

Wayne Place	Professor of Architecture School of Architecture College of Design North Carolina State University
Education	Ph.D. in Physics from University of North Carolina at Chapel Hill, 1972 Master of Architecture from North Carolina State University, 1975 B.S. in Physics from Duke University, 1965
Professional Registrations	Professional Engineer in the State of California, August 1980, 32068 Professional Engineer in the State of North Carolina, June 2003, 28997
Awards	NC State University Outstanding Extension Service Award, 1993 NC State University Outstanding Teacher Award, 1996 NC State University Academy of Outstanding Faculty Engaged in Extension, 2000 NC State University Alumni Association Distinguished Undergraduate Professor, 2000 Nominated for NC State University Alumni Association Distinguished Graduate Professor, 2008 Nominated for NC State University Faculty Advisor Award, 2009 NC State University Alumni Association Outstanding Research Award, 2017 NC State University Research Leadership Academy, 2017 Nominated for NC State University Alexander Quarles Holladay Medal for Excellence, 2017 (final selection still in process)
Research and Technical Innovation	<p>From January 1986 to the present, has been on the Architecture faculty of North Carolina State University, doing research on the use of natural light to illuminate the interiors of buildings and on the design of building systems for natural lighting applications, including integrating the building structure, the electrical lighting system, the electrical and electronic distribution networks, and the air-handling systems.</p> <p>Chair of PhD Advisory Committee for Jianxin Hu, whose dissertation was nominated for the Nancy Pollock Award. Hu's dissertation research was applied immediately in the design of the LEED Gold Headquarters building for the North Carolina Wildlife Conservation Commission on Centennial Campus of North Carolina State University. This building have been visited by hundreds of architects, engineers, state facilities managers, and corporate Executives intent on constructing a new building, to study the daylighting and energy efficiency features of the building.</p> <p>Chair of PhD Advisory Committee for Daryl Carrington, whose dissertation was awarded the King Medal for Excellence in Design Research. Carrington focused on linking daylighting design issues with standard software in the market place for the design of electric lighting systems. In this manner, he expanded the available expertise for daylighting system design, which had previously been the purview of a very small number of experts.</p> <p>Chair of PhD Advisory Committee for Traci Rose Rider, whose dissertation was awarded the King Medal for Excellence in Design Research. Rider's research focused on Architecture Curricula in the United States and internationally to better understand how issues of sustainability can be incorporated into the educations of young architects. While she was a graduate student, she developed a graduate course on sustainability which won her an NC State University award for teaching excellence, the first semester that she taught it.</p> <p>Chair of PhD Advisory Committee for James Grady, whose dissertation was awarded the King Medal for Excellence in Design Research. Grady developed a building energy analysis software package incorporating a powerful simulation engine in a very easy to use format that allows it to be used in the early stages of the design process to sort out options before too many design commitments are made. Grady developed, demonstrated, and validated the computational engine for the software. He also defined how the graphic user interface will be structured.</p>

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(continued)

Chair of the Advisory Committee for Ladan Ghobad. Ghobad focused on optimizing roofing configurations for admitting natural light into buildings, using state of the art computer software such as Energy+, Radiance, and Diva. Her work has extended the previous work by paying more attention to the implications of architectural detailing and the other design realities, which can have a substantial impact on the illumination and thermal performance of the building, as demonstrated in the results of her energy and light quality simulations. Her work has been extremely thorough and accurate, conforming to strict scientific standards, while never straying from the goal of providing concise, meaningful design information. Her dissertation is a paradigm for how this kind of research work should be done.

Chair of PhD Advisory Committee for Mohammad Salamati, who is focusing his research on integrated roofing systems incorporating innovative glazing for admitting regulated quantities of well-behaved natural light for interior illumination of buildings.

Chair of PhD Advisory Committee for Ghazal Kamyabjou, who is focusing on integrated building systems for tall buildings.

Member of PhD Advisory Committee for Mahsan Mohsenin

Member of PhD Advisory Committee for Sedighehsadat Mirian Hosseinabadi

Member of PhD Advisory Committee for Ahoo Malekafzali Ardakan

Member of PhD Advisory Committee for Nooshafarin Mohammadzadeh

Member of PhD Advisory Committee for Jonghoon Ahn

Member of PhD Advisory Committee for Kristen Thorliefsdottir

Designed and built the North Carolina State University Daylighting Facility, which includes:

- Several Sun-Angle Simulators of various designs. These are indoor devices that simulate "solar motion" by moving an electric light in a series of arcs, with the architectural model at the center of the arcs. The main purpose of the devices is to enhance visualization and understanding of solar motion. The devices are both teaching tools and tools of investigation to support design generation and development. They are normally used in the early stages of design, using small and simple models.
- The Outdoor Scale-Model Facility, which is used to test the daylighting performance of architectural schemes using scale models in full sunlight. Models are supported on heliodons which are used to tilt and rotate the models so that sunlight is incident on the models at the angles that would occur for the actual buildings that the models represent. Since the testing is done in actual sunlight, it provides accurate spectral content and intensity of the light inside the model. Extensive photometric instruments are available for making illumination measurements inside and outside the models.
- The Rotating Test Building, which is used for testing advanced systems using daylight admitted through walls. The interior of the rotating test building has been outfitted with various arrangements of office furnishings. The interior spaces are used for doing research on occupant response to the daylit environment, for evaluating auxiliary electric lighting systems, and as a demonstration space for students and professionals interested in daylighting.
- The Resource Measurement Laboratory, which supports an extensive system for monitoring solar radiation and daylight. Photometric and radiometric devices on the roof of the building feed signals to a computerized data acquisition system in the computer room below. The largest space in the resource measurement laboratory is daylit by apertures in the roof. It serves as a teaching, work, and demonstration space.
- A solar access instrument, based on fisheye views of the sky, that can be used to record solar obstructions by taking images from a variety of locations on the site.
- Among the instrumentation is: 70 Licor instrument-grade photometers, a luminance spot meter for recording surface luminance for light quality assessments, High-Dynamic Range photography for light quality studies, three precision spectral pyranometers, two pyrhemometers, a sky luminance mapper, and a complete weather station. (My colleague, Professor Jianxin Hu, also played a vital role in acquiring these resources.)
- A Tragenza Sky Simulator. (My colleague, Professor Jianxin Hu, was the primary initiator and producer of this part of the facility.)
- An artificial sky chamber. (My colleague, Professor Jianxin Hu, was the primary initiator and producer of this part of the facility.)
- Numerous, fully instrumented, architectural daylighting models being used for long-term monitoring. (My colleague, Professor Jianxin Hu, was the primary initiator and producer of this part of the facility.)

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(continued)

Research grants totaling over \$450,000 have been used to build research facilities and instrumentation and to fund a variety of research projects that have led to the books and papers that are listed below. Produced one of the most complete set of illumination and solar data for a single site in the world. Worked under a Shogren grant to develop newer and more sophisticated versions of the Sun-Angle simulator and a new form of diurnal simulation heliodon, which are being made available to other universities by publishing the designs and providing instructional videos on the NCSU web pages.

Invention disclosures:

#12161: Corrugated Precast Concrete Floor Integrated with Under-Floor Air Distribution for Reducing Floor-to-floor Height in Multi-Story Commercial Buildings (by Wayne Place and Jianxin Hu). Integrated flooring systems incorporating precast concrete spanning elements into which both a supply plenum and a return plenum are incorporated and also accommodating integrated electric lighting, mechanical systems elements, electric power, and the electronic network. NCSU: Research & Innovation Seed Funding (RISF) Program. Budget: \$25,000 to work on Integrated Floors. Invention has been introduced to Tindall Corporation. Tindall has made suggestions for changes that substantially strengthen the invention. Tindall Corporation has funded NCSU to develop the patent, which is now complete and has been submitted to the patent office. The patent will be held jointly in the names of Wayne Place (NCSU Professor of Architecture), Jianxin Hu (NCSU Associate Professor of Architecture), Greg Force (President and Chief Operating Officer of Tindall Corporation), Bryant Zavitz (Vice President Product/Process Development of Tindall Corporation), and Kevin Kirkley (Chief Engineer of Tindall Corporation). A business agreement has been signed between NCSU and Tindall Corporation for the development and commercialization of the invention. This represents a rich research and entrepreneurial opportunity and all parties are committed to moving it forward.

#11133: An Integrated Roofing System Incorporating Innovative, Dynamically Adjustable, Remote Shading for the Daylighting Apertures, (Wayne Place, Jianxin Hu, Soolyeon Cho) Integrated roofs with remote shading elements to block unwanted solar heat, but admitting diffuse daylight for illumination. These roofs also incorporate thermal heating and cooling mechanisms, electric lighting, and electric power and electronic networking. The invention has evolved into an even more promising invention which is about to be disclosed to the University. This glazing system has the potential to make skylights across the world much more energy efficient. Research on this system, conducted jointly between Professor Place and Professor Jianxin Hu, has evolved this system into a new concept described in the next paragraph.

not yet assigned: An Integrated Roofing System Incorporating Innovative glazing elements that admit diffuse daylight for interior illumination, while blocking direct-beam sunlight during the cooling season and admitting controllable amounts of beam sunlight during the heating season, (Wayne Place, Jianxin Hu). The glazing system works well, regardless of the solar orientation of the building. These roofs also incorporate mechanical heating and cooling system equipment, electric lighting, electric power, and electronic networking. This glazing system has the potential to make skylights across the world much more energy efficient. Some of this research was presented by Wayne Place at a Symposium on Airport Design sponsored by Fentress Architects and hosted by the European Cultural Center in October of 2016, as part of the Venice Architecture Biennale. (Video presentation available on the internet at: <https://youtu.be/bf97ikyZGNI>.)

#12164: A Multi-Tier Dynamic Light Shelf System Integrated with Curtain Wall Facade, Photovoltaics and LED Lighting in Commercial Buildings, (by Jianxin Hu, Wayne Place, Christoph Konradi)

#12158: A web-based expert system for the design and development of high-performance buildings, (Soolyeon Cho, Wayne Place, Jianxin Hu)

Did a major research and development project for Synergetics, Inc., under funding of \$575,000 from the U.S. Department of Energy, on the *Cornice Duct*, which is an air distribution system for typical residential construction in the United States. Typical residential thermal systems deliver conditioned air through ducts in unconditioned spaces, such as attics, where the ducts can lose more than a third of the thermal conditioning before the air arrives at the space to be conditioned. The cornice duct is a system for distributing the air internal to the thermal envelope of the house, thereby eliminating losses through the ducts. The device provides advanced mechanisms for controlling the amount, speed, and direction of air delivered to the conditioned space, to maximize efficiency of the system and the thermal comfort of the building occupants. The project involved extensive design, fabrication, and thermal and air-flow experimentation. Co-authored the patent for the device. Collaborated with Synergetics, Inc., on the research and development of the *Variable-Area, Light-Reflecting Assembly (VALRAY)*, a device for projecting

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beam sunlight into building cores, under SBIR funding from the U.S. Department of Energy. Wrote the first draft of the patent for the device. Over 90% of the original claims were retained in the final versions of the patent. Collaborated with Synergetics, Inc., on the research and development of the *Integrated Roof Assembly Daylighting Device (IRADD)*, a roofing system integrating structure, air handling, electrical distribution, signal distribution, finished interior surfaces, and controlled daylighting, under SBIR funding from the U.S. Department of Energy.

Collaborated with Synergetics, Inc., on the research and development of Thermally Optimized Glazed Roof Assemblies, a roofing system integrating structure, air handling, electrical distribution, signal distribution, finished interior surfaces, and controlled daylighting. Project emphasized total system construction and ease of modular additions. Was the subject of 1996 Scholarly Leave Research Report (see references). Work was funded under a \$30,000 grant from Hoechst-Celanese Corporation.

Played a critical role in the creation of the PhD in Design program for which he was the acting head for one year. Wrote the proposal to add two new faculty research positions to the Architecture faculty, which led to the hiring of Soolyeon Cho and Jianxin Hu, both of whom are now tenured and contributing vigorously to research and teaching in both the School of Architecture and the PhD in Design Program.

Conducted research on the Catalano House in Raleigh, NC. Gave an invited lecture for the Symposium Celebrating Eduardo Catalano's Teaching and Practice on his 100th Birthday, sponsored jointly by the NC State College of Design and the AIA Triangle, Raleigh, NC, November 2017. https://www.youtube.com/edit?o=U&video_id=XOjtQZrs3dY

Spent 6 days visiting and photographing exemplary tall buildings in China. The images, observations, and data from these case studies support Dr. Place's tall building research, structures classes, and the studio on Designing Tall Buildings.

Mentoring of research faculty:

Jianxin Hu, tenured faculty member of the NC State University School of Architecture (Place was also Professor Hu's PhD Advisor).

Traci Rider, faculty member of the NC State University School of Architecture (Place was also Traci Rider's PhD Advisor).

Soolyeon Cho, tenured faculty member of the NC State University School of Architecture.

Students who have won research awards:

Jianxin Hu: Dissertation nominated for Nancy Pollack Award.

Daryl Carrington: Dissertation awarded the King Medal for Excellence in Design Research.

Traci Rose Rider: Dissertation awarded the King Medal for Excellence in Design Research.

James Grady: Dissertation awarded the King Medal for Excellence in Design Research.

Josh Stephens: First Place in the NCSU Student Research Symposium.

Tom Place: Now owns the world Record for the highest Luminous Efficacy light source ever created, more than 300 Lumens/Watt. Tom was never an officially enrolled student in any of my university classes, but I taught him quite a bit, including the middle school science project measuring the luminous efficacy of a high-efficiency fluorescent lamp. That science project was a learning experience that clearly made a lasting impression on Tom.

<http://www.cree.com/News-and-Events/Cree-News/Press-Releases/2014/March/300LPW-LED-barrier>

Eric Goldman, Mateo Rapallini, and Christoph Konradi: First Place in the NCSU Student Research Symposium.

Between May 1978 and January 1986, was a Principal Investigator at Lawrence Berkeley Laboratory of the University of California, specializing in analysis and experimentation directed at improving the energy efficiency of buildings. Directed a research group consisting of architects, physicists, engineers, computer programmers, and lab technicians involved in multidisciplinary research projects. Administrative responsibilities included defining scientific projects, obtaining grants and contracts, hiring and supervising project personnel, and advising the U.S. Department of Energy on matters related to building research. Defined projects, wrote proposals, and directed research on three dissertation projects for PhD students in Mechanical Engineering.

From 1966 to 1972, completed his PhD in experimental physics at the University of North Carolina at Chapel Hill, doing his dissertation research on energy-gap anisotropy and Tomasz effects in single-crystal, thin films of aluminum, under the supervision of Professor Earl Mitchell.

Teaching

Since 1986, has been on the Architecture Faculty of North Carolina State University, where he has taught:

- ARC 232—Introduction to Materials and Structures (taught the structures part of the course)
- ARC 302—Architectural Design: Technology (for junior students)
- ARC 331—Architectural Structures I
- ARC 332—Architectural Structures II
- ARC 405—Architectural Design: Technology (for graduate students)
- ARC 503—Advanced Architectural Design: Daylighting Design
- ARC 503—Advanced Architectural Design: Tall Building Design
- ARC 503—Advanced Architectural Design: Airport Design
- ARC 590—Special Topics: Tension and Compression Structures
- ARC 590—Special Topics: Design and Analysis of Luminous Environments
- DDN 795—Special Topics for PhD in Design Students
- DDN 890—Doctoral Preliminary Exam
- DDN 890—Doctoral Supervised Research
- DDN 899—Doctoral Dissertation Preparation

Teaching load over the last thirty years has been approximately 18 credit hours per year. This does not include DDN (PhD in Design) courses, which typically involve 9 to 12 credit hours per year when I have two PhD students in process. Teaching load is now at 21 credit hours per year.

Major collaborators/reviewers for ARC 503-Advance Architectural Studio—Tall-Building Design:

From the San Francisco Office of Skidmore Owings and Merrill:

Mark Sarkisian	Principal—Chief Structural Engineer of the SFO office of SOM, Author of the book: <i>Designing Tall Buildings—Structure as Architecture</i>
Leo Chow	Principal—Chief Architect with a focus on cultural sustainability, physical sustainability, and the role of cities in addressing human habitation on the planet
Michael Temple	Architect with a focus on cultural and urbanism issues associated with designing tall buildings
Michael Oerth	Architect with a focus on technical aspects of architecture as they tie into design
Olivier Brouard	Environmental Engineer with a focus on sustainability
Chris Horiuchi	Structural Engineer with a focus on tall buildings
Samantha	Structural Engineer with a focus on tall buildings
Andrew Krebs	Structural Engineer with a focus on tall buildings
Brian Griffith	Mechanical Engineer with a focus on sustainability

From the Chicago Office of Skidmore Owings and Merrill:

William Baker	Principal—Chief Structural Engineer of the Chicago office of SOM
James Pawlikowski	Architect and Engineer with a focus on concrete construction in tall buildings
Gabe Wong	Architect with a focus on tall buildings

This studio has garnered international recognition, including an invitation to Dr. Place to give a presentation on *Teaching Tall-Building Design* at the Super-Tall Building Industry International Summit, sponsored by the Chinese International Exchange Committee for Tall Buildings (CITAB) (the Chinese counterpart to the Council of Tall Buildings and Urban Habitats (CTBUH) in the United States), Chongqing, China, September 2017. This Summit was the coalescing of several established intellectual exchanges, including the 4th China-Japan-Korea Tall-Building Forum and the 4th Sino-US Tall Building Symposium. All presentations at the Summit were invited. https://youtu.be/LkaLti3_zb0

The presentation at CITAB was followed by a public lecture on the Tall-Building studio at the Architecture Department of Chongqing University.

Teaching

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Major collaborators/reviewers for ARC 503-Advance Architectural Studio—Airport Design:

From the Denver Office of Fentress Architects:

Curtis Fentress	CEO, Principal in Charge of Design, FAIA, RIBA
Joshua Stephens	Project Architect-Associate
Ana-Maria Drughi	Intern Architect
Zahra Mirian	Intern Architect
Tom Theobald	Principal and Director of International Business
Thom Walsh	Principal and Director of Airports
Scott Allen	Architect

From the Raleigh-Durham International Airport Authority:

Michael Landguth	President and Chief Executive Officer, Architect
William Sandifer	Senior Vice President and Chief Operating Officer
Robert D Teer Jr	RDU Airport Authority Board, Teer Associates

From O'Neal Engineers:

Mike T. Kelly	Architectural Discipline Leader
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This studio course has garnered international recognition, including being invited by the European Cultural Center to mount an exhibit of student work at the 2018 Venice Biennale.

Guest lectures in:

DDN 701—Design Research Methods

ARC 211—Site and Natural Systems

ARC 414—Environmental Controls

ARC 571—The Urban House

ARC 590—The History of the Skyscraper

8 hours of lectures for Percy Hooper's Geometry class

Lectures on Dorton Arena as part of South Quad

Led tours and gave presentation on Dorton Arena for ARC 441 and visiting lecturer

Students who have won design awards:

Zahra Mirian Hosseinabadi: First Prize Nationally (out of more than 400 entries) in the *AISC/ACSA Design Competition*.

Enzo Liao, Michael Wengenroth, and Jason Patterson: First Place (out of 122 international entries) in the *Fentress Global Challenge to design the Airport of the Future*.

Grant Wylie and Mahta Nazari: Third Place (out of 122 international entries) in the *Fentress Global Challenge to design the Airport of the Future*.

Shawna Hammon: Fourth Place (out 357 international entries) in the *Council on Tall Buildings and Urban Habitat (CTBUH) International Tall-Building Design Competition*.

Four short-listed entries in the *CTBUH International Tall-Building Design Competition* and the *Fentress Global Challenge to design the Airport of the Future*.

Josh Stephens: First Place in the NCSU Student Research Symposium.

Kelsey Morrison and Samuel Burner, winners of the AIA Triangle Award and associated Scholarship. Project selected for presentation at CriticalMASS for the South-Eastern Region of the US.

Supervised 54 independent studies or special topics for BEDA, Bachelor of Architecture, or Master of Architecture students.

Served as chair or member on advisory committees for 37 Master of Architecture Final Projects.

Provided teaching support to the Architecture Department as a floating advisor on structures, energy, and lighting for both undergraduate and graduate studio classes taught by other faculty.

Between 1972 and 1976, taught architectural structures, engineering mechanics, and physics at North Carolina State University.

Between 1966 and 1972, taught physics at the University of North Carolina at Chapel Hill.

**Instructional
and
Curricular
Development**

Played a critical role in the creation of the PhD in Design program for which he was the acting head for one year. During that year, he also served as Associate Dean for Graduate Studies in the College of Design. (Also served for two years as Director of Research, prior to the creation of the PhD program.)

Developed the structures course sequence for the School of Architecture.

Wrote the book *Architectural Structures*, which is a textbook focusing on how structural form evolves from the architectural design problem. As such, geometry is an important topic. In contrast to more traditional texts, this book places less emphasis on detailed calculations related to individual members (e.g., beams, columns, tension members) and more emphasis on the conceptualization process required to form intelligent assemblies of members. Understanding the interactions between members of the system is critical.

Under funding from an IDEA grant that has brought in \$100,000 to the School of Architecture, has converted ARC 331 and ARC 332 into online courses, with over 130 videos, hundreds of test and quiz questions, and roughly a hundred assignments.

Has made extensive use of experimental models, graphical analysis, and computer simulations as tools to explore and represent structural behavior. Materials and connection methods have been developed to represent as closely as possible the actual behavior of full-scale structures. Models have been constructed and testing devices created for demonstrating structural concepts. A particular emphasis has been placed on buckling of every imaginable sort, since this is a topic that the students find difficult to grasp, without first-hand observation of the failure modes that occur. The behavior of columns, frames, trusses, suspension elements, arches, vaults, and domes have been explored in model form.

Introduced computerized design, analysis, and visualization tools into the structures course sequence.

Has used computers to generate innovative graphic representations of structural processes and structural behavior.

Has used case studies of built structures to provide real-world substantiation of the principles being explored.

Developed various devices for teaching daylighting concepts, such as the Sun-Angle Simulator and Solar Heliadons, which have been used extensively in studio classes and the Luminous Environments seminar. (Some of this was done under a grant from the Shogren Foundation.)

Taught the first computerized design studios in the NCSU Department of Architecture.

Performed detailed case studies of buildings that are used as key teaching elements. These case studies have dealt with both structural issues and building energy performance.

Has generated highly interactive, self-paced videos for teaching structures using computer simulations.

Developed a video projection system to allow lecture discussion of small structural models that would normally not be visually accessible to a large class.

Taught the first studio class on tall buildings. Used video teleconferencing technology to facilitate studio reviews by key personnel at Skidmore Owings and Merrill. This studio is in its fifth offering. Students spend four days at SOM and a variety of architectural venues.

Taught the first studio class on airport design. Used remote technology to facilitate studio reviews by key personnel at Fentress Architects. This studio is in its fourth offering. Five of our students have been hired by Fentress Architects.

Spent five days in London photographing distinctive structures for incorporation into the structure courses.

Spent four days in Paris photographing distinctive structures for incorporation into the structures courses.

Funded by the Shogren Foundation to develop Sun-Angle Simulators and Heliadons for teaching principles of solar motion and impacts on building design.

Worked with Jianxin Hu on the development and validation of the Coefficient of Utilization Method, which facilitates rapid evaluation and evolution of daylighting designs, without the requirement of detailed computer simulations.

Design Practice

Dr. Place has been involved in design projects in several capacities, including project manager, project designer, structural designer and analyst, lighting designer and analyst, and energy consultant.

From 1974 to 1978, was a design consultant, in which capacity he produced: structural analyses, structural details, geometry studies, energy analyses, solar collector designs, shop drawings, graphic and model presentations, cost estimates, project proposals, and erection manuals for transportable structures. Many of the structural analyses were done on computers. These were some of the earliest computer-based simulations of a variety of spatially rich, long-span structures, such as space frames, geodesic domes, and hyperbolic paraboloids. In those days, computer simulations were programmed in Fortran fields that were input to the computer via thousands of punched computer cards. Simulating a complex structure might involve a 6ft to 8-ft long box, filled with many thousands of punch cards. He would wrap the box in duct tape and fly it to San Francisco or Saint Louis to run the simulation on a McDonald-Douglas mainframe computer. An extra plane seat would be purchased and the deck of cards would sit beside him, with the seat belt wrapped around it. Those computer simulations were a very stressful process. Every simulation cost between \$5000 and \$10,000 dollars (in mid-1970s dollars) and a single false input on any of those cards would fail the simulation. There were no graphic representations to help trouble shoot problems... just a single errant hole in a single punch card buried in a stack of thousands of punch cards. Figuring out when something went wrong in the simulation required pouring over a huge stack off numerical computer output, looking for numbers that seemed to be errant in that they deviated from numbers that could be generated from simpler, faster calculations that were inherently less accurate. Projects were executed for clients in Europe, South America, and Africa.

Since 1978, has been a consultant on a variety of design projects, with a focus on daylighting design, system integration, and computerized structural design and analysis. Was structural analyst on the Lucy Daniels Inman Office building, the Penland Iron Forge Building, the North Carolina Estuarium, the Shaw University Wellness Center and Basketball Arena (which is awaiting funding to be completed), the SAS Exhibition Pavilion, the Farm Bureau space-frame roof, and numerous other buildings and exhibit structures. Was both the architectural and structural designer on the Briscoe House on Harker's Island.

Has been the daylighting consultant on several buildings, including: The BodyShop Corporate Headquarters in Wake Forest, the Marbles Museum in Raleigh, the Montessori Center for South Raleigh, the Cleveland Elementary School in Johnson County, the Cape Fear Middle School in Fayetteville, the Wake County Human Services Building, the Johnson County Skills Training Center, the Chatham County Community College Library, a classroom building for the Chatham County Community College, Siemens Research and office building in Cary (LEED Gold Rating).

Has consulted extensively with Lysaght and Associates, Structural Engineers. Work focused on performing 3D computerized structural analysis and generating structural contract documents for buildings. Structural analysis on: the grand staircase in the Kenan-Flagler School of Law at the University of North Carolina, Christ United Methodist Church in Chapel Hill, the Wake East Library, the exhibit structures of the Marbles Museum, the trellis structure of the Marbles Museum, Park Devereux, Clancy-and-Theys Corporate Headquarters, and South Side Shopper.

Largest completed project to date is the daylighting, structural design, and systems integration for the Wildlife Resources Commission Headquarters and Exhibition Center on Centennial Campus of North Carolina State University. This work was done for Williard-Ferm Architects and the Structural Engineering firm of Lysaght and Associates. This project brought together design practice, extension, research, and teaching. The daylighting consulting fee on this project was used to provide operating funds and salary supplement for Jianxin Hu, a PhD student in design, who did a dissertation for which the research findings were immediately applied in the design of the Wildlife Resources Commission Headquarters Building. Building received LEED Gold Rating.

Extension

Dr. Place partnered with Tindall Corporation to develop precast concrete spanning elements that integrate structure with a supply air plenum for the occupied space above and return air plenum for the space below, as well as integrating HVAC components, electric power, and electronic networking. The patent for this invention has been submitted to the U.S. Patent Office. (see research)

Partnered with Synergetics, Inc. on the development of the Cornice Duct, VALRAy, IRADD, and shaded roof aperture system. (see research)

Spent three days working with a crew from UNC Television preparing a documentary on Dorton Arena. The video of that production can be accessed at:
<http://video.unctv.org/video/2365276737/>

Provided advice regarding energy efficient lighting, daylight harvesting and control, electric lighting control, and integration of roof aperture and PVs, to an IBM/NCSU-FREEDM smart building coalition.

Assisted Dr. Jianxin Hu in developing a website for Daylighting and Building Energy Research under College of Design, for showcasing research and teaching achievements and for generating outreach and extension opportunities.

Provided continuing education courses for architects, engineers, and builders with the NC State University Industrial Extension Service, USGBC green building seminars, the American Institute of Architects, and numerous architectural design offices.

Authored three books to help architects design buildings that are more energy-efficient, have superior illumination, and provide an enhanced sense of connection with nature. These books also serve for lay persons who are involved in setting design goals for buildings (e.g., school board members, administrators, people who have commissioned buildings, etc.).

Provided advice and experimental testing services for designers wishing to use natural light for interior illumination in their buildings.

Presented workshops for architectural designers and various decision-makers interested in understanding how natural lighting can be used to reduce energy operating costs and improve the quality of life in buildings.

Presented invited seminars on green architecture for the National Association of Industrial and Office Properties.

Gave invited lectures at the North Carolina School of Science and Mathematics.

Gave invited lectures at Saint Augustine College.

Presented lectures and workshops at Hunter Elementary School on: architectural design, structures, geometry, solar energy, natural illumination, energy conversion, and energy-efficiency. Led a team of students in the Odyssey of the Mind competition to build a super-efficient column.

Organized and taught a summer studio for 20 students who generated ideas for a Wake County experimental school to be located on Centennial Campus.

Worked with manufacturers of window blinds to develop products that enhance the illumination and solar performance of buildings.

Service

Has served on numerous School, College, and University committees, including:

- Was one of the two Co-chairs of the University Committee to Formulate an Energy Response to the American Recovery and Reinvestment Act. That committee produced five major pre-proposals submitted to the Office of the Governor of the State of North Carolina and to the NC State Energy Office. More extensive proposals were submitted to the US Department of Energy, the US Department of Labor, the National Science Foundation, and the US Department of Education. This was a highly multidisciplinary enterprise involving NCSU College of Design, NCSU College of Engineering, NCSU Industrial Assessment Center, Energy Management Program, Industrial Extension Service, NCSU College of Natural Resources, NCSU College of Agriculture and Life Science, North Carolina Cooperative Extension Service, NCSU College of Textiles, NCSU Solar Center, Advanced Energy Corporation, NCSU Office of Extension, Engagement, and Economic Development, Small Business and Technology Development Center, NCSU Facilities, NC Green Power, and the City of Raleigh.
- Undergraduate admissions for the College of Design.
- Admissions for the Bachelor of Architecture in Environmental Design.
- Admissions for the Bachelor of Architecture Program.
- Admissions to the PhD program.
- University Courses and Curriculum.
- College of Design Courses and Curriculum.
- School of Architecture Courses and Curriculum.
- PhD in Design Curriculum.
- Chancellor's Energy Council.
- Numerous search committees for the School of Architecture.
- Post Tenure Review for Architecture and for other faculty members in the College of Design, when departmental faculty of sufficiently high rank were not available within the Department of the faculty being reviewed.
- Reappointment, Promotion, and Tenure for the School of Architecture.
- Reappointment, Promotion, and Tenure for the College of Design.
- Served on the External Review Committee for reviewing and evaluating the proposed PhD in Architecture Program in the Department of Architecture at the University of Oregon. The program was well-conceived and laid out and has since been implemented and in operation for a few years.
- Member of the Committee for the 5-year review of the leadership of Robin Abrams, Head of the School of Architecture.
- Chair of the Committee for the 5-year review of the teaching, scholarship, outreach, and extension of Robin Abrams, Professor of Architecture.
- Technology Committee of the College of Design.
- Scholarship, Research, Extension, and Engagement Committee (SREE) of the College of Design.
- Architectural representative on the Zia Lecture Committee of the College of Engineering.

For several years, advised 50 undergraduates per semester in planning their schedules.

Served for one year as acting Director of Research, one year as acting director of the PhD in Design Program, and one year as acting Associate Dean for Graduate Studies.

Led a team of students in the design and construction of the 2800-ft² canopy for the 50th anniversary of the College of Design.

Leader for the College of Design on the Solar Decathlon proposal, which was a joint enterprise between the College of Design and the College of Engineering.

**Professional
Organizations**

Society of Building Science Educators
American Solar Energy Society
Building Technology Educators Society
American Institute of Architects Associate
Architectural Research Centers Consortium
American Institute of Steel Construction
American Society of Civil Engineers
Structural Engineering Institute
Prestressed/Precast Concrete Institute
Portland Cement Association
Illumination Engineering Society of North America
Building Enclosure Council
Council of Tall Buildings and Urban Habitat
North Carolina Daylighting Consortium

Publications: **Wayne Place**

PUBLISHED BOOKS

1. *Architectural Structures* (Wayne Place); textbook published John Wiley and Sons, Inc., ISBN # 978-0-471-72551-0, March 2007.
2. *Daylight Resource Data for Illuminating Building Interiors in North Carolina*, (Wayne Place, Shannon Howard, and Thomas C. Howard); book published by the North Carolina Alternative Energy Corporation, 1992.
3. *Daylighting Classroom Buildings*, (Wayne Place, Thomas C. Howard, and Shannon Howard); book published by the North Carolina Alternative Energy Corporation, 1991.
4. *Daylighting Multistory Office Buildings*, (Wayne Place and Thomas C. Howard); book published by the North Carolina Alternative Energy Corporation, 1990.

BOOKS IN PREPARATION

Natural Light in Architecture, a textbook addressing issues of building orientation, massing, glazing distribution, glazing functions, glazing controls, projection and distribution of illumination inside the building, effects of interior layout and furnishings, glare, human behavior and response in luminous environments, use of experimental models to simulate lighting behavior, use of computer simulations to predict lighting behavior, thermal impacts of lighting strategies, case studies of daylit buildings, and design guidelines for architects, lighting consultants, interior designers, space planners, and lighting engineers. This is being planned with Associate Professor Jianxin Hu, who Professor Place expects to take the lead.

PLANS AUTHORED FOR THE UNITED STATES DEPARTMENT OF ENERGY

1. *National Plan for Passive Solar Research and Development, 1978*
2. *Roadmap for the Commercialization of Passive Solar Systems, 1980*

PUBLISHED PAPERS and PRESENTATIONS

1. W. Place, *Eduardo Catalano: Pushing the Envelope of Structural Innovation*, invited lecture for the Symposium Celebrating Eduardo Catalano's Teaching and Practice on his 100th Birthday, sponsored jointly by the NC State College of Design and the AIA Triangle, Raleigh, NC, November 2017. <https://youtu.be/XOjtQZrs3dY>
2. W. Place, *Teaching Tall-Building Design to Architecture Students*, Super-Tall Building Industry International Summit, sponsored by the Chinese International Exchange Committee for Tall Buildings (CITAB) (the Chinese counterpart to the Council of Tall Buildings and Urban Habitats (CTBUH) in the United States), Chongqing, China, September 2017. (This Summit was the coalescing of several established intellectual exchanges, including the 4th China-Japan-Korea Tall-Building Forum and the 4th Sino-US Tall Building Symposium. All presentations at the Summit were invited.) https://youtu.be/LkaLtj3_zb0
3. W. Place, *Teaching Tall-Building Design*, invited lecture given at the Architecture School of Chongqing University, one of a series of three lectures, including lectures by Mark Sarkisian, Principal Engineer of Skidmore Owings and Merrill, and Leo Chow, Principal Architect of Skidmore Owings and Merrill, Chongqing, China, September 2017.
4. W. Place, J. Hu, *Innovative Daylighting Systems for Airports*, Aerial Futures: Grounded Visions, Shaping the Airport Terminal of Tomorrow, sponsored by Fentress Architects, hosted by the European Cultural Center, Organized by Plane-Site, Palazzo Michiel, Venice, Italy, October 2016. <https://youtu.be/bf97ikyZGNI>
5. L. Ghobad, A. Malekafzali, J. Hu, W. Place, *Comparison of Climate-based Daylighting in Two Integrated Simulation Tools: DIVA and OpenStudio*, Passive and Low-Energy Architecture (PLEA) Conference, Munich, Germany, October 2013.
6. L. Ghobad, W. Place, & S. Cho, *Design Optimization of Square Skylights in Office Buildings*, International Building Performance Simulation Association (IBPSA) BS 2013 Conference Proceedings. Aix Les Bain, France, September 2013. (Presentation in France made by W. Place.)
7. L. Ghobad, W. Place, & S. Cho, *Design Optimization of Daylight Roofing Systems: Roof Monitors with Glazing Facing in Two Opposite Directions*, International Building Performance Simulation

- Association (IBPSA) BS 2013 Conference Proceedings, Aix Les Bain, France, September 2013. (Presentation in France made by W. Place.)
8. J. Hu, W. Place, & C. Konradi, *Using Physical Experiment for Predicting Hourly Daylight Quantity in Architectural Spaces by Coefficient of Utilization Method*, American Solar Energy Society National Conference-Solar 2013, Baltimore, MD April 2013.
 9. L. Ghobad, W. Place, C. Konradi, & J. Hu, *Optimization of Roofing Systems for Daylighting*, Forum, American Solar Energy Society National Conference-Solar 2013, Baltimore, MD, April 2013.
 10. L. Ghobad, W. Place & J. Hu, *The Impact of Systems Integration on the Daylighting Performance of Skylights in Offices*, International Building Performance Simulation Association (IBPSA) BS 2012 Conference Proceedings, London, England, September 2012.
 11. J. Hu, W. Place, & C. Konradi, *Incorporating Sky Luminance Data Measured by EKO Scanner with a Scanning Sky Simulator for Predicting Daylight Quantity in Buildings*, American Solar Energy Society National Conference-Solar 2012, Proceedings of the World Renewable Energy Forum, Denver, CO, May 2012.
 12. L. Ghobad, W. Place & J. Hu, *The Impact of Roofing Configuration on the Daylighting Performance of Skylights in Offices*, American Solar Energy Society National Conference-Solar 2012, Proceedings of the World Renewable Energy Forum, Denver, CO, May 2012.
 13. J. Hu, W. Place, & C. Konradi, *Using Coefficient of Utilization as A Performance Indicator for Climate-Based Daylight Modeling by Physical Experiments*, American Solar Energy Society National Conference-Solar 2012, Proceedings of the World Renewable Energy Forum, Denver, CO, May 2012.
 14. L. Ghobad, W. Place, & L. Hu, *The Impact of Systems Integration on the Daylighting Performance of Skylights in Offices*. Conference Proceeding of SimBuild 2011, Madison, WI, USA, 2011.
 15. J. Hu, J. Du and W. Place, *The Performance Evaluation of an Advanced Daylighting System in Multi-story Office Buildings: Measurement and Simulation*, Passive and Low-Energy Architecture Conference, Louvain-la-Neuve, Belgium, July 2011.
 16. W. Place and J. Hu, *Shining Through – Integrating Structure and HVAC to Increase Ceiling Heights*, Modern Steel Construction, Magazine of the American Institute of Steel Construction, November 2011.
 17. J. Hu, J. Du and W. Place, *The Assessment of Advanced Daylighting Systems in Multi-Story Office Buildings Using a Dynamic Method*, World Renewable Energy Congress, Linköping, Sweden, May 2011.
 18. J. Hu and W. Place, *Using Sky Luminance Data to Classify Sky Conditions for Raleigh, North Carolina*, American Solar Energy Society National Conference-Solar 2011, Raleigh, NC, May 2011.
 19. J. Hu and W. Place, *Assessing Light Shelf and Optical Louver Systems in Multi-Story Office Buildings by Using Experimental Methods*, American Solar Energy Society National Conference-Solar 2011, Raleigh, NC, May 2011.
 20. W. Place and J. Hu, *Integrating Structure and HVAC to Facilitate Penetration of Natural Light into Multi-Story Buildings*, American Solar Energy Society National Conference-Solar 2011, Raleigh, NC, May 2011.
 21. *Integrating Structure and HVAC to Facilitate Penetration of Natural Light into Multi-Story Buildings*
 22. Wayne Place, (Wayne Place and Jianxin Hu); Annual Meeting of the Architectural Research Centers Consortium, August 2003.
 23. *The Design and Assessment of Advanced Daylighting Systems Integrated with Typical Interior Layouts in Multi-Story Office Buildings*, (Jianxin Hu and Wayne Place); Annual Meeting of the Architectural Research Centers Consortium, August 2003.
 24. *Computer Optimization of Innovative Steel Arena Structure Illuminated with Natural Light*, (Wayne Place, Ola Ferm, TC Howard, and Mark Williard); Seventh International Conference on Computer-Aided Optimum Design of Structures, Bologna, Italy, May 2001.
 25. *Roof Assemblies Optimized for Daylighting and Thermal Control*, (Wayne Place); Research Report for Scholarly Leave, December 1996.
 26. *Variable-Area, Light-Reflecting Assemblies (VALRAY)*, (Thomas C. Howard, Wayne Place, Brandt Andersson, J. Pascal Coutier); pp. 390-409 of *Proceedings II of the 1986 International Daylighting Conference*, a special edition of peer-reviewed articles published by ASHRAE in 1989.
 27. *Experimental Evaluation of Innovative Wall Daylighting Systems*, (Wayne Place, T. C. Howard, Susan Paulos, and Kwan-Young Chung); *Proceedings*, Conference on the Design of Buildings for Hot Climates, Texas A&M University, September 1988.

28. *The Impact of Glazing Orientation, Tilt, and Area on the Energy Performance of Roof Apertures*, (Wayne Place, J. Pascal Coutier, Marc Fontoynt, Ronald C. Kammerud, Brandt Andersson, Fred Bauman, William L. Carroll, Michael Wahlig, and Thomas L. Webster); *ASHRAE Transactions*, Vol. 93, Part 1A, New York, January 1987.
29. *The Experimentally Measured Performance of a Linear, Roof-Aperture, Daylighting System*, (Fred Bauman, Wayne Place, Brandt Andersson, Thomas C. Howard and John Thornton); *ASHRAE transactions*, Vol. 93, Part 1A, New York, January 1987.
30. *Daylighting in the Mount Airy Public Library*, (Mari Adegran, Brandt Andersson, and Wayne Place); *Passive Solar Journal*, Vol. 3, No. 4, pp. 349-386, 1986.
31. *Effects of Daylighting Options on the Energy Performance of Two Existing Passive Commercial Buildings*, (Brandt Andersson, Mari Adegran, Thomas L. Webster, Wayne Place, Ronald C. Kammerud, and Patrick Albrand); *Building and Environment*, Vol. 22, No. 1, pp. 3-12, 1987.
32. *Experimental Evaluation of Solar Thermosiphons with Heat Exchangers*, (Thomas L. Webster, J. Pascal Coutier, J. Wayne Place, and Mehdi Tavana); *Solar Energy Journal*, Vol. 38, No. 4, pp. 219-231, 1987.
33. *The Impact of Building Orientation on Residential Heating and Cooling*, (Brandt Andersson, Ronald C. Kammerud, Wayne Place, and Peter Scofield); *Energy and Buildings*, Vol. 8, No. 3, pp. 205-224, 1984.
34. *An Integrating Window Pyranometer for Beam Daylighting Measurements in Scale-Model Buildings*, (Fred Bauman, Wayne Place, John Thornton, and Thomas C. Howard) *ASHRAE Transactions*, Vol. 92, Part 1, San Francisco, January 1986.
35. *Thermal Comfort of Building Occupants: A Preliminary Impact Assessment of Passive Strategies*, (J. Pascal Coutier, Ronald C. Kammerud, and Wayne Place); *ASHRAE Transactions*, Vol. 91, Part 2B, Honolulu, June 1985.
36. *The Energy and Comfort Impacts of Using Variable-Transmission Glazings in Daylit Office Buildings*, (J. Pascal Coutier, Wayne Place, and Ronald C. Kammerud); Lawrence Berkeley Laboratory Report LBL-18521.
37. *Energy Effects of Electric Lighting Control Alternatives in Response to Daylighting*, (Brandt Andersson, Mari Adegran, Wayne Place, Thomas L. Webster, Ronald C. Kammerud, and Patrick Albrand); Lawrence Berkeley Laboratory Report LBL-18069.
38. *Advanced Window Materials: Impact on Heating and Cooling Energy Requirements*, (with J. Pascal Coutier, Ronald C. Kammerud, and Mark Quattrochi); Lawrence Berkeley Laboratory Report LBL-17605.
39. *Ventilation Cooling of Residential Buildings*, (Ronald C. Kammerud, Wayne Place, Brandt Andersson, Eduardo Ceballos, and Benay Curtis); *ASHRAE Transactions*, Vol. 90, Part 1B, pp. 226-252, Philadelphia, January 1984.
40. *Impact of Electric Lighting Efficiency on the Energy Saving Potential of Daylighting from Roof Monitors*, (Marc Fontoynt, Wayne Place, and Fred Bauman); Presented at the 1983 International Daylighting Conference, Phoenix, Arizona, February 1983; published in *Energy and Buildings*, Vol. 6, pp. 375-386, 1984.
41. *The Predicted Impact of Roof Aperture Design on the Energy Performance of Office Buildings*, (Wayne Place, Marc Fontoynt, Craig Connor, Ronald C. Kammerud, Brandt Andersson, Fred Bauman, William L. Carroll, Thomas C. Howard, Atila Mertol, and Thomas L. Webster); Presented at the First International Daylighting Conference, Phoenix, Arizona, February 1983; published in *Energy and Buildings*, Vol. 6, pp. 361-373, 1984.
42. *Thermal Effects Resulting from Occupant Behavior and Building Operation*, (Brandt Andersson, Mari Adegran, Wayne Place, Thomas L. Webster, and Ronald C. Kammerud); presented at the Passive and Hybrid Solar Energy Update Meeting, Washington, D.C., September 1983.
43. *Passive Cooling Technology Assessment: Synthesis Report*, (William L. Carroll, Thomas L. Webster, Atila Mertol, Brandt Andersson, Ronald C. Kammerud, Wayne Place, Marlo Martin, John Peterson, Carolyn Mangeng, Fred Roach, William I. Whiddon, G. Kimball Hart); Prepared for the U.S. Department of Energy; Lawrence Berkeley Laboratory Report LBL-15184, November, 1982.
44. *Commercial Building Daylighting*, (Wayne Place, Marc Fontoynt, Ronald C. Kammerud, Fred Bauman, Brandt Andersson, and Thomas C. Howard); in *Proceedings*, Seventh National Passive Solar Conference, Knoxville, Tennessee, pp. 453-458, August 1982.
45. *Detailed Loop Model (DLM) Analysis of Liquid Solar Thermosiphons with Heat Exchangers*, (Atila Mertol, Wayne Place, Thomas Webster, and Ralph Greif), *Solar Energy Journal*, Volume 27, Number 5, 1981.
46. *Incremental Cooling Load Determination for Passive Direct-Gain Systems*, (Paul Sullivan, Douglas Mahone, Winslow Fuller, Ronald C. Kammerud, Brandt Andersson, and Wayne Place); *Proceedings*, AS/ISES Annual Meeting, Philadelphia, May 1981.

47. *Thermosiphon Water Heaters with Heat Exchangers*, (Atila Mertol, Wayne Place, Thomas Webster, and Ralph Greif); *Proceedings*, AS/ISES Solar Jubilee, Phoenix, pp. 309-313, June 1980.
48. *Human Comfort and Auxiliary Control Considerations in Passive Solar Structures*, (Ronald C. Kammerud, Wayne Place, William L. Carroll, Benay Curtis, Brandt Andersson, Craig Christensen, and Mark Hannifan); in *Proceedings*, AS/ISES Solar Jubilee, 2-6 June 1980, Phoenix, AS/ISES, pp. 821-825; also in *Proceedings*, International Congress on Building Energy Management, Portugal, May 1980.
49. *Mean Monthly Performance of Passive Solar Water Heaters*, (Madjid Daneshyar, Wayne Place, and Ronald C. Kammerud); *Proceedings*, 4th National Passive Solar Conference, Kansas City, MO, AS/IES, pp. 601-604, October 1979.
50. *The Passive Solar Design Process for a Small Office/Laboratory Building*, (Brandt Andersson, Wayne Place, and Ronald C. Kammerud); in *Proceedings*, 4th National Passive Solar Conference, 3-5 October 1979, Kansas City, Mo., AS/ISES, pp. 144-147; also in *Proceedings*, Second International Conference on Energy Use Management, Kansas City, Mo., AS/ISES, pp. 1426-1433, October 1979.
51. *The Effect of Occupant Use Patterns on the Performance of Direct-Gain Passive Solar Systems*, (Ronald Kammerud and Wayne Place); *Proceedings*, Second International Conference on Energy Use Management, Los Angeles; Pergamon Press, pp. 1367-1374, October 1979.
52. *Thermal Mass: Its Role in Residential Construction*, (Benay Curtis, Brandt Andersson, Ronald C. Kammerud, Wayne Place, and Kevin Whitley); in *Proceedings*, Second International Conference on Energy Use Management, Los Angeles, Pergamon Press, pp. 1294-1301; Lawrence Berkeley Laboratory Report LBL-9290, October 1979.
53. *A Passive Solar Residential Prototype for Energy Modeling*, (William L. Carroll, Wayne Place, and Benay Curtis); Lawrence Berkeley Laboratory Report LBL-10783, June 1979.
54. *A Classification Scheme for the Common Passive and Hybrid Heating and Cooling Systems*, (Michael J. Holtz, Wayne Place, and Ronald C. Kammerud); *Proceedings*, Second National Passive Solar Conference, Philadelphia, March 1978.
55. *Interim Report: National Program Plan for Passive and Hybrid Solar Heating and Cooling*, (Wayne Place, Michael J. Holtz, and Ronald C. Kammerud); Prepared for the United States Department of Energy, Lawrence Berkeley Laboratory Report LBL-8606, September 1978.
56. *Energy-Gap Anisotropy and Thomash Effects in Oriented, Single-Crystal Thin Films of Aluminum*, Dissertation written for Ph.D. in Physics at the University of North Carolina at Chapel Hill, 1973.