The College of Optical Sciences, formerly known as the Optical Sciences Center, was established in Tucson, Arizona, in 1964 to fulfill a national need for more highly trained engineers and physicists in the optical sciences. Throughout its 50-year history, OSC has stood on the forefront of the field; today, it educates more students in optics than any institution in the U.S.
2017 SCHOLARSHIP AWARDS PROGRAM

THE UNIVERSITY OF ARIZONA
College of Optical Sciences
FoTO Graduate Student Scholarships

FoTO (Friends of Tucson Optics) endowments at the College of Optical Sciences hold a minimum $500,000 balance, and their scholarships are awarded to first-year optical sciences graduate students. The payout provides — in perpetuity — stipend support at about $20,000 annually, and the awards include tuition and fees.

Graduate Student Fellowships

A graduate student fellowship in Optical Sciences is financial support awarded to a full-time student as they pursue a degree in the fields of optics and photonics. The award is determined according to the criteria that reflects the values and purposes of the donor. Fellowships awards are based on the student’s scholastic ability and promise of academic achievement.

Undergraduate Student Scholarships

An undergraduate scholarship in Optical Sciences is awarded to exceptional students to further their education. Scholarships are awarded based upon the criteria that reflects the values and purposes of the donors who have established the award.
CEREMONY AGENDA

3:30 p.m.  Welcome – Thomas L. Koch, Dean

3:40 p.m.  Keynote Speaker – Sean J. McCafferty, MD, FACS Ophthalmology
President/CEO of Intuor Technologies (College of Optical Sciences M.S. 2015)

4:00 p.m.  Scholarship Certificates and Scholarship Sponsors
R. John Koshel, Associate Dean for Academic Programs
Kaye Rowan, Senior Director of Development

4:40 p.m.  Undergraduate Research Innovation Award in Optics
Thomas L. Koch and Jennifer Barton, Ph.D.

4:45 p.m.  Student Speaker – Seth Erickson, Graduate Student, 2017 Willis E. Lamb Jr. Graduate Student Endowed Scholarship Recipient

4:55 p.m.  Closing Remarks – Thomas L. Koch

5:00 p.m.  Reception
In the Tucson community, Sean McCafferty is widely known for his highly successful private practice in ophthalmology. Yet, there are many more people worldwide, who suffer from serious eye diseases, who are also benefiting from Sean's relentless drive to improve ophthalmic health with innovations in optics, mechanics and medicine. After earning a B.S. in Mechanical Engineering from Youngstown State University (Ohio), he entered the steel, auto, and power industries working as a product development engineer. During this period, he earned multiple patents and introduced profitable products.

In 1991, Sean decided to pursue a medical degree in ophthalmology from Ohio State University - received in 1996. After completing his residency with the UA College of Medicine in 2000, Sean founded three successful ophthalmic practice and surgical centers in Tucson.

Sean's fascination with the optics technologies led him to apply for the graduate program at the College of Optical Sciences in 2009. After six years of balancing a commitment to his burgeoning practice, his studies and research and his family, Sean earned a M.S. in Optical Sciences. Yet, while at the College, Sean took advantage of the guidance and expertise offered by faculty as he explored entrepreneurial avenues to further the impact of his work. By the time he received his degree in optics, Sean had founded several companies that addressed medical treatments for vision. Among them was Intuor Technologies, LLC, an ophthalmic/ optical product development company committed to the detection and treatment of serious eye diseases, such as glaucoma. Utilizing his combined knowledge in optical engineering, medicine, ophthalmology and mechanical engineering, Sean
is living-out an lifelong dream for introducing remarkable medical treatments and devises that will enrich the lives of others.

As an advocate for education, Sean established a scholarship with the University of Arizona known as the U.S. Army Captain John E. Tipton Scholarship – which champions undergraduate OpSci and Engineering students who foster a spirit for inquiry and discovery. Nearly 60 students since 2008 have received this impressive award. In 2015, Sean endowed a permanent fund, this time supporting graduate students in Optical Sciences. Also named for Tipton, the endowment is part of the College’s FoTO (Friends of Tucson Optics) scholarship program.

Celebrated as the 2017 University of Arizona Alumnus of the Year for the College of Optical Sciences, Sean will officially receive this honor as part of the University’s homecoming festivities in October.
FUTURE SCHOLARSHIPS

Future FoTO Graduate Student Scholarships
- Robert M. Edmund Graduate Student Endowed Scholarship in Optical Sciences
- John B. Hayes and Jane C. Quale Graduate Student Endowed Scholarships in Optical Sciences

Future Undergraduate Student Scholarship
- Martinez-Araujo Family Undergraduate Scholarship in Optical Sciences
University of Arizona Regents’ Professor Roger Angel began his research in atomic physics, turning to X-ray astronomy, then optical astronomy and telescope design. In 1985 he founded the Steward Observatory Mirror Lab to pursue the advantages of honeycomb glass technology and develop the stressed lap method for polishing aspheres. The Lab’s mirrors are used in telescopes worldwide.

Angel pioneered the use of optical fibers for multi-object spectroscopy, now widespread, and of deformable secondary mirrors for astronomical adaptive optics. With colleague Nick Woolf, he also developed concepts to search for spectroscopic evidence of life on exoplanets. Shifting his attention to mitigating climate change, Angel explored optical solutions to cool the Earth with a space sunshade. In 2009 he founded the company REhnu to use optics to improve the efficiency of photovoltaic generation of solar electricity.

Angel has been honored with the Kavli Prize in Astrophysics, a MacArthur fellowship, and election to the Royal Society and the National Academy of Sciences.

This scholarship was made possible by the generosity of the Frederick Gardner Cottrell Foundation and the Angel family.

**BENJAMIN CHRYSLER**

Ben earned his bachelor’s in electrical engineering at Colorado State University in 2015 and his master’s in electrical engineering at the University of Arizona in 2017. He is excited to join the College of Optical Sciences and is honored to be a recipient of this FoTO scholarship.
Harrison H. Barrett is considered an icon in the theory and application of image science. His research on the underlying physics and mathematics of image quality assessment has revolutionized the evaluation of medical imaging systems.

Harry joined the University of Arizona faculty in 1974 and was named a Regents' Professor in 1990. He has appointments in the College of Optical Sciences, the department of medical imaging, the Arizona Cancer Center and the Programs in Biomedical Engineering and Applied Mathematics, and he serves as the director of the UA Center for Gamma-Ray Imaging.

This scholarship was founded by colleagues and former students of Harrison H. Barrett as their tribute to his profound commitment for advancing science and technology through interdisciplinary research, education and innovation – and for the many ways he has enriched their lives.

As an incoming Ph.D. student, I am excited to see what areas within optics intrigue me the most. I am very interested in medical imaging. I am humbled to receive this award as it will open doors to help me find a direction to go in optics.
Born in the Netherlands in 1920, Nicolaas Bloembergen earned his undergraduate and master’s degrees from the University of Utrecht. After World War II, he studied at Harvard University, where he was the first graduate student of Edward M. Purcell, who received the Nobel Prize in Physics in 1952.

Bloembergen introduced the three-level maser, a forerunner of the laser, in 1956. In 1964, he wrote the first book in the subfield of nonlinear optics. He received the Nobel Prize for Physics in 1981 for work with far-ranging applications in communications, medicine and security.

The Nicolaas Bloembergen Graduate Student Scholarship was established in 2006 by John A. and Elizabeth S. Armstrong in honor of Bloembergen and his revolutionary research. The scholarship was further strengthened with a generous donation made by Nicolaas and Huberta D. Bloembergen in 2015.
FoTO GRADUATE STUDENT SCHOLARSHIPS

Boye Family Graduate Student Scholarship in Optical Sciences

After a long career as a specialist on the New York Stock Exchange, William E. Boye Jr. established the Boye Foundation, Inc. to pursue his philanthropic interest and invited his family to join him in that endeavor.

Since his death in 2004, the foundation has been administered by his wife, brother, and four children. His son, Robert, Ph.D. in optical sciences, has continued to be actively involved with the College of Optical Sciences since his graduation in 2000.

The Boye family continues to follow Bill’s example of providing service and support to their communities, both personal and professional. After many years of committed support to the educational mission at the College of Optical Sciences, the Boye Family is honored to provide this endowed scholarship to deserving students. They wish to also thank Dr. James C. Wyant for helping to make this award possible.


RYKER EADS

I am a recent graduate in physics at Utah Valley University. I have researched a wide variety of topics in my undergraduate studies: Extinction Spectra, Bionic Prosthetics and Nano-fuel. I plan on pursuing research in quantum information transmission here at the University of Arizona.
Professor Michel Cagnet Graduate
Student Endowed Scholarship in
Optical Sciences

Professor Michel Cagnet received a degree from the Institut d’Optique Théorique et Appliquée (now known as Institut d’Optique Graduate School) in Paris in 1948. He went on to receive the degree of Doctor-Ingenieur at the institute.

As a research scientist, Dr. Cagnet simultaneously pursued missions at the Haute-Provence Observatory located in Saint-Michel-l’Observatoire in south France as well as collaborations with the Laboratoire d’Astronomie Spatiale in Orsay, near Paris. He became Directeur des Etudes (Dean of Academic Affairs) at the Institut d’Optique in 1968, where he worked closely with the renowned French scientist in optics, Dr. Andre Marechal. Prof. Cagnet taught geometric optics and aberration theory to generations of optics students using intuitive graphical and visual methods until he retired in 1993.

Prof. Cagnet’s enduring legacy is his leadership in creating the timeless “Atlas of Optical Phenomena,” published in black and white and a rare edition in color by Springer-Verlag (Berlin, 1962) with text in French, German, and English.

Jannick R. Rolland and Kevin P. Thompson

JIEUN RYU

I received my bachelor’s degree in optical engineering from Bauman Moscow State Technical University in Russia. My research areas of interest are optical system design for imaging/non-imaging optics, visual optics and optical metrology system. This scholarship will allow me to concentrate more of my time for studying and learning.
Arthur G. (Jerry) DeBell began his career in optics in 1944 as Physicist-in-Charge of the photo-optics branch of the United States Naval Ordnance Test Station in China Lake, California. A graduate of Rensselaer Polytechnic Institute, his career encompassed work in both the public and private sectors, concluding as a Research Specialist and Program Manager at the Optical Sciences Center until his death in 1986.

His pioneering work in balloon-borne, cryogenic instruments provided novel technical knowledge for nearly a generation of Optical Sciences graduate students who are grateful for his innovative research and skilled lab instruction.

In memory of Jerry and his wife Bea, the DeBell family and friends established this scholarship to help others accomplish great things in the field of applied optics.

**Arthur G. (Jerry) and Beatrice DeBell Memorial Graduate Student Scholarship in Optical Sciences**

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**Arthur G. (Jerry) and Beatrice DeBell Memorial Graduate Student Scholarship in Optical Sciences**

ZUZANA CALBO

*I developed an interest in Applied Optics during my undergraduate studies in physics. This scholarship will provide me the opportunity to make the most of the first year of the Ph.D. program and will allow me to explore which research areas suit me best.*
The DeMund Foundation was established in 1947 by the late Herman E. DeMund. Chuck DeMund, his son, now oversees the foundation as its president from his home in Waxhaw, N.C.

The DeMund Foundation has provided financial assistance at universities throughout the country through scholarships and grants for many decades. The University of Arizona is fortunate to be among its longtime beneficiaries, with prior grants totaling nearly a half-million dollars.

This endowed scholarship was established in honor of Herman’s admiration for medicine and Chuck’s accomplishments in optics. The foundation aims to give its recipients greater opportunities to work on unique and high-impact research to bring the optical and medical sciences together, with the hope that these scholars will develop exciting technologies that change lives.

NACHIKET KULKARNI

Working on biomedical imaging for a year, and a passion to find novel imaging techniques to detect diseases drove me to pursue a doctorate from OSC. My future plans after getting a doctorate is to go back to India and begin a startup which will make various imaging devices.
Jack D. Gaskill was born and raised in Fort Collins, Colorado. In 1957, he received his undergraduate degree in electrical engineering from Colorado A&M College, now known as Colorado State University, where he was a member of the varsity wrestling team.

Upon graduation, he was hired by Motorola Inc. in Scottsdale, Arizona, but he was soon called to duty by the United States Air Force. There, he became an instructor pilot for the T-33 aircraft. Once his service was completed in 1963, he decided to further his education through Stanford University’s electrical engineering graduate program.

In 1968, Jack was hired by the College of Optical Sciences by Peter A. Franken to teach courses in coherent imaging and holography. He was later named OSC’s associate director for academic affairs. He held this position for 20 years, instituting a strong tradition of student support, recruitment and retention. While in this role, he founded OSC’s Industrial Affiliates program in 1980 and led the charge to establish an undergraduate degree program in optics in 1988.

Jack served as president of SPIE in 1995 and retired from the University of Arizona in 1999.

The Jack D. Gaskill Graduate Student Scholarship was founded by alumni and faculty at the college in sincere gratitude for Jack’s extraordinary contributions as a professor, adviser, mentor and administrator – and in appreciation for his legendary sense of humor.

Farhad Akhoundi received a master’s degree in electrical engineering from Sharif University of Technology in Tehran, Iran. Currently, he is working on a fiber-based multiphoton endoscope which is capable of differentiating cancerous cells from healthy ones inside tissue. This probe can also be used for femtosecond laser pulse delivery.
Joseph W. Goodman, an accomplished optical scientist, has been a steadfast leader in both the academic and corporate aspects of the global optics community.

From 1963 through his retirement in January 2001, Goodman held various positions at Stanford University, including William E. Ayer Professor of Electrical Engineering, chair of the department of electrical engineering and senior associate dean for faculty and academic affairs of the School of Engineering. He has written four major textbooks: Introduction to Fourier Optics, Statistical Optics, Speckle Phenomena in Optics and, with R.M. Gray, Fourier Transforms: An Introduction for Engineers. He has also authored more than 220 technical papers and served as Ph.D. thesis advisor for 49 students. He is the co-founder of Roberts and Company Publishers.

This endowed FoTO scholarship was established by donations from friends, colleagues and former students of Joseph W. Goodman — lives undeniably enriched by this exceptionally talented teacher and mentor. Joe and Hon Mai Goodman, Masud and Annegret Mansuripur and Jeff and Marta Wilde are the leading donors to this scholarship.

The FoTO scholarship helps me, who comes from a grass roots family, to pursue a doctoral degree in optical science. I can continue exploring nature’s mysteries, allowing me to transform my passion into profession.
After joining WYKO Corp. in 1985, John Hayes developed numerous interferometric, scanning probe microscopy and optical metrology products for the optical, data storage and semiconductor markets for 15 years. In 2001, John co-founded 4D Technology, an innovative developer of advanced high-speed, vibration-insensitive interferometers for the aerospace industry.

Jane Quale earned a B.A. in political science from the University of Oregon and a Juris Doctorate in law from the University of San Francisco. In addition to a very successful law practice, she also devotes herself to various community projects. She was once president of the Tucson Waldorf Education Association board of trustees.

John and Jane established three FoTO scholarship endowments to support graduate students as they pursue excellence with discoveries in light and optics.

**Sawyer Miller**

I recently received my bachelor’s in physics from Fort Lewis College. I am interested in imaging science as well optical engineering. Having a FoTO Scholarship means I can focus on my studies, allowing me to discover what interests me the most, a luxury I am extremely grateful for.

**Nathaniel Birrer**

I am a first year Ph.D. student at the College of Optical Sciences, hoping to specialize in image science. I did my undergraduate work in physics at Ramapo College of New Jersey, and twice interned at Lawrence Livermore National Laboratory working on data analysis for cargo radiography systems.
Lawrence A. (Larry) Johnson founded ILX Lightwave Corp. in 1986 and served for 26 years as its president and CEO and chairman of its board of directors. He is recognized throughout the optics community for his business and technical acumen, which enabled ILX Lightwave to become the world leader in laser diode instrumentation and test systems and remain so throughout its history.

Johnson earned a B.S. in engineering physics from the Colorado School of Mines and M.S. and Ph.D. degrees from the University of Arizona College of Optical Sciences. Prior to establishing ILX Lightwave, he led a research group at Rosemount Inc., where he was responsible for the development of fiber optic sensors for industrial applications. He also held technical positions in aerospace and government laboratories, focusing on electro-optical systems for defense and environmental monitoring.

This scholarship is made possible by the generosity of Lawrence A. and Nancy M. Johnson in appreciation of the faculty and staff of the College of Optical Sciences, and with special recognition for James C. Wyant, a mentor, longtime friend and member of the ILX Lightwave Corp. board of directors for over 24 years.

ALEXANDER HEDGLEN

Alex graduated from the University of Hawai'i at Hilo with a bachelor's of arts in physics and a bachelor's of science in astronomy in 2016. Alex is honored to receive this scholarship, which relieves him from the burden of student loans and allows him to truly focus on his career in optical science.
Willis E. Lamb Jr. Graduate Student Endowed Scholarship in Optical Sciences 1 & 2

Nobel Laureate and University of Arizona Regents' Professor of physics and optical sciences, Professor Emeritus Willis E. Lamb Jr. received a Nobel Prize in 1955 for his experimental work on the fine structure of the hydrogen atom and discovery of a phenomenon called the Lamb shift. His discovery revolutionized the quantum theory of matter and led physicists to rethink the basic concepts behind the application of quantum theory to electromagnetism. His work became one of the foundations of quantum electrodynamics, a key aspect of modern elementary particle physics. Dr. Lamb joined the Optical Sciences Center in 1974 and retired in 2002.

Willis and friends established these two scholarships as a legacy to all who pursue their passions and endeavors to discover great things. In addition to Willis, leading donors to these endowments are Murray and Kamela Sargent III and Elsie Wattson-Lamb.

**ERIC REICHEL**

Eric Reichel is a recent graduate of Whitworth University in Spokane, Washington. He holds a bachelor’s of science in physics, completed in the spring of 2016. After a year of deferment working as an optical lab technician, Eric will pursue a doctorate focusing on optical engineering.

**SETH ERICKSON**

Seth Erickson is pursuing a doctorate in optical science, specializing in optical physics. He graduated with a bachelor’s of science in applied physics from Bethel University in Minnesota, his home state. His research interests are in atomic, molecular and optical physics, and he hopes to focus on quantum information.
James Mayo Family Graduate Student Scholarship in Optical Sciences

The James Mayo Family Graduate Student Scholarship in Optical Sciences was established by James W. Mayo III (Jim) in honor of his family. Jim assisted the United States Air Force in its role in the founding of The Optical Science Center (OSC) at the University of Arizona in the 1960s. In 1968, he became the first OSC graduate, earning an M.S. in optical sciences. He worked closely with OSC Founder Dr. Aden Meinel during this period and later with OSC Directors, Dr. Bob Shannon and Dr. James Wyant.

Jim's parents, James W. Mayo Jr. and Mary Viola Arrington Mayo, spouse, Linda Murphy Mayo, and grandmother Elsie Mae Arrington were all tireless lifetime supporters of advanced education.

Jim retired from the USAF in 1985 as Head of the Optics and Beam Control Division, Air Force Research Laboratory, Albuquerque, NM. After retirement, he worked for Logicon RDA as Head, Opto-mechanical Engineering Department and as Department Head and Airborne Laser Project Chief Scientist for Northrop Grumman and TASC in Albuquerque. He was employed as Chief Optics Engineer for Tau Technologies LLC in Albuquerque when this scholarship was established.

CHRISTOPHER NGUYEN

I enjoy dancing, singing and playing instruments. In addition to helping pay for tuition, this scholarship will be used to secure my future.
In 1988, Kenneth E. and Michele L. Moore founded Zemax Development Corp., where they held the positions of president and chief financial officer, respectively, for more than 20 years.

Ken Moore received his Ph.D. from the College of Optical Sciences in 1991. He has garnered many awards for his work in the optics industry, including the David Richardson Medal from the Optical Society (OSA) for contributions to technical optics.

He now serves as the chief technology officer of optical engineering products at Radiant Zemax LLC, in Redmond, Wash. Michele is a certified public accountant who volunteers time to support nonprofit organizations in the Seattle area. They have two children, Sophia and Alexander.

The pair is passionate about education. They chose to endow three scholarships because of the University of Arizona’s status as a world leader in physical science research and because of their strong connection to OSC.

**JOSEPH COX**

*Joseph Cox is an Electrical Engineer with optics experience. He intends to research optical system simulations and he looks forward to his study and research with the OSC faculty.*

**PAGE KING**

*Page King is excited that her funding will support her in pursuing research in non-imaging freeform optics for her doctoral studies. She received her bachelor’s degree in optical sciences and engineering from the College of Optical Sciences in 2012, and has since worked as an Optical Engineer at Raytheon.*
Optical Data Storage Graduate Student Endowed Scholarship

Optical Data Storage refers to the science and technology of recording and readout of digital information using laser light. Compact Audio Discs (CDs) and Digital Versatile Discs (DVDs) are examples of media that store digital music and video, which can subsequently be played back with the help of a sharply-focused laser beam.

The Optical Data Storage Graduate Student Scholarship was established under the leadership of Masud Mansuripur, Professor and Chair of Optical Data Storage at the College of Optical Sciences. Also contributing to this endowment were several faculty members, research scientists, and industry partners, whose participation attests to the value of advancing innovation in the field of Optical Data Storage.

Masud and Annegret Mansuripur

ABHINAV NISHANT

I am a first year Ph.D. student, continuing my doctoral studies after a successful master’s degree from OSC. The Optical Data Storage Graduate Student Endowed Scholarship enables me to continue my studies at OSC without any financial burdens.
Jacobus M. and Michelle L. Oschmann Optical Sciences and Business Leadership Scholarship

University of Arizona alumnus Jacobus (Jim) M. Oschmann earned a Master of Science degree from the College of Optical Sciences and a Master of Business Administration degree from the Eller College of Management. Among his many career highlights are executive management positions at Ball Aerospace and Technologies Corp., including the vice presidency of both the tactical solutions and civil space and technology business units. In support of the international optics community, he has served on review panels and advisory boards for NASA, the National Science Foundation and the Association of Universities for Research in Astronomy.

Michelle L. Oschmann is a 30-year veteran of the financial services industry, where she has performed several high-level roles, including vice president of VectraBank Colorado. She has also volunteered for a variety of organizations and been part of the YWCA of Boulder County board of directors.

This scholarship, generously provided by Jim and Michelle, will support those ambitious and dedicated students pursuing an education in optical sciences and an interest in business management.

EMMA LANDSIEDEL

I am an Arizona native beginning my master’s degree this year, after completing my bachelor’s here at OSC. I am interested in opto-mechanics and optical engineering. This scholarship allows me freedom to explore my research options and delve into coursework while avoiding financial stress.
In 1964, eminent engineer, inventor and educator Roland V. Shack joined the University of Arizona Optical Sciences Center as one of its very first faculty members. Prior to commencing his professorship, Dr. Shack worked at the National Bureau of Standards and The Perkin-Elmer Corporation in the United States. He earned his Ph.D. at Imperial College, University of London.

Dr. Shack’s world-wide renown, as underscored by the highest acclamations and honors in optical sciences, is due to his contributions to optical design and testing, interference and diffraction, image formation and evaluation, and light scattering, among other topics. He designed the Shack-Hartmann wavefront sensor and the Shack cube interferometer and, in his 38 years in the classroom, imparted the principles of optics to several generations of engineers. As a scholar and instructor, Roland Shack was well regarded for the unique way he combined science, art and engineering — yet his longest-lasting legacy may be his sincere interest in his students.

This award is made possible by Roland’s family, friends, colleagues and students, in gratitude and respect for this extraordinary man.

KIRA ANN HART

I graduated from the UCLA Honor’s College in June with a bachelor’s in physics. At the University of Arizona, I have begun research in the Polarization Lab and am excited to focus on optical design for my doctorate. I am incredibly grateful for this scholarship and the opportunity to study in this incredible program!
Robert R. Shannon came to the University of Arizona in 1969 as a professor of optical sciences. He was later named director of the University’s Optical Sciences Center, serving from 1984 to 1992. He then was appointed Professor Emeritus of Optical Sciences.

He has been a prolific leader in the optics community, including terms as president of SPIE and the Optical Society (OSA). He served on the Air Force Scientific Advisory Board and Aerospace Corp.'s board of trustees, as well as a number of National Academy of Sciences committees. Bob's many technical contributions have earned numerous awards including SPIE’s Goddard Award and Gold Medal and membership in the National Academy of Engineering. He is a fellow of OSA and SPIE.

This scholarship was founded by John R. Rogers and J. Michael Rodgers in appreciation for Robert Shannon’s wisdom, mentorship and lasting friendship. Both were advised by Shannon while pursuing doctorate degrees in optical sciences.

ANDREW ROCHA

My research interests are laser inertial fusion energy, lasercom, and astronomical telescope technologies. I have been working on professional and personal milestones in order to apply for NASA's Astronaut Candidate Program upon earning my doctorate. This scholarship will help me with the transition as a Ph.D. candidate.
Richard L. Shoemaker received his Ph.D. in physical chemistry from the University of Illinois in 1971. After two years at IBM Research Laboratories, he came to the University of Arizona where he became professor of optical sciences, chemistry and radiology. He also served as the associate dean for academic programs at the College of Optical Sciences. He is a fellow of the Optical Society (OSA) and has twice served on its board of directors.

Rick established this scholarship out of gratitude to the College of Optical Sciences for the wonderful colleagues and opportunities it has provided him. This scholarship was generously established by Dr. Shoemaker with the desire to support outstanding graduate students as they pursue their own careers in the optical sciences.

I studied electrical and computer engineering, and now am interested in optics. With the Richard L. Shoemaker FoTO Scholarship, I want to pursue my interest in optical and electrical devices for space exploration. I enjoy exercising and cooking. I spent my summer traveling and learning Chinese in Taiwan.
SPIE Graduate Student Endowed Scholarship in Optical Sciences

SPIE, the international society for optics and photonics, was founded in 1955 to advance light-based technologies. Serving more than 256,000 constituents from approximately 155 countries, the not-for-profit society advances emerging technologies through interdisciplinary information exchange, continuing education, publications, patent precedent, and career and professional growth. Annually, SPIE provides multiple millions dollars in support of education and outreach programs.

In recognition of the University of Arizona College of Optical Sciences 50th-year anniversary, the society established this scholarship to further advance the vision for power and potential in optics and photonics by educating brilliant young minds. On behalf of all SPIE members worldwide, this scholarship represents the significant appreciation that the society holds for the college and its students and our profound desire to further strengthen this partnership for infinite years to come.

CHARLOTTE GUTHERY

I recently graduated from the photographic sciences program at Rochester Institute of Technology. I am honored to receive this award to help me in my studies towards a doctorate in optical science. I intend to focus on optical engineering as it relates to astronomy and telescope manufacturing.
The U.S. Army Captain John E. Tipton Graduate Student Endowed Scholarship in Optical Sciences is awarded to promising graduate students pursuing an education in optical sciences at the University of Arizona.

This scholarship was named for John E. Tipton by Sean McCafferty, Tucson ophthalmologist and OSC alumni, whom he never met but was inspired by Tipton’s dedication, determination, leadership and selflessness – all requirements for a life of service. This award is intended to inspire students to also view their careers as an opportunity to serve their community, their country and the world while introducing and perfecting optical technologies that will help change lives for the better.

Recipients of this scholarship demonstrate diverse engineering interests as well as talents for creative and innovative thinking. They are extraordinary students who embrace an enduring spirit of inquiry, discovery and responsibility.

Sean McCafferty

SEAN ASHLEY

Sean is an American-born son to a wonderful hard-working Korean-born mother. Sean has a bachelor’s in optical sciences and engineering (2015), a bachelor’s of science in applied mathematics (2015) and a master’s of science in statistics (2016) from the UA. Sean is pursuing his doctorate under the advisement of Dr. Jim Schwiegerling.
Mary Lou Wolfe Memorial
Graduate Student Endowed Scholarship in Optical Sciences

William L. Wolfe Jr. is a professor emeritus of the College of Optical Sciences. He joined the faculty in 1969 after receiving a B.S. in Physics from Bucknell University and advanced degrees in physics and electrical engineering at The University of Michigan. He is a noted author, educator and researcher. His contributions in the field of infrared technology cover the space, military, commercial and medical fields. He has mentored some 50 students to their advanced degrees.

This scholarship is dedicated to his beloved wife who supported him through 60 years of married bliss and especially some tough ones. She graduated from The University of Michigan magna cum laude with a degree in medical technology.

I am looking forward to studying quantum optics and optical physics here at the University of Arizona College of Optical Sciences. I'm very grateful for this scholarship because without this assistance I would likely not be able to attend graduate school.

THOMAS KILMER
Louise A. Wyant Memorial
Graduate Student Endowed Scholarship in Optical Sciences

Louise excelled as a watercolorist, receiving numerous prestigious local awards. She was a signature member of the Southern Arizona Watercolor Guild and served for nearly 25 years in various membership roles, including President. She was known for taking time to share her talent through various art activities, instruction and special exhibits.

As a tribute to Louise Wyant, this scholarship was established by her husband, James C. Wyant, professor emeritus and founding dean for the College of Optical Sciences and their son, Clair.

James C. Wyant
Photo by Jacob Chinn, UA Alumni Association

JUNFENG WANG

After obtaining my master’s degree at OSC, I was excited to know that I was selected for this honor. The scholarship will help me to concentrate more on academics. During my doctorate program, I’m planning to research nonlinearity and fiber lasers due to my background of photonics.
James C. Wyant is a professor emeritus at the College of Optical Sciences, where he served as director from 1999 to 2005 and founding dean from 2005 to 2012. He received a B.S. in physics from Case Western Reserve University and a M.S. and Ph.D. in optics from the University of Rochester.

For his technical work, Wyant received OSA's Joseph Fraunhofer Award and SPIE's Gold Medal, Technology Achievement Award and Chandra S. Vikram Award.

He co-founded WYKO Corp. and served as its president and board chairman from 1984 to 1997. He also co-founded 4D Technology and serves as its board chairman. For his entrepreneurial achievements, Wyant received the Arizona Innovator of the Year Product Award, the Tom Brown Excellence in Entrepreneurship Award, the University of Arizona Technology Innovation Award, the Arizona Technology Council William F. McWhortor Award, the University of Rochester College of Engineering Distinguished Alumnus Award and the Case Alumni Association Gold Medal Award.

This scholarship was established by faculty, alumni and colleagues at the College of Optical Sciences with deep respect and sincere appreciation for James C. Wyant’s unyielding commitment to inspire and educate students in optical sciences.

*Photo of James C. Wyant by Jacob Chinn, UA Alumni Association*
John and Sophie Zavada were married at the beginning of the Great Depression and raised a family during the difficult times of World War II.

John was a design engineer based in New York City and worked in many countries around the world. In addition to caring for their two children, Sophie joined him for extended visits to Spain and Brazil. Together John and Sophie fostered in their children a deep appreciation for learning, education, and leadership.

This scholarship was established by their son, John M. Zavada Jr., who received a Ph.D. from New York University and whose long career has centered on optical semiconductor materials and photonic devices. He founded this award in his parents’ memory to encourage graduate students to overcome personal hardships and to pursue advances in optical sciences.
The Dean’s Fund for Excellence scholarships are made possible by the generous annual donations offered by the College of Optical Sciences alumni and friends. Awards are made to both undergraduate and graduate students, and selections are made by a committee designated by the Dean. In addition to academic excellence, the committee also considers commitment to the scholarship, involvement in extracurricular activities and interests beyond science and technology. The Dean gives final approval of the selected award recipient in accordance with the defined eligibility criteria.

Guanghao Chen is a graduate student in the College of Optical Sciences. His area of research is volume holographic data storage. He is humbled and honored to receive this scholarship and grateful to the donors who have made it possible. It will inspire him to strive to achieve his educational aspirations.

Weiyu Chen is pursuing a master’s degree in optical sciences. Her research focuses on ultrafast laser application. She is honored to receive the Dean’s Fund for Excellence Award scholarship. This will inspire her to continually strive for her advanced education and research.

I received my bachelor’s of science in electrical engineering degree from Islamic Azad University. I am pursuing a master’s degree and currently working in the ARPA_E group on the development of a solar energy system. This scholarship will help me to focus on research and academics.
**MICAH MANN**

I am Micah Mann, and I am a Navajo student in the optics program starting my third year here at the University of Arizona. I did research this summer at the UA on fluorescence anisotropy in Dr. Leilei Peng’s lab. This award will help with books, and other living expenses.

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**KHALID OMER**

Being selected for this award will allow me the availability to accomplish my goals in optics. I will use my skills as a physics and optical engineering dual major to innovate various fields of research. In particular, I hope to further imaging techniques in medical imaging.

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**LENNON REIHNHART**

I became interested in optics because it is intertwined with space applied research. I am now heavily involved with such research at the Space Dynamics Laboratory and Steward Observatory Solar Laboratory. This scholarship will help me focus on classes and my application towards a doctorate in optical sciences at OSC.

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**LAUREN SCHATZ**

Lauren Schatz is a third year Ph.D. student. She is currently working on pyramid wavefront sensing for MagAO-X, the extreme adaptive optics system for the Magellan 6.5 meter telescope in Chile. She has served as a board member of Women in Optics for two years, and is currently serving as vice president.

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**ADRIANA STOHN**

As an OSC undergraduate, Adriana recognizes the importance of cultivating research experiences as an early career student. She will capitalize on the momentum this scholarship allows by further developing her research background, and will continue her work in polarization imaging with plans to attend graduate school.

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**KAREN WARD**

A member of Dr. Milster’s research group, Karen is developing experience in the microlithography process, complementing her academic emphasis in opto-mechanics. Karen loves volunteer work that excites the next generation about optics. This scholarship will allow Karen to focus less on financial concerns and more on academic and volunteer pursuits.
A long-time resident of Arizona, James and Mary Jo Lake established this fellowship in 1999 to support women scientists pursuing advanced degrees in Optical Sciences at the University of Arizona.

A native of St. Paul, Minnesota, Mary Jo was a devoted wife and mother who supported her husband, James, in his highly successful career as a metallurgical engineer. Together they established households around the country while raising their daughters, Nancy and Mary, both of whom excelled in the field of fine arts.

Mary Jo believed in helping women achieve and she had great interest in supporting women pursuing careers in science and engineering. It was the James desire that recipients of this fellowship benefit from Mary Jo’s commitment to lead young women into greatness.

Lauren Schatz is a third year Ph.D. student. She is currently working on pyramid wavefront sensing for MagAO-X, the extreme adaptive optics system for the Magellan 6.5 meter telescope in Chile. She has served as a board member of Women in Optics for two years, and is currently serving as vice president.
GRADUATE STUDENT FELLOWSHIPS

Kenneth E. and Michele L. Moore Endowed Scholarship in Optical Sciences

In 1988, Kenneth E. and Michele L. Moore founded Zemax Development Corp., where they held the positions of president and chief financial officer, respectively, for more than 20 years.

Ken Moore received his Ph.D. from the College of Optical Sciences in 1991. He has garnered many awards for his work in the optics industry, including the David Richardson Medal from the Optical Society (OSA) for contributions to technical optics.

He now serves as the chief technology officer of optical engineering products at Radiant Zemax LLC, in Redmond, Wash. Michele is a certified public accountant who volunteers time to support nonprofit organizations in the Seattle area. They have two children, Sophia and Alexander.

The pair is passionate about education. They chose to endow three scholarships because of the University of Arizona’s status as a world leader in physical science research and because of their strong connection to OSC.

JUSTIN KNIGHT

The Kenneth E. and Michele L. Moore Fellowship allows me to focus on my research into stellar coronagraphs. These devices are used with telescopes to suppress unwanted starlight to study nearby planets. Doing so enables direct imaging and spectroscopic characterization of potentially habitable planets outside of our solar system.
Romeo I. and Erlinda Mercado Graduate Student Fellowship in Optical Design

Dr. Romeo I. Mercado is an optical engineering professional with more than 30 years of experience and a proven record of profitable accomplishments achieved through creative, multi-disciplinary research and development teams, establishing intellectual property and marketable products. He has authored more than 30 technical papers in optics and optical designs, holds 35 U.S. patents and a number of foreign patents on optical system designs. Romeo earned a B.S. in Electrical Engineering from Far Eastern University in the Philippines, and a M.S. and Ph.D. in Optical Sciences from the University of Arizona in 1971 and 1973, respectively.

Erlinda Mercado earned a B.S. in Chemical Engineering from Far Eastern University. Her career as a quality engineer included work in qualitative and quantitative chemical analyses, semiconductor manufacturing and metrology. In the early 1970’s, she completed courses at the UA in statistics and computer programming.

This scholarship was established by Romeo and Erlinda to support a full-time graduate student pursuing a degree in optics with a thesis or dissertation related to the field of optical design.

Yufeng is a Ph.D. candidate at the College of Optical Sciences at the University of Arizona. His research under the guidance of Professor José Sasián involves innovative optical design, fabrication and testing of optical systems, and development of novel imaging techniques, including the use of freeform surfaces in optical design.
Dr. Philip N. Slater is professor emeritus of Optical Sciences at the University of Arizona, and an expert in remote sensing calibration. He graduated with a B.S. from London University in 1955, and obtained a Ph.D. in physics from Imperial College in London, UK in 1958. After graduation, he was manager of the Optics Research Section at the ITT Research Institute in Chicago until he joined the faculty of the University of Arizona in 1966.

This scholarship was established by Dr. Slater and his wife, Joan, to support graduate students who demonstrates and aptitude for optical engineering and design, remote sensing or radiometry.

EDWARD LA VILLA

I am a fifth year Ph.D. candidate in the optical engineering track. My dissertation is focused on the development of an altered fundus camera for studying myopia. Through the generous Phillip N. and Joan A. Slater Scholarship I am able to continue my dissertation research this upcoming year.
David H. Cushing, an expert in thin films and optical coatings, was born and raised in Boston, where he earned his B.S. in electrical engineering from Northeastern University. He worked for several years at Baird Atomic Inc. with thin films pioneer Edgar Barr, and then co-founded MicroCoatings Inc. The company became renowned the quality of its work; NASA used their filters for the Galileo and Voyager spacecrafts.

After MicroCoatings was acquired by the Optical Corporation of America, Cushing was employed by JDS Fitel Inc. and Corning Precision Lenses. He and his wife, Helen, retired to Tucson in 2004, where he discovered the College of Optical Sciences.

David Cushing was extraordinarily generous to the college, donating a coating machine and sharing his expertise with students. After his death in 2009, Helen endowed this scholarship in his honor.

I am an upcoming senior, with interests in material science and how it incorporates into optics in such aspects as optical coatings, and I have pride in being an international engineer with knowledge in the Japanese language. This funding will continue to allow me to pursue my interests in engineering.
UNDERGRADUATE STUDENT SCHOLARSHIPS

Eustace L. Dereniak Family and Friends
Endowed Scholarship in Optical Sciences

This scholarship was founded as a tribute to Professor Eustace (Stace) L. Dereniak for tirelessly dedicating his life to teaching and advancing excellence in optical sciences.

Stace received his B.A. from Michigan Technological University and an M.S. from the University of Michigan. He then worked in the aerospace industry on projects related to space optics before enrolling in a promising new optics program at the University of Arizona (UA). After completing his doctorate in 1976, the College of Optical Sciences became home base for this remarkable professor and researcher. He was also influential role in the development of the college’s undergraduate program and was awarded the College of Optical Sciences Award of Distinction for Undergraduate Teaching in 2006

This scholarship is generously funded by Eustace and Barbara Dereniak and their daughters, Teresa and Andreana; Claudia and Elias Martinez and their sons Andrew and Joaquim; and many former students and friends.

ANTHONY SMITH

I joined the OSC family as an undergraduate researcher under Palash Gangopadhyay. Palash introduced me to the field of magneto-optics, a field that I aim to study when I move on to my graduate studies. This summer, I have been working at Sandi National Labs, and I greatly wish to start my career with Sandia.

JILIAN NGUYEN

I am a senior undergraduate in OSC this year, as well as an optics ambassador and treasurer for SOCK! I’m interested in pursuing graduate school for VR/AR related fields after earning my bachelor’s degree. The optics scholarships will ensure that I continue getting a great education without worry for the future!
In 1942, Norman W. Edmund founded a mail-order optical instruments company, Edmund Scientific, which specialized in the sales of salvaged telescopes, microscopes and other scientific devices. In the years that followed, he moved operations from a card table in the family home to a brand-new office building, and he shifted his focus from selling surplus equipment to manufacturing and distributing commercial-quality optical components.

Today, that company, now called Edmund Optics, is regarded as the world's leading producer of optics, imaging and photonics technology.

This scholarship was founded by his son, Robert Edmund, and his wife, Gwynne, in remembrance of Norman W. Edmund's fearless entrepreneurial spirit.

Adriana is a junior in the College of Optical Sciences. Her research includes solar physics and small body behavior. Adriana has a great passion for space sciences, and the Norman W. Edmund Merit Scholarship in Optical Sciences will bring her one step closer to her dream of becoming an astronaut.
For 20 years, professor Jack D. Gaskill served as OSC’s associate director for academic affairs, where he played a key role in shaping the graduate curriculum and starting the undergraduate program; he also recruited students and mentored them as they pursued their degrees. In 1999, he commemorated his retirement from teaching by contributing a very generous leadership gift for an undergraduate student scholarship in optical sciences. Many alumni followed his excellent example in order to endow the Gaskill Scholarship.

These donations help ensure that promising students of optical sciences will have the resources to complete their baccalaureate degrees and continue the great tradition of OSC for years to come.

Jilian Nguyen
I am a senior undergraduate in OSC this year, as well as an optics ambassador and treasurer for SOCk! I’m interested in pursuing graduate school for VR/AR related fields after earning my bachelor’s degree. The optics scholarships will ensure that I continue getting a great education without worry for the future!

Lennon Reinhardt
I became interested in optics because it is intertwined with space applied research. I am now heavily involved with such research at the Space Dynamics Laboratory and Steward Observatory Solar Laboratory. This scholarship will help me focus on classes and my application towards a doctorate in optical sciences at OSC.
John E. Greivenkamp received his Ph.D. from the Optical Sciences Center in 1980. After a decade as a research scientist with Eastman Kodak Co., he returned to the University of Arizona as a professor of optical sciences. He is renowned for an innovative teaching style that captivates and challenges students. His use of in-class demonstrations began the collection of antique telescopes and optical instruments that grew to become the Museum of Optics at the College of Optical Sciences.

A generation of optical engineers owes its understanding of geometrical optics to John. His dedication to teaching and the preservation of the historical legacy of optics has contributed to the excellence of the College of Optical Sciences.

The scholarship was instituted by David Steed, a friend of John’s who shares his enthusiasm for education and antique optics. The award supports undergraduate students with the aim of instilling an appreciation of how the historical foundation of optics leads to future innovations in optical instruments.

David Steed and John E. Greivenkamp

CARLOS OGAS

As a self-funded student at the University of Arizona, I’ve spent time working with volunteer outreach, doing research for OSC and working as an intern for Edmund Optics. This scholarship will help me pay for my last year.
The John E. Tipton Undergraduate Student Scholarship in Optical Sciences is an annual award to promising undergraduate students pursuing an education in optical sciences or optical engineering at the University of Arizona.

This scholarship was named for John E. Tipton by Sean McCafferty, Tucson ophthalmologist and OSC graduate student, whom he never met but was inspired by Tipton’s dedication, determination, leadership and selflessness – all requirements for a life of service. This award is intended to inspire students to also view their careers as an opportunity to serve their community, their country and the world while introducing and perfecting optical technologies that will help change lives for the better.

Recipients of this scholarship demonstrate diverse engineering interests as well as talents for creative and innovative thinking. They are extraordinary students who embrace an enduring spirit of inquiry, discovery and responsibility.

Born into a military family, John Tipton served in the Middle East during the Gulf War and died in combat in 2004. He earned commendations that included a Purple Heart, the Army Commendation Medal and the Valorous Unit Award. He left behind two children, who were ages two and four at the time of his death; his wife, Susie; and countless family members and friends.

JOSHUA PAUL MCDONALD

I am a self-starting maker interested in the development of volumetric display systems. As a native Texas student, this scholarship greatly augments my finances, allowing more time in the research lab and focusing on school work instead of working a job. Thanks to all donors for your support and generosity.
Professor Emeritus Arvind Marathay and his wife, Sunita, have established the Marathay Family Scholarship in support of undergraduate students at the College of Optical Sciences.

A native of India, Arvind Marathay was educated in Bombay, London and Boston, receiving his Ph.D. from Boston University in 1963. He joined the College of Optical Sciences in 1969 and was active in teaching and research until his retirement in 2002.

When asked why he chose to establish a scholarship, Professor Marathay explained that the College of Optical Sciences “is a unique college where a wide variety of research areas are explored. I want to help OSC grow.”

Ridley Gatlin

Ridley is entering her senior year at OSC. She is an Undergraduate Research Assistant for Dr. Tom Milster’s group working in the Maskless Lithography and Computer Generated Holography Lab. This award helps to ease the financial burden of this year and has helped in the decision to attend graduate school after the conclusion of this year.
James M. Palmer, teacher and mentor to a generation of OSC students, was a key figure in the formation of the bachelor’s degree program in the late 1980s. Today, the ABET-accredited program is successful and well-established, with more than 200 students enrolled.

Palmer’s research in sensor-system calibration significantly advanced the state of the art in that field. His interests reflected a broad base of knowledge and expertise, ranging from self-calibration and quantum-efficient detectors to radiometric properties of the moon to the design of a flawless Venus probe that monitored the atmosphere of that planet to investigate its greenhouse effect.

After Jim’s death from chondrosarcoma in 2007, his family, friends, associates and former students contributed generously to a scholarship in his honor.

A member of Dr. Milster’s research group, Karen is developing experience in the microlithography process, complementing her academic emphasis in opto-mechanics. Karen loves volunteer work that excites the next generation about optics. This scholarship will allow Karen to focus less on financial concerns and more on academic and volunteer pursuits.
This award recognizes a University of Arizona optics undergraduate student whose research achievements demonstrate promise in advancing innovative applications of optics that improve quality of life or address societal challenges. The metrics for the award are Innovation, Exceptional Quality and External Validation.

I am a junior in the College of Optical Sciences, and was given the opportunity to work in Dr. Barton's laboratory this past summer. My position involved analyzing and characterizing stray light in a novel endoscope design. This award validates the research’s significance, and will help support my studies.
This scholarship was established to aid the recruiting of an exceptionally talented undergraduate or M.S. student selected from a pool of local, national and international student applicants. The recipient must be a first-time student at the College of Optical Sciences and successfully meet all academic requirements to pursue a degree in optics.

CHAO-HSIUNG TSENG

I majored in mathematics and astronomy in Taiwan. I have participated in a space imager project in UC Berkley and learned that the quality of imaging is critical in observations. That intrigues me to further study in Optics. This scholarship reduces my financial burden and encourages me to pursue this dream.
The College of Optical Sciences, formerly known as the Optical Sciences Center, was established in Tucson, Arizona, in 1964 to fulfill a national need for more highly trained engineers and physicists in the optical sciences. Throughout its 50-year history, OSC has stood on the forefront of the field; today, it educates more students in optics than any institution in the U.S.