

University of Maryland Reliability Engineering Program: Structure, Philosophy and Activities



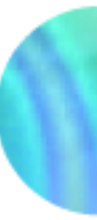
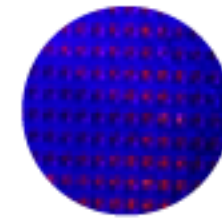
Mohammad Modarres

Director, Reliability Engineering Program
Department of Mechanical Engineering

**Presented at the RAMS-2015 Symposium
Palm Harbor, FL, 27 January 2015**

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Reliability Engineering Graduate Program



- Offering comprehensive education and research activities in risk, reliability, and safety of engineered systems and processes
- MS, PhD, and Graduate Certificate in Reliability Engineering (on campus and online access for off campus)
- Over 20 Graduate Courses in diverse areas of risk, reliability and safety
- 30 years of existence, 25 years of which as a formal degree offering discipline in Reliability

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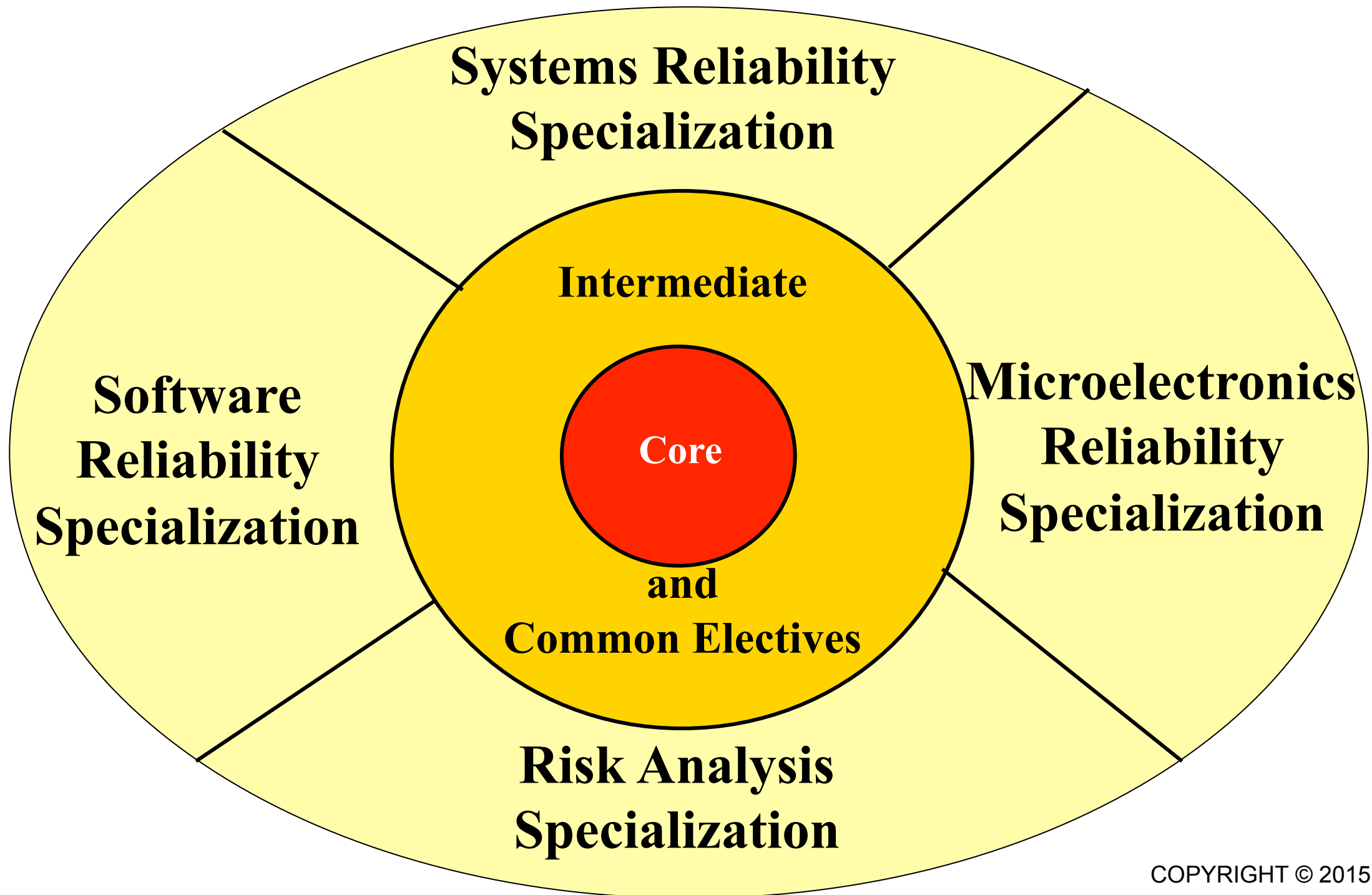
Research Areas

- Hybrid Systems Reliability (Systems of Hardware, Software and Human)
- Probabilistic Physics of Failure of Mechanical Systems
- Simulation-based Probabilistic Risk Assessment
- Bayesian Data Analysis and Predictive Models
- Uncertainty Characterization and Assessment
- Human Reliability and Socio-technical Systems Risk
- Software Reliability Microelectronics Reliability
- Prognostics and Health Monitoring of Complex Systems and Structures
- Healthcare Systems Risk Management and Medical Device Reliability
- Risk Based Design



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Reliability Engineering Curriculum Structure



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Major Courses Offered

CORE AND INTERMEDIATE COURSES

- Fundamentals of Failure Mechanisms
- Reliability Analysis
- Fundamentals of Reliability Engineering
- Mathematical Techniques of Reliability Engineering
- Probabilistic Physics of Failure and Accelerated Testing
- Advanced Methods in Reliability Modeling

Research Courses

- Independent Studies in Reliability Engineering
- Master Thesis
- Ph.D. Thesis

TECHNICAL ELECTIVES

- Collection and Analysis of Reliability Data
- Reliability Engineering Management
- Microelectronics Device Reliability
- Probabilistic Risk Assessment
- Risk Management for Engineers
- Software Reliability and Integrity
- Information Security
- Other Interdisciplinary elective tracks meet needs of engineering community (i.e. take electives in Systems Engineering, Project Management, etc.)

Close collaboration with the governmental and private organizations including over 400 alumni bring new ideas, contents and directions into the curriculum which is updated regularly.

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Faculty

Current Core Faculty (ME)

Professor Aris Christou
Associate Professor Michel Cukier
Associate Professor Enrique Droguett
Nicole Y. Kim Eminent Professor
Mohammad Modarres
Associate Professor Jeffrey Herrmann
Assistant Professor Monifa Vaughn-Cooke
Professor of the Practice Jeong H. Kim

Emeritus Professors

Professor Marvin Roush
Professor Vincent Brannigan (FPE)
Professor Ali Mosleh

Affiliate Faculty

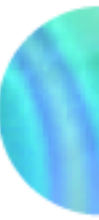
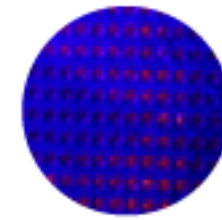
Professor Shapour Azarm (ME)
Professor Neil Goldsman (ECE)
Professor Bilal Ayyub (CEE)
Professor Gregory Beacher (CEE)
Professor Peter Sandborn (ME)
Associate Professor Linda Schmidt (ME)
Professor Peter Sandborn (ME)
Professor Carol Smidts (ME, OSU)
Professor Joseph Bernstein (ECE, Israel)

Adjunct Faculty and Lecturers

Dr. Nathan Siu (NRC)
Dr. Norman Eisenberg (Independent Consultant)
Dr. Mark Kaminiskiy (CRR-CEE)
Dr. Roy Schuyler (Independent Consultant)
Dr. Vasiliy Krivtsov (Ford Motor)
Dr. Michael Stamatelatos (independent Consultant)

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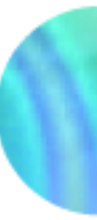
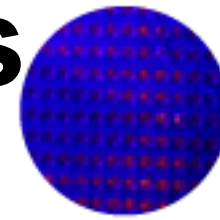
Center for Risk and Reliability (CRR)



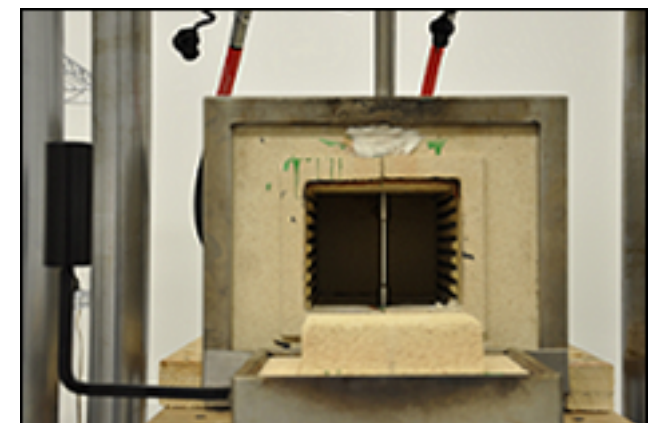
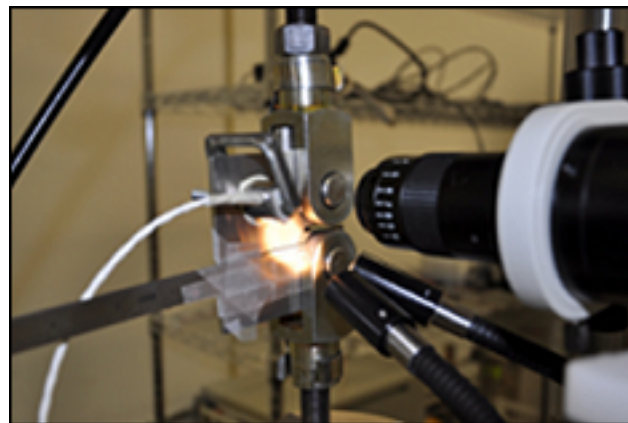
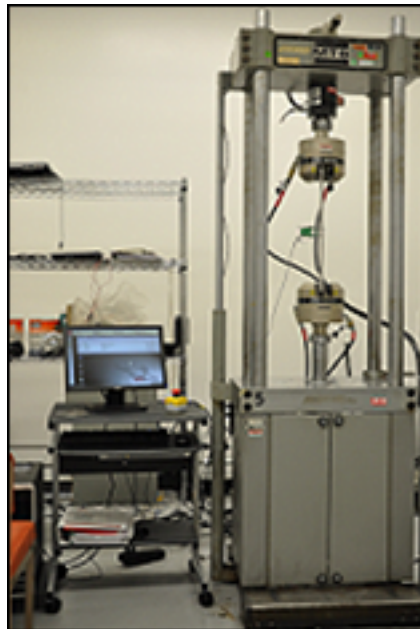
- Formed in 1985 as the umbrella organization for risk and reliability research at the A.J. Clark School of Engineering.
- Covers research involving systems and processes with applications to space missions, military and civil aviation, nuclear energy, petroleum facilities, medical devices, information systems, and civil infrastructures.
- Research arm of the Reliability Engineering educational program-- largest and most comprehensive degree granting graduate program in reliability engineering.



CRR Research Laboratories

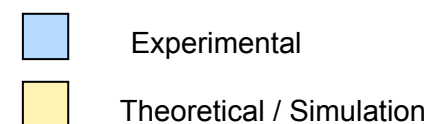
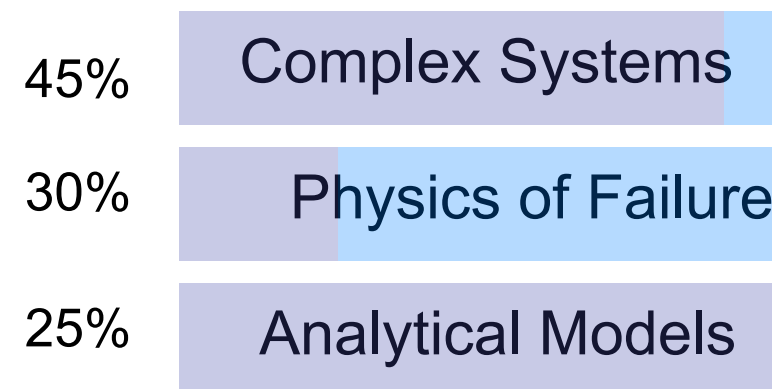
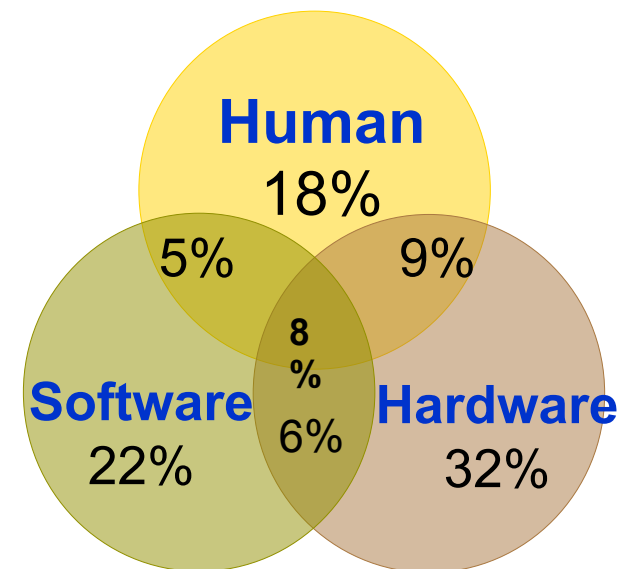


- Cyber security Assessment
- Design Decision Support
- Hybrid Systems Integration and Simulation
- Probabilistic Physics of Failure and Fracture Mech
- UMD Radiation Facilities: High-Energy Linear Accelerator



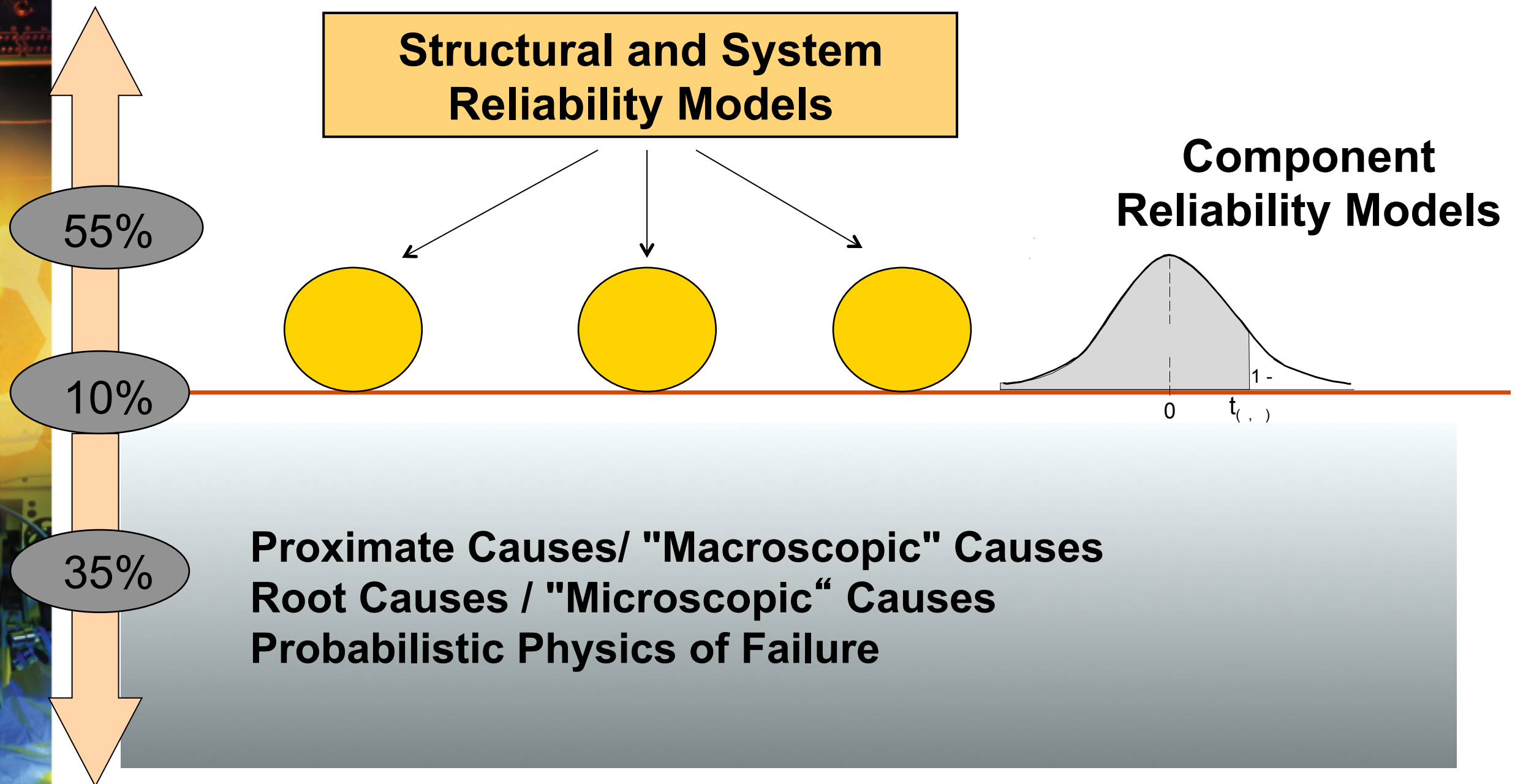
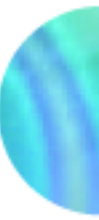
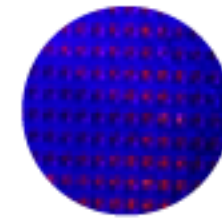
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CRR Research Focus: Reduction of Failures

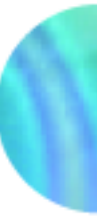
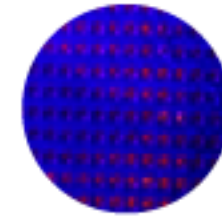


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Distribution of Research Efforts



CRR Research Partnerships



- **Recent Past and Present *Cooperative Research Agreements* with government agencies:**

- US NRC
- ONR
- NAVAIR
- NASA
- USDA
- EC Halden Research Center, Norway
- EEC Joint Research Center, Italy
- Norwegian Institute of Technology
- Monash University
- Paul Scherrer Research Institute, Switzerland

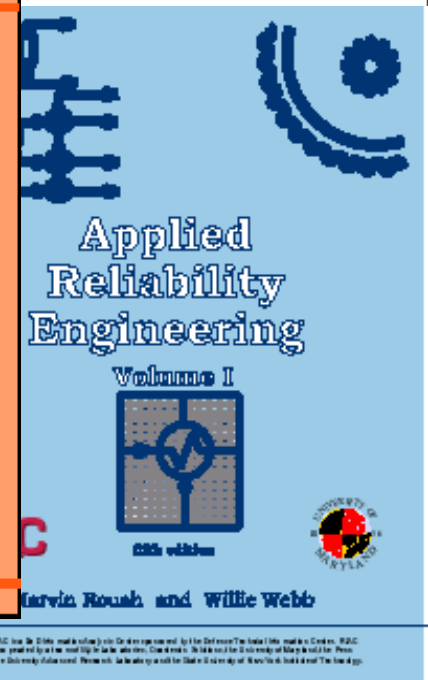
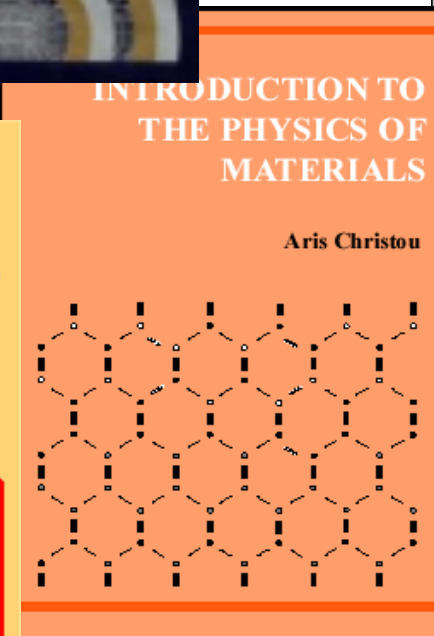
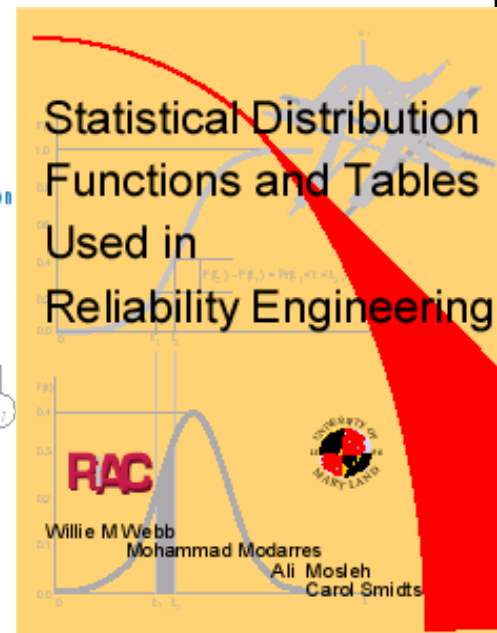
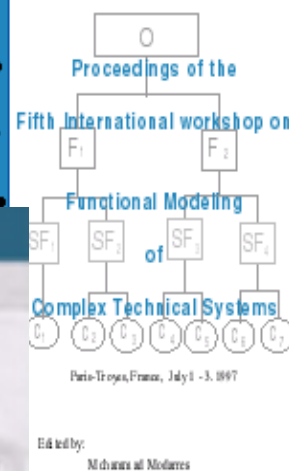
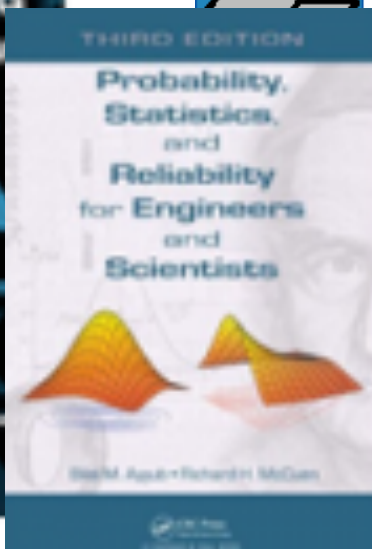
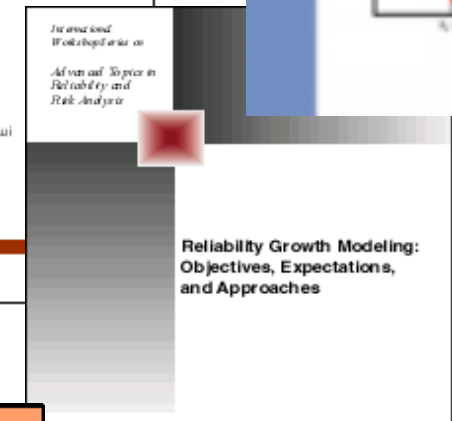
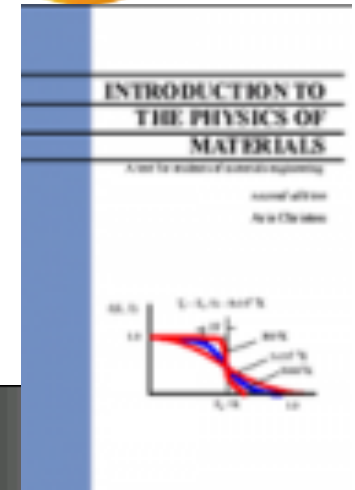
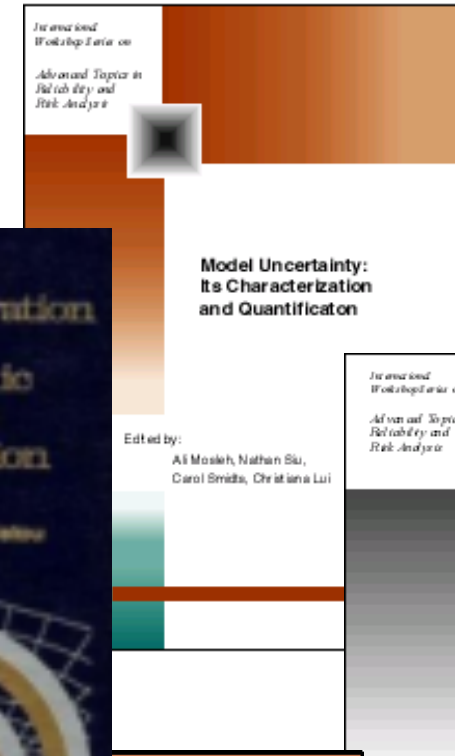
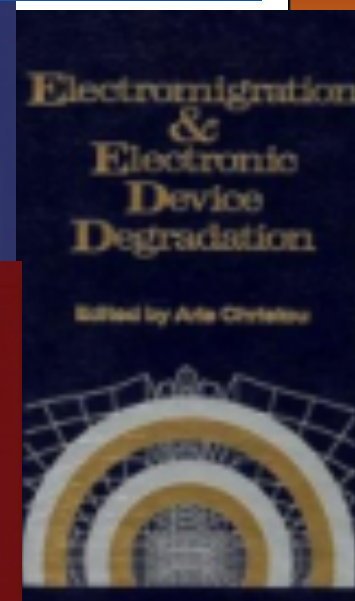
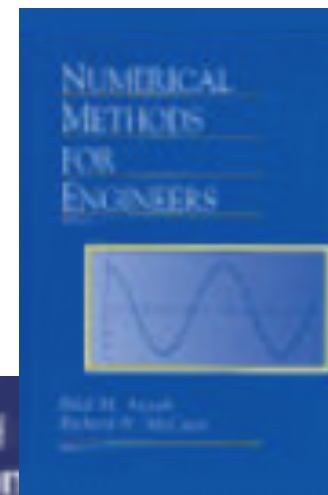
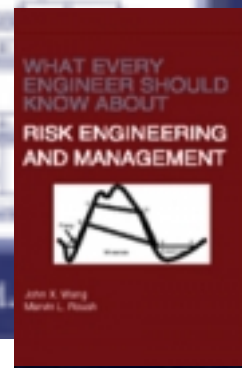
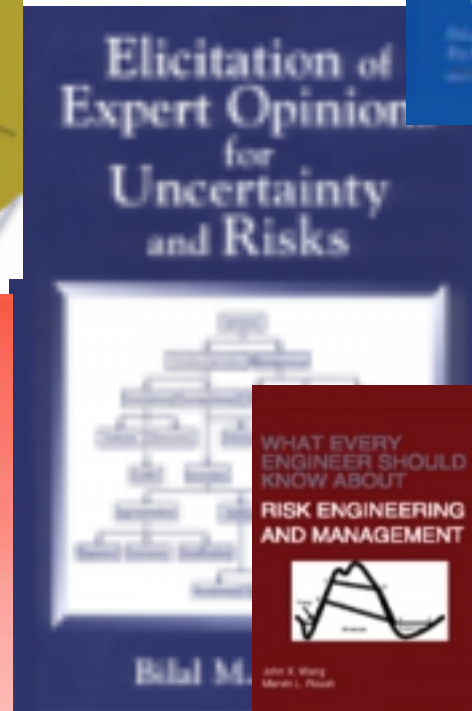
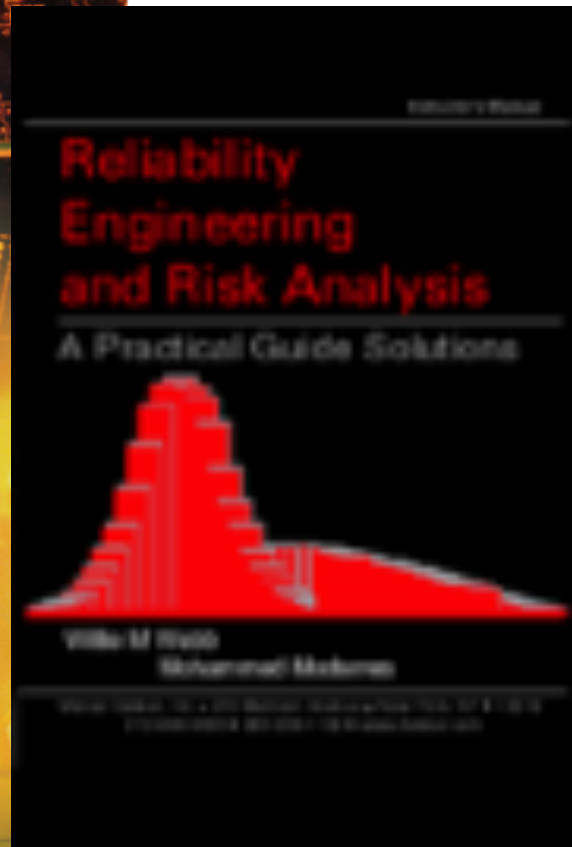
- **Partnership with industry:**

- Mantech
- Wyle Labs (DoD's DTIC)
- ARES Corporation
- Corning Corp.



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Samples of Publications



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25TH ANNIVERSARY SYMPOSIUM

*Promise of a Discipline: Reliability
and Risk in Theory and Practice*

AGENDA

WEDNESDAY, APRIL 2, 2014

University of Maryland Reliability Engineering
Symposium

*Promise of a Discipline: Reliability
and Risk in Theory and Practice*

8:30 a.m. – 5:00 p.m.

Samuel Riggs IV Alumni Center
University of Maryland

University of Maryland Reliability Engineering
25th Anniversary Reception and Alumni Reunion
5:00 – 7:00 p.m.

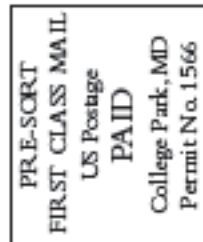
Samuel Riggs IV Alumni Center
University of Maryland

TWENTY FIVE YEARS AGO, Maryland established the first degree-granting reliability engineering education program in the country and today it is one of the largest and most comprehensive graduate programs in the field of reliability and risk analysis of engineered systems and processes. The program offers MS, PhD, and Graduate Certificates in Reliability Engineering and Risk Analysis. All courses are available through traditional on-campus and online delivery modes.



The Center for
Risk and Reliability

www.crr.umd.edu



THE A. JAMES CLARK SCHOOL of ENGINEERING

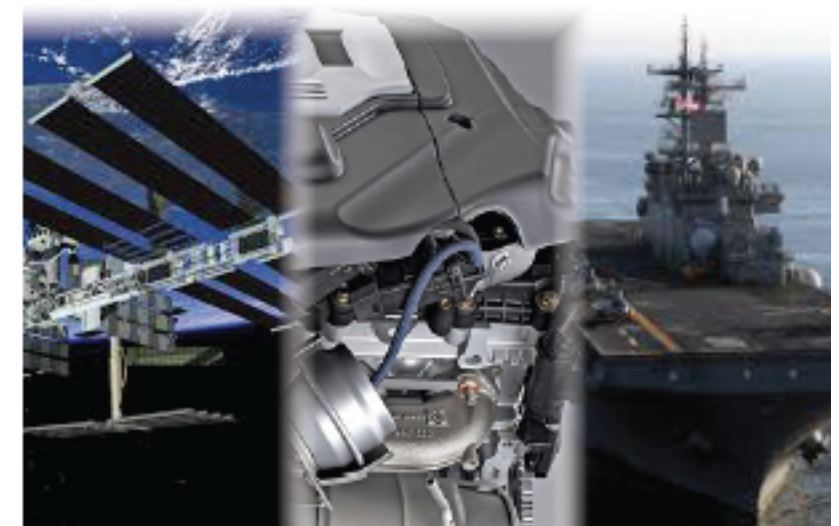


RELIABILITY
ENGINEERING

1989-2014

*Promise of a Discipline: Reliability
and Risk in Theory and Practice*

25TH ANNIVERSARY SYMPOSIUM



APRIL 2, 2014

Samuel Riggs IV Alumni Center
University of Maryland
College Park, Maryland



The Center for
Risk and Reliability

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UNIVERSITY OF MARYLAND

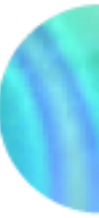
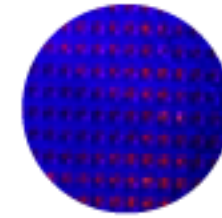


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Thank you



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