iNEER/ICEE-ISC Nomination
May 26, 2003

Nominator: Mohamad Al-Sheikhley, Professor and Director,
University Radiation Facilities
University of Maryland,
Department of Materials Science and Engineering
College Park, MD 20742
mohamad@umd.edu
Phone Number: 301-405-5207

Nominee: Aristos Christou, Professor
Materials Science and Mechanical Engineering,
University of Maryland,
College Park, MD 20742
Christou@umd.edu
Phone Number: 301-405-5208, 571-276-6413

Category of Award: Leadership and/or Achievement

Summary of Accomplishments

Since 1981 Professor Christou has made significant contributions and achievements to Engineering Education and Research at the international level. His contributions have had a significant impact on materials science education in Europe and especially Greece. Professor Christou was awarded in 1985, the Fullbright Fellowship, which he utilized to establish molecular beam epitaxy research programs in Greece. In 1989, he established laboratories in microelectronics devices which to this date continue to contribute to EEC research programs. Between 1988-1993, Professor Christou made significant contributions to a number of ESPRIT and RACE EEC programs which were instrumental in bringing compound semiconductor technology capability to Greece. In 1986-1988 he established reliability programs in both Italy and Greece. These programs were established under the auspice of the NATO Scientific Affairs Committee for Southern European Stability, a committee in which he was a member in 1986-1987. In 1981, he was awarded the UNESCO Scientific Affairs Service Commendation for his work in training international scientists in applying electron microprobe techniques to geological exploration. He utilized these techniques in order to introduce electron microprobe analysis to geological research and exploration in Greece. He has served on advisory committees both for the University of Crete and the Research Center of Crete, as well as for the Hellenic Research Center, "Democritos." Professor Christou has been and is a frequent lecturer at the University of Cardiff, Wales, as well, and has established collaborative research programs with Cardiff since 1987.

Major Achievements

- Contributions to UNESCO Scientific Affairs Program (1981-1984). As a researcher at the Naval Research Laboratory, Prof Christou established an electron microprobe analytical facility at the Hellenic Geological Research Center, "IGME", and trained Greek and other visiting scientists in the theory and utilization of the electron beam microprobe. Through these three years of collaboration, Professor Christou contributed to five geological analysis projects, and his lecture notes were utilized for the

training of other engineers and scientists even to the present. To date, this laboratory continues to contribute to geological exploration throughout the region.

- Leadership and Achievements in European Research Projects (1987-present). Professor Christou made significant contributions to a number of ESPRIT and RACE EEC programs in the area of microwave device technology and optical interconnects. These projects introduced Greece to EEC applied research and were also instrumental in bringing compound semiconductor technology capability to Greece. In addition, his leadership in these projects led to the establishment of international conferences which further increased the interaction of Greek engineers with their counterparts in Europe and the United States. He organized and was the Conference Chairman of the 1987 International GaAs Symposium as well as a number of other NATO Advanced Study Institutes in Greece. In 1987-1989 he established reliability programs in both Italy and Greece. These programs were established under the auspice of the NATO Scientific Affairs Committee for Southern European Stability, a committee in which he was a member in 1986-1987. In 1987, he was awarded the University of Bologna Millenium Medal celebrating scholarly contributions during the 1000 year anniversary of the University. From 1980-1990, Professor Christou received five different awards for Outstanding Performance from the U.S. Government crediting him with inventions in mixer detector diodes, thin film interconnects and for the development of reliable solid state phased array radar devices, thus recognizing his expertise in the areas of collaboration with his European colleagues. He has served on advisory committees both for the University of Crete and the Research Center of Crete, as well as for the Hellenic Research Center, "Democritos." Professor Christou has been a frequent lecturer at the University of Cardiff, Wales, as well, and has established collaborative research programs with Cardiff from 1987-1995.

- Establishment of Microelectronics Courses and Solid State Device Courses at Greek Universities (1988-present). Professor Christou established a course sequence for microelectronics which allowed students to understand device physics and also to process microelectronic components. Professor Christou accomplished this at the University of Crete, which led to a "concentration" in microelectronics under the Physics degree program. Between 1988 and the present, three different clean room facilities have been built both for teaching and research. Professor Christou also introduced the first graduate curriculum in microelectronics at the University of Crete. This program and associated clean room facilities have been used to train graduate students from the US, France, Poland, Russia, China and Germany hence producing a truly international graduate educational program and facility.

- As a leader in Engineering Education, he has chaired the Education Committee of the Federation of Materials Societies since 2003, and he has recently (2004) organized a conference which has examined the need for international collaboration in Engineering Education. The conference was entitled: "Materials Education for the 21st Century Workforce". Hence he continues to be dedicated to enhancing the community's opportunities for international collaboration in engineering education and research.

Professor Christou's work has been recognized by his peers. He is a fellow of IEEE and a Trustee of the Federation of Materials Societies as well as the president elect of the Federation of Materials Societies. He has received four separate publication awards from the US Government for his research at the Naval Research Laboratory, as well as the University of Bolognia Millenium Medal. Professor Christou has dedicated his entire career to innovative international engineering education and research collaborations and hence is very deserving of this award.

Suggested Citation: For leadership and achievements in international education and research in engineering.

Professor Christou will be able to attend the International Conference in Olomouc June 27-30, 2004 in order to receive the award.

Supporting Letters

Professor Agisilios Iliadis, Professor of Electrical and Computer Engineering, University of Maryland, USA.

Professor and Head of the College of Engineering, **David Vernon Morgan**, University of Cardiff, Wales, UK.

Dear Sir/Madam;

It is with great honor to write this letter of support for the nomination of Professor Aris Christou, for the 2004 iNEER Leadership Award.

Since 1985 Professor Christou has made significant contributions to Engineering education and research at the international level. His contributions have had a significant impact on materials science education in Europe and especially Greece. Professor Christou was awarded in 1985, the Fullbright Fellowship, which he utilized to establish molecular beam epitaxy research programs in Greece. In 1989, he established laboratories in microelectronics devices which to this date continue to contribute to EEC research programs. Between 1988-1993, Professor Christou made significant contributions to a number of ESPRIT and RACE EEC programs which were instrumental in bringing compound semiconductor technology capability to Greece. In 1986-1988 he established reliability programs in both Italy and Greece. These programs were established under the auspice of the NATO Scientific Affairs Committee for Southern European Stability, a committee in which he was a member in 1986-1987. In 1981, he was awarded the UNESCO Scientific Affairs Service Commendation for his work in training international scientists in applying electron microprobe techniques to geological exploration. In 1987, he was awarded the University of Bologna Millenium Medal celebrating scholarly contributions during the 1000 year anniversary of the University. From 1978-1990, Professor Christou received five different awards for Outstanding Performance from the U.S. Government crediting him with inventions in mixer detector diodes, thin film interconnects and for the development of reliable solid state phased array radar devices.

Professor Aris Christou was the Chairman of the University of Maryland, Materials and Nuclear Engineering Department (until July 2003), and is presently the Director of the NSF Center on Optoelectronic Components, Devices and Packaging, and professor of Materials Science and Engineering at the University of Maryland. Prof. Christou received his Ph.D. in Materials Science from the University of Pennsylvania in 1971. He conducts research in compound semiconductor materials and process science, optoelectronic materials and devices, manufacturing science, and reliability. Dr. Christou was previously a Professor of Electronic Materials at Rutgers University, Professor of Physics at the University of Crete and he presently conducts research in compound semiconductor materials and process science, optoelectronic materials and devices, manufacturing science, and reliability. He has authored two books and has been the editor of three others. Dr. Christou has more than 150 publications in archival journals and 14 patents (including two pending), and has organized international conferences in GaAs devices, materials and reliability. Dr. Christou is a Fellow of the IEEE, a Fullbright Fellow, a recipient of the DoD-Berman Publication Awards, and an IEEE Guest Lecturer. As a University Professor, Dr. Christou has chaired the Department of Materials Science and Engineering, which includes graduate programs in Reliability Engineering and Radiation Science. As an educator in Materials Engineering, he has established a new undergraduate degree program, which spans electronic materials science and organic materials, and has led the expansion of the department which now conducts more than 8 million dollars of research per year.

Professor Christou's technical contributions encompass the development of materials surface and interface science and methodologies for achieving reliable high frequency devices, optoelectronic devices and circuits. Professor Christou's contributions established the critical relationships which exist between materials, materials surfaces and interfaces, process science, and reliability. His work has led to: reliable metallization gates, and hence to a reliable interconnect technology for compound semiconductor devices. His developed "Failure Physics" approach to the design and manufacture of compound semiconductor devices and circuits has been critical in achieving low cost-high yield commercial products. The achievement of a radiation –hard GaAs technology and enhanced package reliability as well as the establishment of the relationships between yield and reliability are directly attributed to his technical leadership. These contributions have ensured the availability of the industrial base for dual use products. Professor Christou's contributions and technical leadership has paved the way for such products as satellite receive-transmit circuits, GPS systems and cellular communication.

In conclusion, I enthusiastically support Professor Christou's nomination for iNEER Leadership Ward.

Sincerely,

Dr. Mohamad Al-Sheikhly
Associate Professor
Director, Radiation Facilities
Department of Materials Science and Engineering
University of Maryland at College Park
Tel: (301) 405-5214
E-mail: mohamad@eng.umd.edu

Dear Sir/Madam 3/18/04

It is my distinct pleasure to write this letter of support for the nomination of Dr. Aris Christou, for the 2004 iNEER Leadership Award. Dr. Christou is a Professor of Materials and Nuclear Engineering at the University of Maryland College Park, and I consider him one of the topmost leading professional engineers and educators in electron device technology and reliability, with outstanding contributions in the development of novel devices such as silicon microwave power transistors, microwave and millimeter wave Impatt devices, thin film metallization systems for GaAs integrated circuits, ohmic contacts, silicon high frequency detectors, radiation hard GaAs MMICs, and others. Being an electron device engineer professional myself, I have noted since the mid-eighties Professor Christou's research and contributions to the electrical and electronics engineering community, and I believe his work helped advance the state of the art of current microelectronic devices and systems today.

Prof. Christou's research has singularly contributed to advancing field effect transistor and heterojunction device electronic and opto-electronic technologies, contributed to the educational effort globally by publishing four highly regarded books on the Reliability of GaAs Monolithic ICs, the Reliability of High Temperature Electronics, Photonic Materials, Devices, and Reliability and the Introduction to the Physics of Materials.

Dr. Christou is one of the few who has shown leadership in research and education on international level. He has promoted education and research in the European Common Market by developing the Molecular Beam Epitaxial growth and Clean Room Facility at the University of Crete, Greece during his two years of Sabbatical leave from NRL. This developed now into a robust and highly productive research and education center in Greece.

As the chair of the Materials and Nuclear Engineering Department, Prof. Christou had the unique initiative to develop a modern curriculum oriented towards the new and emerging electronic technologies that helped graduate and undergraduate students better understand, and be directly involved with electron device technology. Furthermore, he has mentored, trained, and supervised numerous graduate students through their masters and doctorate studies.

Prof. Christou is involved with several professional societies such as the IEEE where he is an IEEE Fellow. He is active in editing scientific peer review journals; chairing technical and scientific conferences; advising science funding agencies; serving on IEEE EDS Technical, Educational, and Professional Activity Boards and Committees; and is a Distinguished Lecturer for the IEEE.

In conclusion, I enthusiastically support Prof. Christou’s nomination for the iNEER Leadership Award this year.

Sincerely Yours

Dr. Agis Iliadis, Professor
Electrical and Computer Eng. Dept.
University of Maryland, College Park MD 20742
Tel: 301-405-3651
Email:agis@eng.umd.edu

ARISTOS CHRISTOU
University of Maryland, College Park, MD 20742

EDUCATION

B.A. Physics, 1967	Columbia University, New York, NY
Ph.D. Materials Science, 1971	University of Pennsylvania, Philadelphia, PA

PRESENT POSITION

April 2004 — *Professor* of Materials Science and Engineering.
Professor of Mechanical Engineering and Reliability Engineering.

July 1, 1993 to July 1, 2003 — *Professor and Chairman*, Department of Materials and Nuclear Engineering, University of Maryland at College Park.

Professor of Materials Science, *Professor of Mechanical Engineering, Professor of Reliability Engineering.*

Headed a Department with Academic and Research programs in Materials Engineering, Reliability and Radiation Sciences since1993.

Director: Space Lidar Materials Technology Center.

Heads a University-NASA Joint Center of LIDAR technology research since 1997-2003.

PREVIOUS POSITIONS

1990-1993 *Professor*, Department of Mechanical Engineering, University of Maryland, and Associate Director, CALCE Electronic Packaging Research Center.

1989-1990 *Professor*, Department of Electrical and Computer Engineering, Rutgers University.

1985-1989 *Branch Head*, Surface Physics Branch Electronics Science and Technology Division, Naval Research Laboratory, Washington DC.

1985-1987 *Professor*, University of Crete and Research Center of Crete Greece and Director of Microelectronics Research Group at the Institute for the Electronic Structure and Lasers (FORTH), during sabbatical year and as Fulbright Scholar.

1976-1985 *Section Head*, Advanced Semiconductor Technology and Reliability Section, Electronics Science and Technology Division, Naval Research Laboratory.

1972-1976 *Researcher* in Materials Science Branch Electronics Technology Division, Naval Research Laboratory.

PROFESSIONAL BACKGROUND

1990-2004 *Professor and Chairman(1993-2003),* carrying out novel research programs in the mechanics and physics of microelectronic and optoelectronic packaging. His research included the reliability of electronic packaging materials, the reliability physics of compound semiconductor devices as well as process-performance-reliability correlations. Dr. Christou made advances in high frequency devices, photonics materials and optical interconnects and biomolecular devices, materials, surfaces and interfaces. *Dr. Christou headed a department with undergraduate programs in Materials Science, and in Nuclear Engineering, and graduate degree programs in Materials Science and Engineering, Reliability Engineering and Nuclear Engineering.*

1990-9/90 Dr. Christou became *Director* of the Rutgers University Microelectronics Research Laboratory which was established as a collaborative University-Industry Research Center through the support of ATT.

1985-1990 *Head, Surface Physics Branch*, Naval Research Laboratory. Dr. Christou directed research in the area of semiconductor surfaces and interfaces, thin films and microelectronic device fabrication science. Directed programs in the area of Molecular Beam Epitaxy of compound semiconductors, and Reliability Physics of devices and packages.

1985-1987 *Professor* of Materials Physics and Visiting Member of the Institute of Electronics and Lasers, University of Crete and Research Center of Crete, Heraklion, Greece. Dr. Christou established EEC funded programs in microelectronics and founded the Microelectronics Research Group (MRG) of FORTH.

1976-1985 *Section Head*, Reliability Physics Section, Naval Research Laboratory. Established the Navy's research program in reliability science. Initiated novel programs in the area of compound semiconductor devices and physics, as well as silicon power electronics.

1972-1976 *Research Materials Scientist*, Electronics Technology Division Naval Research Laboratory. Initiated the Navy's Physics of Failure Physics approach to reliability and to novel device design.

1967-1972 *Graduate Researcher*, University of Pennsylvania, Laboratory for the Research on the Structure of Matter.

PROFESSIONAL ACTIVITIES

SOCIETY MEMBERSHIP

Institute of Electrical and Electronic Engineers (Fellow)
American Physical Society
Materials Research Society
The Minerals, Metals and Materials Society
Society of Photonic and Instrumentation Engineers (SPIE)
Member since 1993 of the *University Materials Council. The UMC is the national council of materials department chairmen.*
Member since 1993 of *NEDHO*
(The Nuclear Engineering Department Heads Organization)
Member of Board of Trustees of Federation of Materials Societies, 2000.
Vice President 2003, *Federation of Materials Societies*.

EDITORIAL BOARDS

2000-Present, Editor IEEE Transactions on Device and Materials Reliability.
1998-Present, Associate Editor IEEE Trans on Electron Devices
1998-Present, Editor, Reliability and Quality International, John Wiley Publisher
1990-Present, Editorial Board Member and Technical Committee Member of GaAs Applications Conference,
1988-1995, Academic Press, Journal of Superlattices and Microstructures, Member of the Board
1987-1988, Institute of Physics-Solid State Series (UK)
1987-1989, Kluwer Publishing Company, NATO ASI Series
1978-1981, IEEE Transactions on Parts, Hybrids and Packaging, Member of Editorial Board
1976-1978, IITRI Series on Scanning Electron Microscopy

CONFERENCE CHAIRMAN

Chair of MRS Symposium on Molecular and Nanomolecular Electronics, April 2001.

June 1995, NATO Advanced Study Institute, Rapid Thermal Processing.

December 1995, Co-Chair of MRS Symposium on the Mechanics of Nanocrystalline Materials

July 1991, Reliability of GaAs Monolithic Microwave Integrated Circuits Workshop

August 1990, Fifth International Conference on Superlattices, Microstructures and Electro-optical Devices

June 1989, 1989 NATO Advanced Study Institute on "Semiconductor Device Reliability".

September 1987, 14th International GaAs and Related Compounds Symposium.

1982-1985, IEEE Integrated Circuits "Compound Semiconductor Reliability Workshop".

TECHNICAL PROGRAM COMMITTEES

July 2002	NATO ASI Advanced Study Institute, Nanomaterials, Crete
May 2000	EXMATEC 2000 Symposium on Materials and Electronic Process Science
Dec. 1995	MRS 95 Symposium on the Mechanics of Nanocrystalline Materials
Oct. 1994	ESREF 94 European Symposium on Reliability
Oct 1995,	ESREF 95 European Symposium on Reliability
Oct 1997	ESREF 97 European Symposium on Reliability
April 1992	IRPS 92, International Reliability Physics Symposium
April 1993	IRPS 93, International Reliability Physics Symposium
June 1992	SAMPE Society for the Advancement of Materials, and Processes Engineering.
April 1992	IRPS 92, International Reliability Physics Symposium
Oct. 1991	ESREF 91 Syposium on Reliability and Failure Analysis (France).
Aug. 1990	International Conference on the Physics of Semiconductors (Greece).
April 1990	International Conference on GaAs Applications 1990 (Italy).
May 1990	IEEE MTT Symposium, Panel on Microwave Circuit Reliability.
1988, 1989	IEEE GaAs I.C. Manufacturing Technology Symposium
1988, 1989	International Symposium on GaAs and Related Compounds (Japan).
1990	EEC Symposium on Device and Circuit Reliability (Italy) (ESREF '90).
1986	EEC Conference on Metastable Phases (Netherlands).
1985	NATO ASW on Solid State Reliability (Denmark).
1982-1985	IEEE International Reliability Physics Symposium Committee Member (U.S.).
1981	IEDM International Electron Device Meeting, Committee Member.

TECHNICAL ADVISORY COMMITTEES

2000,2002	Member of Review Panel for NERI program
1991-2000	Member of a number of NSF Review Panels.
1997-98	Naval Studies Board, Head of Subcommittee on Materials for the Navy of the 21st Century.
1994-95	National Research Council Advisory Committee on Materials for Microwave Devices.
1994	National Research Council Committee on High Temperature Electronics.
1992-94	Chairman IRPS Committee on Compound Semiconductors.
1988-94	Member of the Advisory Committee of GaAs and Related Compounds Symposium.
1992-94	Member of National Science and Technology Council (NSTC) Working Group on Electronic Materials
1987-88	Member, NATO Scientific Affairs Committee.
1979-1981	Member of the UNESCO Science Committee and UNESCO Scientific Advisory
1988-1990	Member of DARPA Advisory Committee on GaAs Reliability/Radiation Effects
1988	Member of the National Academy of Sciences Committee on Interconnects and Electronic Packaging.
1987	Member of the IEE (UK) Committee on Heterojunctions and Heterostructures.

1987-1996 and Member of International Advisory Committee on GaAs and Related Compounds, GaAs Related Compounds Conference.

1986-1987 Member of EEC ESPRIT Review Committee, review of European Program on the special action on Information Technology.

AWARDS

1969-1970 *Ford Foundation* Fellowship, for graduate studies in Materials.

1976 *Alan Berman Publication Award*. Two separate archival publications were awarded, each dealing with new thin film metal systems for silicon microwave power transistors.

1977 *Alan Berman Publication Award.* Award for the archival publication in the area of microwave power transistors.

1978 *Outstanding Service Awards* from **1978-1983** for contributions to solid state electronics for phased array radar and for contributions to reliable microelectronics materials.

1981 UNESCO Award for Scientific Excellence

1985 *Fullbright Scholar Award.* Granted to Dr. Christou for the academic year 1985-86 for research in Molecular Beam Epitaxial Materials in Europe.

1987 *Millenium Medal* from the University of Bologna, Celebrating the 1000 year anniversary of the University of Bologna, Centenial Award for Contributions in Compound Semiconductors

1989, 1990 *The Naval Research Laboratory Outstanding Performance Award.* Granted to Dr. Christou for outstanding research and management during 1989 and 1990.

1991 *Navy (NRL) Patent* Award for Electron Device Inventions

1993 *Fellow of the IEEE.* For contributions in the area of GaAs device and circuit reliability.

1999-2002 *IEEE National Lecturer* in Electron Devices.

1999 *University of Maryland Invention of the Year Award* in the Physical Sciences

2000 *IEEE National Lecturer* in Optoelectronic Devices and Device and Materials Reliability Physics.

PATENTS

1. "Method for Epitaxial Growth of GaAs Films Independent of Substrate," Patent Number 4,226,649 (1980).
2. "Refractory-Refractory Oxide InP MIS Schottky Diodes," N.C. 63,334 Granted (1988).
3. "Low Barrier Height Epitaxial Ge-GaAs Mixer Diode," Patent Number 4,316,201 (1980).
4. "Multi-Refractory Films for GaAs Devices," Patent Number 4,179,533 (1980).
5. "Electron Collector for Forming Low-Loss Electron Images," Patent Number 4,179,604 (1978).
6. "Ion Implanted Evaporated Germanium Layers as n^+ Contacts to GaAs," Patent Number 4,298,403 (1981).
7. "Semiconductor Encapsulant for Annealing Ion Implanted GaAs," Patent Number 4,267,014 (1980).
8. "Refractory Passivated Ion Implanted GaAs Ohmic Contacts," Patent Number 4,330,343 (1981).
9. "Ohmic Contacts for Group III-V N-Type Semiconductors Using Epitaxial Ge Films," Patent Number 4,188,710 (1979).
10. "Ion Implanted Improved Ohmic Contacts to GaAs," Patent Number 4,263,605 (1980).
11. "Formation of Epitaxial Si-Ge Heterostructures by Solid Phase Epitaxy," Patent Number 4,975,387 (January 1991).
12. "Method of Making Self-Aligned GaAs/AlGaAs FETs," Patent Number 4,927,782 (May 1990).
13. "PLZT Spatial Phase Modulator," Patent Granted (2000).
14. "Novel Bragg Mirror Reflectors At 1.5μm," Patent Pending (2002).

PUBLICATIONS

Four books.
174 archival articles and conference papers.
(iNEER Webmaster's note: Individual listings omitted but will be furnished upon request.)