselves academically, the astrometrists with their meticulous work, do not find easily government support and ways to compete. The rapid development of detectors and observation techniques during the last decade has almost completely transformed Astronomy. The data collected from observation are once again the main source for the theoreticaldevelopment of this science. Moreover, observations have often changed many theoretical concepts. Astrometry has not been left behind and the future, almost magical, observations include the space projectssuch as GAIA and SIM. These projects should be seen as the spur for the adaptation of Astrometry to the new era, making this area a basic one in the professional training of any astronomer. The astrometrist is the one whomust enlarge his scope to encompass data interpretation, taking advantage of the meticulous and craftsman-like character that this work has always had in order to access the big data bases that will be generated and arein danger of being considered as sources of statistical information. This

concern for the future of Astrometry was discussed in this meeting. ADeLA-2004 had two additional innovations. The first one consisted in including a workshop, or a series of conferences on topics related to Astrometry, addressed to students interested in astronomy. This meeting has offered the opportunity to gather important foreign researchers. The participation of ESO Vitacura (Chile) researchers in ADeLA 2004, as well as the usual ADeLA meeting participants, facilitated a wide and diverseseries of lectures on related topics. These lectures were addressed both in a pedagogical and a professional atmosphere which encouraged Venezuelan undergraduate, and graduate students interested in or majoring in astronomy, to participate in both events. The so-called "Taller de ADeLA-2004" took place after the meeting on November 25 and 26. The workshop improved the relationships between the Venezuelan scientific and student communities."

The blossoming of adaptive optical techniques has brought about a revolution in the field of astronomical observation. Coupled with the new generation of large, ground-based telescopes, it allows us to achieve an unprecendented angular resolution in the analysis of faint astronomical sources at optical wavelengths. This book provides the basic concepts of adaptive optics, discusses the possible instrumental strategies and the state-of-the-art technical achievements of this development and presents the key astrophysical programs which will most benefit from it. Over fifteen well-known experts have contributed to making this volume a comprehensive one, with steady progression as well as

full coverage of the various aspects of the field. Students graduating in optical sciences and astrophysics, astronomers, engineers interested in atmospheric turbulence compensation will find this book a reference text on the subject.

It is through images that we understand the form and function of material objects, from the fundamental particles that are the constituents of matter to galaxies that are the constituents of the Universe. Imaging must be thought of in a flexible way as varying from just the detection of objects OCo a blip on a screen representing an aircraft or a vapour trail representing the passage of an exotic particle OCo to displaying the fine detail in the eye of an insect or the arrangement of atoms within or on the surface of a solid. The range of imaging tools, both in the type of wave phenomena used and in the devices that utilize them, is vast. This book will illustrate this range, with wave phenomena covering the entire electromagnetic spectrum and ultrasound, and devices that vary from those that just detect the presence of objects to those that image objects in exquisite detail. The word OCyfundamentalsOCO in the title has meaning for this book. There will be no attempt to delve into the fine technical details of the construction of specific devices but rather the book aims to give an understanding of the principles behind the imaging process and a general account of how those principles are utilized.

Adaptive optics is a field which is coming into its own with new discoveries occurring almost daily both in astronomy and in applications of AO in applied fields. In

an adaptive optics system, the output from a wavefront sensor is used to calculate corrections that actively remove distortions from an image. The applications of adaptive optics in vision science have received considerable impetus from the knowledge developed by astronomers about how to correct images using AO technology. It is expected that developments in adaptive optics will radically change the face of astronomy in the 21st century. These systems will largely overcome the main limitation of ground-based telescopes, namely the severe reduction in image quality caused by turbulence in the Earth's atmosphere. Intended for use at near infrared wavelengths, adaptive optics allow imaging and spectroscopy at the limit of resolution imposed by optical diffraction an advance in astronomer's ability to view the heavens unparalleled since the invention of the telescope. AO is now also entering clinical medicine in the field of ophthalmology and other related fields. This new book presents several hundred current abstracts in the field, each fully indexed, for ease of access and contains a CD ROM for further research.

The 4th International Workshop on Adaptive Optics for Industry and Me- cine took place in Munster, ? Germany, from October 19 to October 24, 2003. The series of International Workshops on Adaptive Optics for Industry and Medicine beganwiththe?rstworkshopinShatura/Russi ain1997,thesecond workshop took place in Durham/England in 1999, and the third workshop was held in Albuquerque/USA in 2001. The workshop series started out as a true grassroots movement and kept an informal spirit throughout all four workshops. Many

personal friendships and scienti?c collaborations have been formed at these meetings. This fourth workshop was supposed to be held in Beijing, China. H- ever, the program committee decided in May 2003 to move the workshop to Munster ? due the general perception that the SARS (Severe Acute R- piratory Syndrome) cases reported in China could lead to a large epidemic. Despite this rather short notice the workshop in Munster ? was attended by about 70 people. Incidentally, the workshop coincided with the 50th anniv- sary of adaptive optics, because it was October 1953 when Horace Babcock published his famous paper “The possibilities of compensating astronomical seeing” in the Publications of the Astronomical Society of the Paci?c.

This dissertation describes work performed at the Palomar Testbed Interferometer (PTI) during 1998-2002. Using PTI, we developed a method to measure stellar angular diameters in the 1-3 milli-arcsecond range with a precision of better than 5%. Such diameter measurements were used to measure the mass-radius relations of several lower main sequence stars and hence verify model predictions for these stars. In addition, by measuring the changes in Cepheid angular diameters during the pulsational cycle and applying a Baade-Wesselink analysis we are able to derive the distances to two galactic Cepheids (h Aql & z Gem) with a precision of 10%; such distance determinations provide an independent calibration of the Cepheid period-luminosity relations that underpin

current estimates of cosmic distance scales. Second, we used PTI and the adaptive optics facility at the Keck Telescope on Mauna Kea to resolve the low mass binary systems BY Dra and GJ 569B, resulting in dynamical mass determinations for these systems. GJ 569B most likely contains at least one sub-stellar component, and as such represents the first dynamical mass determination of a brown dwarf. Finally, a new observing technique, dual star phase referencing, was developed and demonstrated at PTI. Phase referencing allows interferometric observations of stars previously too faint to observe, and is a prerequisite for large-scale interferometric astrometry programs such as the one planned for the Keck Interferometer; interferometric astrometry is a promising technique for the study of extra-solar planetary systems, particularly ones with long-period planets.

Two hundred years after the first asteroid was discovered, asteroids can no longer be considered mere points of light in the sky. Spacecraft missions, advanced Earth-based observation techniques, and state-of-the-art numerical models are continually revealing the detailed shapes, structures, geological properties, and orbital characteristics of these smaller denizens of our solar system. This volume brings together the latest information obtained by spacecraft combined with astronomical observations and theoretical modeling, to present our best current

understanding of asteroids and the clues they reveal for the origin an,d evolution of the solar system. This collective knowledge, prepared by a team of more than one hundred international authorities on asteroids, includes new insights into asteroid-meteorite connections, possible relationships with comets, and the hazards posed by asteroids colliding with Earth. The book's contents include reports on surveys based on remote observation and summaries of physical properties; results of in situ exploration; studies of dynamical, collisional, cosmochemical, and weathering evolutionary processes; and discussions of asteroid families and the relationships between asteroids and other solar system bodies. Two previous Space Science Series volumes have established standards for research into asteroids. Asteroids III carries that tradition forward in a book that will stand as the definitive source on its subject for the next decade.

This workshop is devoted to Double stars. The general topics of the meeting were: for mation, dynamics and evolutionary tracks. In accordance with the pure tradition of the Saint James way, "pilgrims" from all over the world come to meet together in Santiago. Although with a common interest (double stars), this meeting was a multidisciplinary one, since scientists with different backgrounds participated in it. As a matter of fact, we think that this is the first workshop jointly

supported by IAU Commissions 7 (Celestial mechanics) and 26 (Double and multiple stars). It is our belief that this meeting will be the origin of a more close relations and common research. This meeting was held under the invitation of the University of Santiago de Compostela to commemorate its fifth centenary, and organized by the Astronomical Observatory named after its founder, Ramon M. Aller, who made significant contributions in the study of visual double stars, and was one of the pioneers who put the seeds of the present blossoming of Astronomy in Spain. The Scientific Organizing Committee was formed by Drs. C. Allen, P. Couteau, J. A. Docobo, R. Dvorak, A. Elipe, S. Ferraz-Mello (co-chairman), H.A.McAlister, M. Valtonen, C.Worley (chairman) and H. Zinnecker. The Local Organizing Committee was formed by Drs. J. A. Docobo (chairman), A.

The field of Adaptive Optics (AO) for astronomy has matured in recent years, and diffraction-limited image resolution in the near-infrared is now routinely achieved by ground-based 8 to 10m class telescopes. This book presents the proceedings of the ESO Workshop on Science with Adaptive Optics held in the fall of 2003. The book provides an overview on AO instrumentation, data acquisition and reduction strategies, and covers observations of the sun, solar system objects, circumstellar disks, substellar companions, HII regions, starburst

environments, late-type stars, the galactic center, active galaxies, and quasars. The contributions present a vivid picture of the multitude of science topics being addressed by AO in observational astronomy.

This book is about general infrared (IR) engineering, technology, practices, and principles as they apply to modem imaging systems. An alternative title to this book with appeal to managers and marketing personnel might be "Everything You Always Wanted to Know about Infrared Sensors, but Couldn't Get Answers on from Engineers." This book is not meant to be a comprehensive compendium of IR (like the Infrared and Electro Optical Systems Handbook). Rather, it is intend ed to complement such texts by providing up to date information and pragmatic knowledge that is difficult to locate outside of periodicals. The information contained in this book is critical in the day-to-day life of en gineering practitioners, proposal writers, and those on the periphery of an IR pro gram. It serves as a guide for engineers wishing to "catch up," engineers new to the field, managers, students, administrators, and technicians. It is also useful for seasoned IR engineers who want to review recent technological developments.

Adaptive Optics for Biological Imaging brings together groundbreaking research on the use of adaptive optics for biological imaging. The book

builds on prior work in astronomy and vision science. Featuring contributions by leaders in this emerging field, it takes an interdisciplinary approach that makes the subject accessible to nonspecialists who want to use adaptive optics techniques in their own work in biology and bioengineering. Organized into three parts, the book covers principles, methods, and applications of adaptive optics for biological imaging, providing the reader with the following benefits: Gives a general overview of applied optics, including definitions and vocabulary, to lay a foundation for clearer communication across disciplines Explains what kinds of optical aberrations arise in imaging through various biological tissues, and what technology can be used to correct for these aberrations Explores research done with a variety of biological samples and imaging instruments, including wide-field, confocal, and two-photon microscopes Discusses both indirect wavefront sensing, which uses an iterative approach, and direct wavefront sensing, which uses a parallel approach Since the sample is an integral part of the optical system in biological imaging, the field will benefit from participation by biologists and biomedical researchers with expertise in applied optics. This book helps lower the barriers to entry for these researchers. It also guides readers in selecting the approach that works best for their own applications.

This white paper identifies the main issues and major recommendations for German astronomical research. Their implementation will require initiative from all partners and will allow German astronomers and astrophysicists to continuously play a leading role in their field.

An authoritative account of the contributions to science made by the Hipparcos satellite, for astronomers, astrophysicists and cosmologists.

For over four decades there has been continuous progress in adaptive optics technology, theory, and systems development. Recently there also has been an explosion of applications of adaptive optics throughout the fields of communications and medicine in addition to its original uses in astronomy and beam propagation. This volume is a compilation of research and tutorials from a variety of international authors with expertise in theory, engineering, and technology. Eight chapters include discussion of retinal imaging, solar astronomy, wavefront-sensorless adaptive optics systems, liquid crystal wavefront correctors, membrane deformable mirrors, digital adaptive optics, optical vortices, and coupled anisoplanatism.

In 1988, in an article on the analysis of the measurements of the variations in the radial velocities of a number of stars, Campbell, Walker, and Yang reported an - teresting phenomenon;the radial velocity variations of Cephei seemed to suggest the existence of a Jupiter-like planet around this star. This was a very exciting and, at the same time, very surprising discovery. It was exciting because if true, it would have marked the detection of the ?rst planet outside of our solar system. It was surprising because the planet-hosting star is the primary of a binary system with a separation less than 19 AU, a distance comparable to the planetary distances

in our solar system. The moderatelyclose orbit of the stellar companionof Cephei raised questions about the reality of its planet. The skepticism over the interpretation of the results (which was primarily based on the idea that binary star systems with small sepa- tions would not be favorable places for planet formation) became so strong that in a subsequent paper in 1992, Walker and his colleagues suggested that the planet in the Cephei binary might not be real, and the variations in the radial velocity of this star might have been due to its chromospheric activities.

We present the results of an adaptive optics survey for faint companions among Galactic O-type star systems (with V 8) using the Advanced Electro-Optical System (AEOS) 3.6 m telescope on Haleakala. We surveyed these O-star systems in the I -band, typically being able to detect a companion with a magnitude difference of deltam(sub I)

Learn how to overcome resolution limitations caused by atmospheric turbulence in Imaging Through Turbulence. This hands-on book thoroughly discusses the nature of turbulence effects on optical imaging systems, techniques used to overcome these effects, performance analysis methods, and representative examples of performance. Neatly pulling together widely scattered material, it covers Fourier and statistical optics, turbulence effects on imaging systems, simulation of turbulence effects and correction techniques, speckle imaging, adaptive optics, and hybrid imaging. Imaging Through Turbulence is written in tutorial style, logically guiding you through these essential topics. It helps you bring down to earth the complexities of coping with turbulence.

Adaptive optics has been under development for well over 40 years. It is an indisputable necessity for all major ground-based astronomical telescopes and is the foundation for laser and wavefront sensor design. Lighter Side of Adaptive Optics

is a nontechnical explanation of optics, the atmosphere, and the technology for untwinkling the stars. While interweaving a fictional romantic relationship as an analogy to adaptive optics, and inserting satire, humor, and philosophical rants, Tyson makes a difficult scientific topic understandable. The why and how of adaptive optics has never been more enjoyable. Robert Tyson's numerous puns and anecdotes form a continuous stream of silliness that made me laugh and wonder what was coming next....The technical discussions on adaptive optics are not too deep, but they are really perfect for this type of book. In a very entertaining way, he describes the fundamentals of the technology. For people who are not too technical, it is very understandable, and for people with a background in the science, it's still a fun read. -Josh Cobb, Optical systems designer and coauthor of Light Action! Amazing Experiments with Optics This book is fun, it is memorable and it represents superb teaching; of course the aspiring professional will need one of Tyson's many other books with their 1000 or so up-to-date references but Lighter Side awakens the interest and will be part of my library as well as that of my high school. Everything is there in a condensed and accurate form and the power of this technology is evident; it is well indexed and the references are sufficient and up-to-date. R. S. Shorter, Lighter Side of Adaptive Optics, by Robert K. Tyson, Contemporary Physics, [b]52[/b]:4, 370, 2011 [doi: 10.1080/00107514.2011.558924]. In recent years, Moore's law has fostered the steady growth of the field of digital image processing, though the computational complexity remains a problem for most of the digital image processing applications. In parallel, the research domain of optical image processing has matured, potentially bypassing the problems digital approaches were suffering and bringing new applications. The advancement of technology calls for applications and knowledge at the

intersection of both areas but there is a clear knowledge gap between the digital signal processing and the optical processing communities. This book covers the fundamental basis of the optical and image processing techniques by integrating contributions from both optical and digital research communities to solve current application bottlenecks, and give rise to new applications and solutions. Besides focusing on joint research, it also aims at disseminating the knowledge existing in both domains. Applications covered include image restoration, medical imaging, surveillance, holography, etc... "a very good book that deserves to be on the bookshelf of a serious student or scientist working in these areas." Source: Optics and Photonics News

Principles of Adaptive Optics is a comprehensive guide to adaptive optics systems and components. It covers all the basic principles, analytical tools, and instrumentation hardware included in an adaptive optics system. This single volume resource includes hundreds of references and outlines design and performance analysis of adaptive optics wavefront sensors, controls, correcting optics, and their integrated operation. The book discusses adaptive optics, system analysis and system design, and the major subsystems: wavefront sensors, correcting optics, wavefront reconstructors, and real-time controls. It details the principal equations that govern atmospheric turbulence compensation.The book contains nearly 700 citations that cover a quarter century of research and development. It includes a new section on laser guide stars and their usage. It also includes recently declassified military information on laser guided stars and all the governing equations of wavefront error, imaging system resolution, beam tilt or wander,

scintillation, temporal spectra, anisoplantism, and guide star position.

Adaptive optics is a powerful new technique used to sharpen telescope images blurred by the Earth's atmosphere. This authoritative book is the first dedicated to the use of adaptive optics in astronomy. Mainly developed for defence applications, the technique of adaptive optics has only recently been introduced in astronomy. Already it has allowed ground-based telescopes to produce images with sharpness rivalling those from the Hubble Space Telescope. The technique is expected to revolutionise the future of ground-based optical astronomy. Written by an international team of experts who have pioneered the development of the field, this timely volume provides both a rigorous introduction to the technique and a comprehensive review of current and future systems. It is set to become the standard reference for graduate students, researchers and optical engineers in astronomy and other areas of science where adaptive optics is finding exciting new applications.

Leading experts present the latest technology and applications inadaptive optics for vision science Featuring contributions from the foremost researchers in the field,Adaptive Optics for Vision Science is the first book devotedentirely to providing the fundamentals of adaptive optics alongwith its practical applications in vision science. The material forthis book stems from collaborations fostered by the Center forAdaptive Optics, a consortium of more than thirty universities,government laboratories, and corporations. Although the book is

written primarily for researchers in visionscience and ophthalmology, the field of adaptive optics has strongroots in astronomy. Researchers in both fields share thistechnology and, for this reason, the book includes chapters by bothastronomers and vision scientists. Following the introduction, chapters are divided into the followingsections: * Wavefront Measurement and Correction * Retinal Imaging Applications * Vision Correction Applications * Design Examples Readers will discover the remarkable proliferation of newapplications of wavefront-related technologies developed for thehuman eye. For example, the book explores how wavefront sensorsoffer the promise of a new generation of vision correction methodsthat can deal with higher order aberrations beyond defocus andastigmatism, and how adaptive optics can produce images of theliving retina with unprecedented resolution. An appendix includes the Optical Society of America's Standards forReporting Optical Aberrations. A glossary of terms and a symboltable are also included. Adaptive Optics for Vision Science arms engineers, scientists,clinicians, and students with the basic concepts, engineeringtools, and techniques needed to master adaptive optics applicationsin vision science and ophthalmology. Moreover, readers willdiscover the latest thinking and findings from the leadinginnovators in the field. Advances in adaptive optics technology and applications move forward at a rapid pace. The basic idea of wavefront compensation in real-time has been around since the mid 1970s. The first widely used application of

adaptive optics was for compensating atmospheric turbulence effects in astronomical imaging and laser beam propagation. While some topics have been researched and reported for years, even decades, new applications and advances in the supporting technologies occur almost daily. This book brings together 11 original chapters related to adaptive optics, written by an international group of invited authors. Topics include atmospheric turbulence characterization, astronomy with large telescopes, image post-processing, high power laser distortion compensation, adaptive optics and the human eye, wavefront sensors, and deformable mirrors.

Stars are mostly found in binary and multiple systems, with at least 50% of all solar-like stars having companions; this fraction approaches 100% for the most massive stars. A large proportion of these systems interact and alter the structure and evolution of their components, leading to exotic objects such as Algol variables, blue stragglers and other chemically peculiar stars, but also to phenomena such as non-spherical planetary nebulae, supernovae and gamma-ray bursts. While it is understood that binaries play a critical role in the Initial Mass Function, the interactions among binary systems significantly affect the dynamical evolution of stellar clusters and galaxies. This interdisciplinary volume presents results from state-of-the-art models and observations aimed at studying the impact of binaries on stellar evolution in resolved and unresolved populations. Serving as a bridge between observational and theoretical astronomy, it is a comprehensive review for

researchers and advanced students of astrophysics. Adaptive optics systems and components have achieved a level of sophistication and simplicity that goes beyond traditional applications in astronomy and the military and into developments in medicine, manufacturing, and communications. This book was written for those interested in the multidisciplinary technology and those who need a broad-brush explanation without wading through thousands of journal articles. It follows the structure of a one-day tutorial taught by the author, including humor and sidebars of historical material.

This is the first collection of review articles in one volume covering the very latest developments in exoplanet research. This edited, multi-author volume will be an invaluable introduction and reference to all key aspects in the field this field. The reviews cover topics such as the properties of known exoplanets and searching for exoplanets in the stellar graveyard. The book provides an easily accessible point of reference in a fast moving and exciting field.