UNIVERSITÀ
DEGLI STUDI
DI BRESCIA

SERVIZIO RISORSE UMANE
U.O.C. PERSONALE DOCENTE

Brescia, 10/01/2020
UNBSCLE - Prot. n. 2545

PROF. BERETTA GIAN PAOLO
Via Cerva, 14
20122 - Milano

RACCOMANDATA A/R

OGGETTO: Nomina a Professore Emerito

Ho il piacere di comunicare che alla S.V. è stato conferito il titolo di "Professore Emerito" con Decreto Ministeriale nr. 1179 del 27.12.2019, di cui in allegato.

Distinti saluti

IL RETTORE
(Prof. Maurizio Tira)

Piazza del Mercato, 15
25121 Brescia, Italia
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davide.fantoni@unibs.it

Il Ministro dell'Istruzione, dell'Università e della Ricerca

VISTO il T.U. delle leggi sull'Istruzione Superiore approvato con R.D. 31.8.1933, n.1592, con particolare riferimento all'art.111;

VISTO l'art.15 della legge 18 marzo 1958, n.311;

VISTO il D.P.R. 4 settembre 2019 pubblicato in G.U. del 6.9.2019 n.209;

VISTA la delibera del 13 giugno 2019 del Consiglio del Dipartimento di Ingegneria Meccanica e Industriale dell'Università degli Studi di Brescia ;

D E C R E T A

Al Prof. Gian Paolo Beretta, già ordinario del S.S.D. ING-IND/10 (Fisica Tecnica Industriale) presso il Dipartimento di Ingegneria Meccanica e Industriale dell'Università degli Studi di Brescia, è conferito il titolo di

"PROFESSORE EMERITO"

a tutti gli effetti di legge.

Firmato digitalmente da
FIORAMONTI LORENZO
C=IT
O=MINISTERO ISTRUZIONE UNIVERSITA' E RICERCA

IL MINISTRO
On.le prof. Lorenzo Fioramonti

ACCADEMIA PELORITANA DEI PERICOLANTI

PALAZZO UNIVERSITÀ - MESSINA

Chiar.mo Professore

Gian Paolo Beretta

Gentile professore,

ho il piacere di comunicarLe che l'Assemblea Generale dei Soci Ordinari dell'Accademia Peloritana dei Pericolanti tenutasi il 7 aprile 2016 ha all'unanimità approvata la proposta, avanzata dalla Classe di Scienze Fisiche, Matematiche e Naturali, della sua nomina a socio corrispondente.

Nel vivo auspicio che con la sua attività vorrà contribuire al rilancio dell'Accademia, Le invio un cordiale saluto

Il Presidente
(prof. P. Navarra)

Messina, 20 Maggio 2016

March 11, 2011

Prof. Gian-Paolo Beretta
University Di Brescia, Via Branze 38
Dipartimento di Meccanica
Brescia 25123
Italy

Dear Prof. Beretta:

Congratulations! It's my pleasure to inform you that the Calvin W. Rice Lecture selection committee has selected you as the 2011 year recipient.

The award consists of a **$4,000.00** ***H**onorarium, a certificate and a lifetime membership with ASME. You are required to present the Calvin W. Rice Lecture at one of ASME's Division conferences. The choice of the venue is yours and that of the technical division executive committee. You will receive your honorarium and certificate at that conference. Your lifetime membership with ASME will be processed and sent to you as soon as you accept this award. Your nominator, Michael von Spakovsky, will be informed of your acceptance and will be in contact with you.

Please confirm that you accept this award at your earliest convenience by contacting Jacinta McComie-Cates, Calvin W. Rice Lecture Award Coordinator, ASME, by email mccomiej@asme.org, or by phone 212-591-7052 or fax 212-591-7671 ASAP.

Sincerely,

Henry A. Scarton, Ph.D.
Chair, Calvin W. Rice Lecture Award Selection Subcommittee

cc: Michael R. Von Spakovsky, Advance Energy Systems Division, ASME
John Beck, Manager, Member Records & Information, ASME
Jacinta McComie-Cates, Calvin W. Rice Lecture Award Coordinator, ASME

***$4,000. Honorarium is intended to offset expenses incurred to present the Calvin W. Rice Lecture Award.**

ASME

SETTING THE STANDARD

THE
ADVANCED ENERGY SYSTEMS
DIVISION

Recognizes the Achievement of

Prof. Gian Paolo Beretta

for service to the mechanical engineering profession and for promoting the goals of the Advanced Energy Systems Division by contributing to and disseminating knowledge on sustainable energy issues and delivering the

Keynote Lecture
"World Energy Consumption: An Outlook for the Rest of the Century and the Role of Thermodynamic Research"

at the
Advanced Energy Systems Division Reception
2008 International Mechanical Engineering Congress and Exposition
Boston, MA

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

B.G. Shiva Prasad
Division Chair, 2008-2009

November 4, 2008

ASME

SETTING THE STANDARD

THE ASME FELLOW
A MEMBERSHIP GRADE OF DISTINCTION

The ASME Board of Governors confers the Fellow grade of membership on worthy candidates to recognize their outstanding engineering achievements.

Nominated by their peers, these 2006–2007 Fellows have had 10 or more years of active practice and at least 10 years of continuous active corporate membership in ASME, or 20 years of active practice and five years of continuous corporate membership in ASME.

There are 161 new Fellows out of a total of 2,915 Fellows.

The 2006-2007 ASME Fellows...

Memis Acar

Memis Acar has been a researcher and faculty member for 30 years. He has written over 120 journal and conference papers. He recieved over two million dollars in grant money from national and international sources. Acar has graduated eight Ph.D. students and currently advises six. He is a member of the editorial board of three academic journals, has contributed to the development of degree programs and advised universities on curricula development. He chaired an ASME conference and two other major conferences. He is actively involved with ASME's UK Section and District H. Ph.D. (1984), Loughborough University, UK.

M. Khairul Alam

M. Khairul Alam has been on the Ohio University faculty since 1983. As part of his dissertation research, he developed a new reactor for particle synthesis, which was awarded a patent. His graduate research work was awarded a Certificate of Recognition by NASA. His research and teaching has been recognized by Ohio University with several awards and nominations. He has been a member of ASME since 1985 and has served on the Heat Transfer Division K-15 Technical Committee (Transport Phenomena in Manufacturing and Materials Processing) as a member, secretary, vice-chair, and finally as a chair of the committee from 2002-2005. He was appointed the Moss Professor of Mechanical Engineering at Ohio University in 1997. His research accomplishments include the study of particle synthesis and collection, including the development of electrostatic precipitators. He is author or co-author of several patents in electrostatic precipitators, including a novel membrane precipitator that is now in commercial production. He has also worked in novel carbon structures, including carbon foams, vapor grown carbon fibers, and carbon composites. He has published more than 90 papers in journals and conference proceedings. Ph.D. (1984), California Institute of Technology.

David G. Alciatore

David G. Alciatore, P.E., is co-author of "Introduction to Mechatronics and Measurement Systems," a widely used textbook in the mechatronics area, now in its third edition. An active consultant in mechatronic system design and high-speed video motion analysis, he has been very active in ASME for 20 years, serving in leadership positions at the local, regional, and international levels. Alciatore is the author of over 40 publications on modeling, simulation, and mechatronics. He was an ASME Distinguished Lecturer for the topic: "Illustrated Principles of Pool and Billiards." He has received awards at the department, college, and university levels. for his teaching, and is the author of "The Illustrated Principles of Pool and Billiards," a popular book dealing with the physics of pool. He is a Webmaster of many popular Websites, including www.engr.colostate.edu/pool, www.engr.colostate.edu/mechatronics, and www.engr.colostate.edu/hsv, and www.engr.colostate.edu/video_demos. He is the author of VP-Sculpt, a commercial software package for 3D scanning and surface modeling applications. Ph.D. (1989), University of Texas.

Kai-Nan An

K.N. An's career spans 30 years at the Mayo Clinic. He has used his knowledge and expertise in mechanical engineering and applied mechanics to study the human musculoskeletal system. He has developed and assessed numerous devices for joint implant replacement, fracture fixation, and soft tissue reconstruction. These devices aid doctors in the diagnoses and treatment of musculoskeletal disorders and injuries. Ph.D. (1975), Lehigh University.

David M. Anderson

David M. Anderson, P.E., CMC, has had a 33-year industrial career. He holds professional registrations in Mechanical, Industrial, and Manufacturing Engineering. He has written four books, authored three Websites, issued four patents, and taught five courses at the University of Portland and in UC Berkeley's Management of Technology Program. His latest book, "Design for Manufacturability & Concurrent Engineering" and his web site, www.HalfCostProducts.com, are the basis for his now 20-year-long career providing leading-edge corporate training. Ph.D. (1972), University of California, Berkeley.

Malcolm J. Andrews

For over 28 years, Malcolm J. Andrews, P.E., has researched computational, experimental and theoretical fluids

dynamics. He is a recognized world leader in buoyancy driven mixing and has made significant contributions in computational multiphase flows and heat transfer. His work has resulted in four patents, over 55 international journal publications, and numerous conference publications. Andrews has contributed to ASME through his committee work over the past 14 years, is presently an associate editor for the ASME Journal of Fluids Engineering, and track/topic organizer for the FED General Papers at the summer and IMECE meetings. He recently received the E.O. Lawrence Award for National Security from the Department of Energy. Andrews has also received the Ralph R. Teetor Educational award from the SAE, an Outstanding Graduate Teaching award a Distinguished Teaching award. He is presently on a leave of absence from Texas A&M University as National Security Fellow at Los Alamos National Laboratory. Ph.D. (1986), Imperial College, London University.

Gerard A. Ateshian

Gerard Ateshian is a leading authority in the field of cartilage mechanics and biotribology, joint mechanics and imaging, soft tissue mechanics and transport, cell mechanics, and tissue engineering. His work includes the theoretical analyses of biological tissues using mixture theory, experimental techniques for analyzing tissues and cells, and engineering tissue constructs. Ateshian is an active member of the ASME Bioengineering Division, currently serving as the division chair. He also serves on the editorial boards of three major journals in biomechanics and orthopedic research. Ph.D. (1991), Columbia University.

Kenneth S. Ball

Before completing his doctorate, Kenneth S. Ball spent two years working in the Center for Fluid Mechanics, Turbulence, and Computation at Brown University. This was followed by 15 years as a professor at the University of Texas at Austin. His teaching and research are in the fields of heat transfer, fluids, and materials processing. He attracted research support from the National Science Foundation, the National Institute of Standards and Technology, The Office of Naval Research, The Air Force Office of Scientific Research, and private industry. He is particularly noted for his development and application of spectral methods for the direct numerical simulation of turbulence in engineering flows with heat and mass transfer. In 2004, he became The L.S. Randolph Professor and department head of mechanical engineering at Virginia Tech. Ph.D. (1987), Drexel University.

Terry V. Baughn

Terry V. Baughn received a B.S. degree in 1965 and an M.S. degree in 1967 from Purdue University in Aeronautics, Astronautics and Engineering Sciences. Baughn gained extensive industrial experience while employed at E.I. duPont, General Motors, and International Harvester. He then joined the faculty of Southern Methodist University in Dallas in 1982, holding the position of Associate Professor in the Mechanical Engineering Department. After leaving Southern Methodist University in May 1989, Baughn joined the technical staff of Texas Instruments in Dallas in 1997. Texas Instruments sold the military electronics division to Raytheon in Dallas and Baughn became an employee of Raytheon. Currently, his technical rank is that of Engineering Fellow. At Raytheon, he is responsible for the structural and thermal analysis of RF electronic products and concepts. His area of specialization is in the application of nonlinear structural analysis to the thermomechanical failure of electronic components. Ph.D. (1973), University of Delaware.

Abdel-Moez E. Bayoumi

Abdel-Moez E. Bayoumi has earned an outstanding reputation in scholarship and education, while providing exemplary service at local, national, and international levels. He has demonstrated effectiveness in leadership and management in academic and industrial environments, where his efforts have transformed several academic institutions and industries with the development of new programs, new degrees, new laboratories, and inter-institutional articulation agreements. His most recent achievement is the initiation of the highly visible Condition-Based Maintenance program for military and commercial aircraft, which provides diagnosis, prognosis, and health monitoring systems through the integration of design, manufacturing, materials, and mechanics. Ph.D. (1982), North Carolina State University.

Meyer J. Benzakein

The career of Meyer (Mike) J. Benzakein, P.E., spans 40 years. He joined GE in 1967 and made a number of important initial contributions in engine acoustics. This was followed by a series of engineering and management assignments in the CFM56 program. He then led the GE90 engineering program for the Boeing 777. More recently, he led the research and development technology effort for all new commercial and military engines. In 2004 he joined the faculty at The Ohio State University, and is currently Chair of the Aerospace Engineering Department and Director of The Ohio Center for Advanced Propulsion and Power. Ph.D. (1967), Wayne State University.

Gian-Paolo Beretta

Gian-Paolo Beretta, P.E., has 26 years of experience in mechanical engineering as an academic and as a consultant to industry and government. He has conducted research and taught at the Massachusetts Institute of Technology, the Politecnico di Milano, and the Universita' di Brescia, where he has been Dean of Mechanical Engineering Studies for the last eight years. Major contributions include: a widely used fundamentally based description for flame propagation in spark-ignition engines; an influential outlook on world energy consumption, resources and sustainable solutions; performance analyses of urban waste-to-energy power plants; the invention of a nonlinear equation containing the Schroedinger equation of quantum physics as a special case and extending this realm to the broader domain of quantum thermodynamics of irreversible processes; the coauthoring of an authoritative reference textbook on the foundations of thermodynamics and its engineering applications. Sc.D. (1981), Massachusetts Institute of Technology.

David L. Berger

David L. Berger currently chairs the Subcommittee on Power Boilers, Section I of the ASME Boiler & Pressure Vessel Committee. For twenty years he has been an active contributor, drafting proposals for revisions and interpretations. His service to the B&PVC began with simultaneous appointments to the Subgroups on Piping and Fabrication and Examination, each of which he chaired for a period. Berger was appointed to the Subcommittee on Power Boilers in 1988 and to the BPV Standards Committee in 1994. He is also a Charter member of ASME's Post-Construction Committee and their Subcommittee on Inspection Planning, where he served a term as Vice-Chair. He has been a member of ASME's Board of Pressure Technology Codes & Standards since 2002 and twice served as BPTCS's representative to Nominating Committee. In total, he has served as a member of at least twelve different ASME pressure technology standing committees, plus many special task groups. Berger has

ASME Committee of Past Presidents
Three Park Avenue
New York, NY 10016

Dear Committee of Past Presidents:

I am writing this letter to sponsor Gian Paolo Beretta's election to the grade of Fellow in ASME. I have known Gian Paolo since 1978 when he came to M.I.T. as a graduate student. I was a member of his doctoral thesis committee, have been in frequent contact with him during his appointment on the M.I.T. faculty, and have provided financial support for his research.

Gian Paolo was one of the brightest and most creative young men that I had met in the Department of Mechanical Engineering at M.I.T. For two years (1979-1980) we met almost every saturday morning at Thermo Electron Corporation to discuss about thermodynamics. Gian Paolo was touching on things concerning the logical structure of physical theories and their impact on engineering thermodynamics, something more fundamental than technology, but which in fact is the root from which technology can really develop, and I remember Gian Paolo was unique in that respect.

Gian Paolo's subsequent work on the foundations of thermodynamics is pioneering and pathfinding. I believe that his contributions will have a permanent and profound impact on physics and mechanical engineering. Very few people are interested in the fundamentals of thermodynamics, and Gian Paolo rates among the best. But he has the additional very rare gift of being at the same time a profound physicist and an excellent mechanical engineer, as testified by his curriculum and list of publications, and his ability to relate to and gain respect from both the physical and the engineering community. As a result of his broad and profound understanding of the foundations, Gian Paolo is also an excellent teacher and mentor, as testified by the list of undergraduate and graduate mechanical engineering students he motivated and supervised.

Gian Paolo has been an active member of ASME, he participated in the early formation of the Advanced Energy Systems Division and contributed more than 20 top quality scientific articles to AES and HTD proceedings and ASME Transactions. He has also been an active and prudent observer of the "energy crisis" issues, as testified by his popularizing activities in the energy field (see his recent article "World energy consumption and resources: an outlook for the rest of the century") and his professional record (he was member of the board of directors of the Brescia utility company at the time they built one of the most advanced waste-to-energy cogeneration facility in Europe).

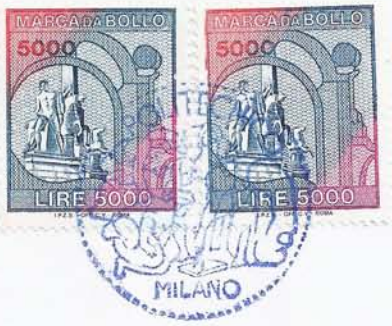
In 1987 Gian Paolo moved to the Mechanical Engineering Department at the Brescia University in Italy, where he soon became full professor. By examining his curriculum, it is clear that he continued to contribute to the field at the same level of dedication, responsibility and recognition, as shown by his election as Dean of Mechanical Engineering Studies at the Brescia University when the engineering schools in the italian university had to undertake a major change imposed by the European community.

If I can be of further assistance in helping to elevate Prof. Beretta to Fellow grade, please do not hesitate to call on me.

Sincerely yours,

George N. Hatsopoulos
President, Levitronix
Chairman Emeritus, Thermo Electron
ASME Honorary Member

Politecnico di Milano



SERVIZIO DEL PERSONALE

UFFICIO PERSONALE DOCENTE

C E R T I F I C A T O

****
* N. 40 del Registro *
* Rilascio Documenti *
****
N. cert. 1517

A richiesta dell'interessato, si attesta risultare dagli atti che

il PROF. BERETTA GIAN PAOLO

nato a MONZA (MI) il 14.04.56

ha prestato servizio presso questo Politecnico come segue:

FACOLTA' DI INGEGNERIA

- RICERCATORE DI RUOLO IN PROVA (L)
  presso: DIPARTIMENTO DI ENERGETICA
  dal 1.08.83 al 31.07.86

- RICERCATORE DI RUOLO CONFERMATO (L)
  presso: DIPARTIMENTO DI ENERGETICA
  dal 1.08.86 al 21.05.87

- PROFESSORE SUPPLENTE (RUOLO ALTRA SEDE)
  di ENERGETICA
  dal 1.11.89 al 31.10.90

Milano, 14.01.92

IL CAPO UFFICIO
(F. Barocelli)

IL DIRETTORE AMMINISTRATIVO
(dott. G. Assante)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 24, 1991

Professor Gian Paolo Beretta
Department of Mechanical Engineering

Dear Professor Beretta:

I write to inform you that the President and the Executive Committee of the Corporation have approved your reappointment as Visiting Associate Professor, part-time, for one year beginning July 1, 1991, without salary.

Sincerely yours,

Joel Moses

Joel Moses
Dean of the School
of Engineering

Uniting mechanics and statistics

An adventurous scheme which seeks to incorporate thermodynamics into the quantum laws of motion may end arguments about the arrow of time — but only if it works.

THE logical relationship between the laws of mechanics and those of thermodynamics deserves more attention than it usually receives. Thermodynamics and statistical mechanics are ways of describing the behaviour of macroscopic systems made from components whose behaviour is determined by the laws of mechanics, classically those of Newton (as amended), but otherwise the equations of motion of quantum mechanics. Where the first law of thermodynamics is concerned, there is no difficulty. In both classical and quantum mechanics, total energy is a constant of the motion and is thus always conserved, at least in a closed system.

The difficulty arises chiefly with the second law of thermodynamics, and not only because there is such a variety of ways in which this principle can be defined. But now a group of three theoreticians has put forward an intriguing way in which the laws of quantum mechanics may be modified so as to incorporate the second law from what appears to be the outset (Beretta, C. P., Gyptopoulos, E. P. & Park, J. L., *Il Nuovo Cimento B* **87**, 77–97; 1985). Whether the modification proposed is sufficient, only time will tell, but the objective seems well worth the trouble Beretta *et al.* have taken.

The difficulty is well illustrated by the way in which some kind of correspondence is established between the mechanical behaviour of a system and its thermodynamic properties. For more than a century, people have been brooding on the paradox that while the laws of classical (and, for that matter, quantum) mechanics are symmetrical with respect to time inversion, the second law selects from all possible trajectories of motion only those corresponding to a continual increase of the entropy. The arrow of time is conjured like a rabbit from a hat.

The definition of entropy in terms of the mechanical properties of the constituents of a system is similarly clouded. The classical model is Boltzmann's H-theorem (1872), which shows that the rate of change with time of a certain mathematical construct from the probability distribution of single particles in phase space will always be zero or negative. So Boltzmann argued, his quantity H is admirably suited to be the negative of what is known in thermodynamics as entropy. This is argument by analogy, but none the worse for that — if it works.

Since Boltzmann's time, there has accumulated a rich literature on the implied paradox of the conflict between the irreversibility of macroscopic processes and the reversibility (in time) of the laws of mechanics and thus of microscopic processes. Indeed, the argument was begun by Loschmidt in 1976, but now even elementary text-books of thermodynamics reckon to give some kind of account of it.

The standard explanation is that the apparent paradox is not a paradox at all, but a confusion about timescales. Any measure of entropy, that derived from Boltzmann's H or otherwise, will fluctuate (and so decrease as well as increase on a short timescale), which is not inconsistent with the notion that the average value of the entropy should increase steadily over long periods of time (or remain unchanged when the system is in equilibrium).

Much the same is said of the recurrence paradox, based on the observation due to Poincaré that the point in phase space (momentum as well as position) representing the state of a classical system will return to more or less the same place after a sufficient length of time. On the face of things, that means that non-equilibrium states of a system will repeatedly recur. The standard resolution of that paradox is the observation that, for any realistic system, the interval of time between recurrences will be huge, much greater than, say, the age of the Universe. Again there is nothing wrong with these arguments, but they are far from being rigorous.

So why not take the bull by the horns, and build irreversibility into the laws of mechanics? That is the point from which Beretta *et al.* start. Properly, they acknowledge that they are not the first to tread this path. They work with quantum statistical mechanics, where the formalism is easier. They start from the equation of motion for the operator representing the state of a physical system, say $\mathbf{m}$, which is, in operator language, $d\mathbf{m}/dt = -i/\hbar[\mathbf{H},\mathbf{m}]$, where t is time, $\mathbf{H}$ the Hamiltonian operator of the system and i and $\hbar$ the square route of minus once and Planck's constant (divided by 2π) respectively. The quantity in square brackets is the commutator of its two components, $\mathbf{mH}-\mathbf{Hm}$.

The natural way to proceed is to assume that this equation is modified in such a way that the right-hand side is some other function of the state operator $\mathbf{m}$ than in the standard form. The objective is to find a form of the function which is compatible both with what is known of the evolution of thermodynamic systems and, perhaps more important, the dynamics of real microscopic systems. Beretta *et al.* have convinced themselves that the function they are seeking cannot be a linear function of $\mathbf{m}$. What they propose is the addition to the right-hand side of the quantum equation of motion of a particular function of $\mathbf{m}$ which, by including both the square root and the logarithm of the state operator of the system, is non-linear enough to satisfy anybody's taste.

Almost magically, the system has some of the obviously necessary properties. For example, for a system in a pure quantum state, say that represented by a solution of Schrodinger's equation, the extra terms vanish and the simple form of the equation of motion applies. Similarly, constants of the motion in the new system are also constants of the motion determined by the simpler equation of motion.

What can be said about the entropy? In reality, the state operator $\mathbf{m}$ is the equivalent of what is called the density matrix in quantum statistical mechanics, which is why Beretta *et al.* define entropy in terms of the operator $\mathbf{m}\log\mathbf{m}$, where the logarithm is the natural logarithm of the operator $\mathbf{m}$. Specifically, the entropy of the negative of the trace of this operator multiplied by Boltzmann's constant; the authors are able to show that is increases (or does not increase) in the course of time.

So is this a demonstration that the laws of mechanics and of thermodynamics can indeed be combined? Not quite. For one thing, there are various mathematical problems that make some of the steps in the argument conjectural. Worse still, some of the operator functions in the formalism are sometimes undefined. But the system does have the merit of hanging together — the paper now published extends to composite systems the treatment of one-component systems published a year ago.

None of this implies that the arguments about the reconciliation between microscopic reversibility and macroscopic ir reversibility will now be stilled. Indeed, while for as long as the present justification of the basis of statistical mechanics holds water, there will be many who say that what Beretta *et al.* have done is strictly unnecessary. But this is a field in which the proof of the pudding is in the eating.

John Maddox

DEPARTMENT OF MECHANICAL ENGINEERING

DAVID N. WORMLEY
PROFESSOR AND HEAD

CAMBRIDGE, MASSACHUSETTS, 02139
ROOM 3-174, (617) 253-2246

11 October 1988

To Whom It May Concern:

In this letter, the appointment status, and the teaching and scientific activities of Dr. Gian Paolo Beretta at the Massachusetts Institute of Technology are described.

In July, 1981, Dr. Beretta was appointed as Assistant Professor of Mechanical Engineering. He held this position until June, 1986. After a one year leave of absence, in July, 1987 he was appointed as Visiting Associate Professor of Mechanical Engineering.

Dr. Beretta taught subjects in the undergraduate and graduate curriculum in the area of thermodynamics. Specifically, in the Spring terms of 1982, 1983, 1984, 1985, and 1986, and in the Fall term of 1987, he taught our undergraduate course, 2.40, Thermodynamics; in the Fall terms of 1981, 1982, 1983, 1984, 1985, and 1987 he has been co-instructor with Professor Gyftopoulos in teaching the graduate course, 2.451, General Thermodynamics I; and in the Spring terms of 1982, 1983, 1984, 1985, and 1986, working in collaboration with Professor Gyftopoulos, he has developed the advanced graduate course, 2.452, Quantum Thermodynamics.

In addition, Professor Beretta, working in collaboration with Professor Gyftopoulos, has developed a textbook in thermodynamics which is next to completion.

Based upon his outstanding performance, Professor Beretta was awarded the Soderberg Professorship in Power Engineerng in 1984.

Very truly yours,

David Wormley

David N. Wormley
Professor and Head

POLITECNICO DI MILANO
DIPARTIMENTO DI ENERGETICA

ORIGINALE

- LETTERA DI REFERENZA SUL PROFESSOR GIAN PAOLO BERETTA -

Il professor Gian Paolo Beretta studente di que=
sto Politecnico dal 1974 al 1979, si iscrisse al Corso di Laurea in Ingegneria Nucleare (indirizzo impiantisti=
co) e prese contatto con me all'inizio del 1978, per o=
rientarsi su una possibile tesi di laurea. Constatata la sua altissima preparazione, gli consigliai come ar=
gomento una rassegna critica di natura termodinamica, che si concretò nel titolo "Punti di vista sul concet=
to di entropia". Lo consigliai inoltre, visti i suoi interessi, di immergersi in un ambiente dove la termo=
dinamica e i fenomeni di trasporto (della massa, della quantità di moto e dell'energia) fossero coltivati a livello internazionale. Egli seguì il mio consiglio e trascorse la seconda metà del 1978 e la prima metà del 1979 presso il Massachusetts Institute of Technology (MIT,USA), donde tornò per laurearsi in Italia con lo=
de nel luglio 1979 sull'argomento sopra citato di cui il sottoscritto fu relatore.

Successivamente egli conseguì, sempre al MIT,il M.Sc. nel gennaio 1980 sulla combustione turbolenta nei motori alternativi e il Ph.D. nel settembre 1981 sulla termodinamica quantistica. Dal 1981 al 1983,co=
me ricercatore a contratto del CNR, si occupò di e=
nergetica di base, organizzando anche un corso sull'ar=
gomento a Roma, presso la sede del PFE nel gennaio 1982. Vinto il concorso di ricercatore nel 1983,confer=
mato nel 1986, divenuto professore associato di Termo=
tecnica nel maggio 1987, egli continuò a mantenere strettissimi contatti col Politecnico di Milano, col

./.

POLITECNICO DI MILANO
DIPARTIMENTO DI ENERGETICA

Dipartimento di Energetica e in particolare con me personalmente che, quale titolare della Cattedra di Energetica, gli affidai per più anni la responsabilità delle esercitazioni di detto Corso.

Presso il Dipartimento lo indirizzai verso argomenti di natura sperimentale, in particolare sul moto di corpi solidi striscianti per autolubrificazione, sui tubi di calore nella versione cosidetta "termosifoni chiusi bifase", e sui moti bifasi in tubi capillari.

Credo superfluo tessere l'elogio del prof.Beretta, per il quale parlano da soli i lavori da lui svolti. Voglio però sottolineare l'ampiezza della sua attività scientifica, che va dalla termodinamica classica, alla quantistica e al moto dei fluidi, con eguale profondità in tutti e tre i settori. Affermo pertanto che egli rappresenta uno di quei rari individui che possono collegare l'attività teorica più astratta con quella sperimentale e rappresenta un ponte di collegamento e di dialogo fra la Fisica Tecnica e la Fisica pura.

Aggiungo che il suo modo di fare collaborativo e il suo prestarsi con entusiasmo alla dialettica scientifica fanno del professor Beretta una forza potenziale di primissimo piano nell'ambito della Fisica Tecnica italiana.

POLITECNICO DI MILANO
Dipartimento di Energetica
CATTEDRA DI ENERGETICA

(professor Mario Silvestri)

Mario Silvestri

Milano,20.X.1988

MS.cgfe

DEPARTMENT OF NUCLEAR ENGINEERING

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

77 Massachusetts Avenue Cambridge, Massachusetts 02139

Room: 24–109 (617)253-3804

March 24, 1988

To Whom it May Concern

Dr. Gian Paolo Beretta asked me to write a letter in support of his candidacy for a professorship. I am especially happy to wholeheartedly, warmly, and enthusiastically recommend Dr. Gian Paolo Beretta for an appointment as a Full Professor of Mechanical Engineering.

I know Gian Paolo very well. He was an exceptional student in two of my classes, and worked on his doctoral thesis research project under my supervision. Over the past seven years, he and I have been teaching two graduate subjects together, General Thermodynamics I, and Quantum Thermodynamics, have co–authored several papers and proposals, and have been cooperating in the writing of an extensive manuscript on the foundations and applications of thermodynamics.

Gian Paolo is a brilliant young scientist, having a first class imaginative and creative intellect. He has already many great achievements to his credit, and holds the promise for even greater accomplishments.

In his doctoral thesis he attacked the problem of finding a fundamental quantum equation of motion that encompasses the requirements of both mechanics and thermodynamics without the use of statistics. He succeeded admirably in this ambitious, challenging, and extremely difficult task. He conceived of an elegant and far reaching resolution of the problem, entirely distinct and more general than any other equation of motion that has been proposed to date, and yet consistent with all the extremely restrictive criteria that must be satisfied by such an equation. In my view, the proposed equation is a contribution to the foundations of physics of the same importance as Newton's postulate F = ma, and Schoedinger's equation for change in state with time. The work has already resulted in several publications, and more are pending. Much more research remains to be done to fully explore and comprehend all the implications of the new dynamical law. Gian Paolo is working diligently and most productively on these implications.

I know of no other individual of Gian Paolo's generation working in the nonstatistical foundations of thermodynamics, and their relation to quantum physics. Gian Paolo brings to this field a profound understanding of the concepts and principles of both quantum theory and general thermodynamics. I believe his research will have a permanent impact on science and engineering, and will be a source of great honor and pride to the Institution with which he will be affiliated.

In addition to his work on fundamentals, Gian Paolo has been doing excellent work on problems of combustion and flame turbulence, and chemical kinetics. His publications in these areas are also first rate.

Gian Paolo is a methodical and lucid teacher. His lectures are always excellently prepared and very clearly delivered. His backboard technique is beautiful. He communicates very well with students, and is always willing to assist them both in class and outside the classroom.

It gives me great pleasure to recommend Gian Paolo strongly and without any reservation for a Full Professorship so that he can continue his creative and productive work on the foundations of quantum thermodynamics and its applications.

Sincerely yours,

Elias P. Gyftopoulos

Elias P. Gyftopoulos
Ford Professor of Mechanical
and Nuclear Engineering

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mechanical Engineering
77 Massachusetts Avenue
Cambridge, Massachusetts 02139

Professor John B. Heywood
Director, Sloan
Automotive Laboratory

Room 3-340
(617) 253-2243
Telex: 921473 MIT CAM

March 17, 1988

LETTER OF RECOMMENDATION

To Whom It May Concern:

I am writing to provide you with my evaluation of Professor Gian Paolo Beretta's academic, research and professional contributions. I do this from my perspective as Head of the Fluids Thermal Science Division in our Mechanical Engineering Department, and as one of his senior colleagues in Thermodyanamics.

Professor Beretta, while at M.I.T., contributed to our thermodynamics teaching in substantial ways. His teaching evaluations by the students were very good, specifically stressing his clear exposition and logical organization skills. He has played a major role in revising and reinvigorating our graduate course in thermodynamics, and at a more sophisticated graduate level, has explored the fundamentals of the discipline in an advanced course/seminar format. He is a prolific writer, and with Professor Elias Gyftopoulos, is working on an advanced text in Thermodynamics. It is truly a shared activity. Our assessment of his teaching was that he has made important contributions. His ability to organize and structure the intellectual content of the material he is teaching, and articulate that structure, are the areas where he is outstanding.

His research contributions have been marked with the same high intellectual content and insight. I have followed one of his interests closely -- that related to engine combustion. His work with Professor James Keck on the structure of turbulent flames in engines is a remarkably original contribution to an extremely complex topic which has been studied for many years. Jointly, they developed a fundamentally based description for the flame propagation process in a spark-ignition engine, which contains important and novel physical insights, as well as guidance for the practical engineer.

More recently, Professor Beretta's major research focus has been "Thermodynamics" rather than "Combustion." While he has been developing second law methods of analysis for internal combustion engines (an area which has been much neglected and is important both pedagogically and in practice), his primary research has been devoted to the fundamentals of

thermodynamics in the expectation that out of such efforts, this discipline, so central to the power field and Mechanical Engineering, will continue to develop. He has and is addressing a series of major fundamental issues, and several publications have already resulted. One of his major efforts (with Professor Gyftopoulos) was the subject of a provocative and complimentary one page editorial in "Nature." Obviously the scientific world is taking notice of this effort.

In summary, Professor Beretta is a truly accomplished individual with the outstanding intellectual ability and the motivation which is the mark of the most able faculty. He has an excellent publication record based on impressive research accomplishments. He is very committed to excellence and growth in the field of Thermodynamics.

Sincerely yours,

John B. Heywood

John B. Heywood

JBH/kas

Thermo Electron

101 First Avenue
Post Office Box 9046
Waltham, MA 02254-9046
(617) 622-1100 Telex 92-3323

George N. Hatsopoulos
Chairman of the Board and President

March 25, 1988

TO WHOM IT MAY CONCERN:

I am very happy to wholeheartedly and strongly recommend Dr. Gian Paolo Beretta for an appointment as Full Professor.

I have known Gian Paolo since he came to M.I.T. as a graduate student. I was a member of his doctoral thesis committee, have been in frequent contact with him since his appointment on the M.I.T. faculty, and have been providing financial support for his research.

Gian Paolo is one of the brightest and most creative young men that I have met in the Department of Mechanical Engineering at M.I.T. His work on the quantum foundation of thermodynamics is pioneering and pathfinding.

The number of people interested in the fundamentals of quantum thermodynamics is very small, and Gian Paolo rates among the best. I believe that his work will have a permanent and profound impact on physics.

Gian Paolo is a dedicated teacher. His excellent performance as a lecturer stems from his profound understanding of the foundations and concepts of thermodynamics and his genuine interest and talent to communicate this understanding to his peers and students.

I recommend him for a Full Professorship very strongly and without any reservation.

Sincerely yours,

George N. Hatsopoulos

George N. Hatsopoulos

GNH:LN

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

FOUNDED 1880

Honorable Mention

Best Paper on Energy Systems Analysis
1986 Winter Annual Meeting

"A New Approach to
Constrained-Maximization Nonequilibrium Problems"

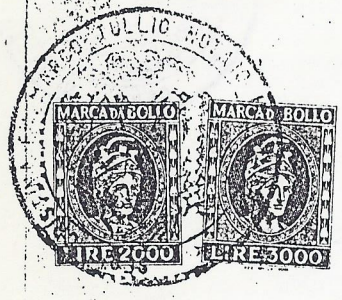
by

GianPaolo Beretta

Chairman, Advanced Energy Systems Division

Symposium Chairman
December 15, 1987

MASSACHUSETTS INSTITUTE OF TECHNOLOGY



UPON THE RECOMMENDATION OF THE FACULTY
HEREBY CONFERS ON

Gian Paolo Beretta

THE DEGREE OF

DOCTOR OF SCIENCE

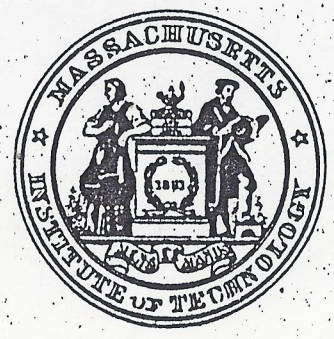
IN RECOGNITION OF SCIENTIFIC ATTAINMENTS AND THE ABILITY
TO CARRY ON ORIGINAL RESEARCH AS DEMONSTRATED BY A THESIS
in the field of Mechanical Engineering entitled

On the General Equation of Motion of Quantum Thermodynamics
and the Distinction Between Quantal and Nonquantal Uncertainties

GIVEN THIS DAY UNDER THE SEAL OF THE INSTITUTE AT CAMBRIDGE
IN THE COMMONWEALTH OF MASSACHUSETTS

FEBRUARY 17, 1982

Vincent A. Fulmer
SECRETARY



PRESIDENT

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

UPON THE RECOMMENDATION OF THE FACULTY
HEREBY CONFERS ON

Gian Paolo Beretta

THE DEGREE OF

MASTER OF SCIENCE

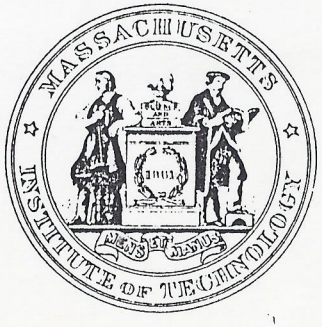
IN

MECHANICAL ENGINEERING

IN RECOGNITION OF PROFICIENCY IN THE GENERAL AND THE SPECIAL STUDIES AND EXERCISES PRESCRIBED BY SAID INSTITUTE FOR SUCH DEGREE GIVEN THIS DAY UNDER THE SEAL OF THE INSTITUTE AT CAMBRIDGE IN THE COMMONWEALTH OF MASSACHUSETTS

FEBRUARY 20, 1980

Vincent A. Fulmer
SECRETARY



Jerome B. Wiesner
PRESIDENT

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
CAMBRIDGE, MASSACHUSETTS 02139

ROOM 3-160

June 11, 1982

TO WHOM IT MAY CONCERN

It results from the official records that Gian Paolo Beretta, born in Monza (Milan, Italy), on April 14, 1956, has been registered as a GRADUATE STUDENT and has held the appointment of RESEARCH ASSISTANT in the Department of Mechanical Engineering at the Massachusetts Institute of Technology from September 1978 through June 1981. During that period he attended the courses listed below, obtaining the grades indicated:

METHODS OF ENGINEERING ANALYSIS	A
ADVANCED FLUID MECHANICS	A
GENERAL THERMODYNAMICS I	A
DYNAMICS	A
GENERAL THERMODYNAMICS II	A
APPLIED ELASTICITY	A
ADVANCED HEAT TRANSFER	A
COMPRESSIBLE FLUID MECHANICS	A
VISCOUS AND TURBULENT FLOWS	A
MODERN ALGEBRA	A
ABSTRACT LINEAR ALGEBRA	A
TURBULENT FLOW AND TRANSPORT	A
ENERGY PRODUCTION: RENEWABLE RESORCES	A

Gian Paolo Beretta has been awarded the following degrees:

MASTER OF SCIENCE IN MECHANICAL ENGINEERING ..... February 1980

DOCTOR OF SCIENCE ..... February 1982

His doctoral dissertation "On The General Equation of Motion of Quantum Thermodynamics and the Distinction between Quantal and Nonquantal Uncertainties" was held on September 16, 1981.

Attest:

Sandra Williams

Sandra Williams
Administrator,
Graduate Office

Prudence A Young
Notary Public
State of Massachusetts
Comm Exp: 7/18/86

Massachusetts Institute of Technology

Notice of Appointment to the Graduate Student Staff

Gian Paolo Beretta

Social Security No. _____

I am happy to confirm your appointment as a Research Assistant (Title) Maximum registration: 60 units per academic yea

in the Department of Mechanical Engineering

for the period September 1, 1978, through May 31, 1979, at a salary of $ 925.00 per month.

You are expected to pursue a full program of studies consonant with your assistantship duties. You must be registered each term, including the summer term if this appointment includes the summer, as a candidate for an advanced degree. Your salary payments will be made on the last working day of each month. Your tuition will be that of a full-time student as listed in the General Catalogue.

You should refer to department instructions concerning the subject and thesis units for which you may register. Assistants assigned to teaching are expected to assist in proctoring examinations when requested by the Committee on Academic Performance.
For more complete information on the responsibilities and privileges of the Graduate Student Staff you should refer to *Policies and Procedures* and the *Graduate School Manual*.
This appointment may be terminated for failure to make satisfactory academic progress or for failure to fulfill your responsibilities as an assistant. If at any time you wish to relinquish this appointment, please notify the undersigned immediately. Retain this notice of appointment for your personal records.

For the Department W J Westcott Date September 5, 1978

Student

AO-55A REV.6/70

Massachusetts Institute of Technology

Notice of Appointment to the Graduate Student Staff

Gian Paolo Beretta

Social Security No. 888-00-9159

I am happy to confirm your appointment as a Research Assistant (Title) Maximum registration: 24 units

in the Department of Mechanical Engineering

for the period September 1, 1979, through January 15, 1980, at a salary of $ 1,030.00 per month.

You are expected to pursue a full program of studies consonant with your assistantship duties. You must be registered each term, including the summer term if this appointment includes the summer, as a candidate for an advanced degree. Your salary payments will be made on the last working day of each month. Your tuition will be that of a full-time student as listed in the General Catalogue.

You should refer to department instructions concerning the subject and thesis units for which you may register. Assistants assigned to teaching are expected to assist in proctoring examinations when requested by the Committee on Academic Performance.

For more complete information on the responsibilities and privileges of the Graduate Student Staff you should refer to *Policies and Procedures* and the *Graduate School Manual*.

This appointment may be terminated for failure to make satisfactory academic progress or for failure to fulfill your responsibilities as an assistant. If at any time you wish to relinquish this appointment, please notify the undersigned immediately. Retain this notice of appointment for your personal records.

For the Department W J Westcott Date August 28, 1979

Student

AO-55A REV.6/70

Massachusetts Institute of Technology

Notice of Appointment to the Graduate Student Staff

Gian Paolo Beretta

Social Security No. 888-00-9159

I am happy to confirm your appointment as a Research Assistant (Title) Maximum registration: 24 units

in the Department of Mechanical Engineering

for the period January 16, 1980, through May 31, 1980, at a salary of $ 1,030.00 per month.

You are expected to pursue a full program of studies consonant with your assistantship duties. You must be registered each term, including the summer term if this appointment includes the summer, as a candidate for an advanced degree. Your salary payments will be made on the last working day of each month. Your tuition will be that of a full-time student as listed in the General Catalogue.

You should refer to department instructions concerning the subject and thesis units for which you may register. Assistants assigned to teaching are expected to assist in proctoring examinations when requested by the Committee on Academic Performance.

For more complete information on the responsibilities and privileges of the Graduate Student Staff you should refer to *Policies and Procedures* and the *Graduate School Manual*.

This appointment may be terminated for failure to make satisfactory academic progress or for failure to fulfill your responsibilities as an assistant. If at any time you wish to relinquish this appointment, please notify the undersigned immediately. Retain this notice of appointment for your personal records.

For the Department N J Newcott Date December 3, 1979

Student

REPUBBLICA ITALIANA

IN NOME DELLA LEGGE

NOI PROF. DOTT. ING. LUIGI DADDA
RETTORE DEL POLITECNICO DI MILANO
VEDUTI GLI ATTESTATI DEGLI STUDI COMPIUTI

DA **BERETTA GIAN PAOLO MARIA**

NATO A MONZA (MILANO) IL 14 APRILE 1956

VEDUTO IL RISULTATO DELL'ESAME DI LAUREA DA LUI SUPERATO CON LODE IN QUESTO POLITECNICO IL 24 LUGLIO 1979
GLI CONFERIAMO LA LAUREA DI

DOTTORE IN INGEGNERIA NUCLEARE

IL PRESENTE DIPLOMA DI LAUREA VIENE RILASCIATO A TUTTI GLI EFFETTI DI LEGGE

REGISTRATO AL N. 32041 E AL N. 333

DATO A MILANO IL 31 LUGLIO 1979

IL DIRETTORE AMMINISTRATIVO
(PIETRO ORSOLINI)

IL RETTORE
(LUIGI DADDA)

IL PRESIDE DELLA FACOLTÀ
(CESARE CARDANI)

ARCH. GEN. N. 029731

POLITECNICO DI MILANO

FACOLTA' DI INGEGNERIA

REGISTRATO AL N. 4535

SI CERTIFICA RISULTARE DAGLI ATTI CHE IL SIG.
BERETTA GIAN PAOLO MARIA
NATO A MONZA (MI)
IL 14-04-1956, HA CONSEGUITO PRESSO QUESTO POLITECNICO IN DATA 24-07-1979 LA LAUREA DI DOTTORE IN INGEGNERIA NUCLEARE CON LA VOTAZIONE DI 100/100 E LODE.

IL MEDESIMO HA SUPERATO DURANTE IL QUINQUENNIO DEGLI STUDI UNIVERSITARI I SEGUENTI ESAMI, RIPORTANDO LE SEGUENTI VOTAZIONI:

ANALISI MATEMATICA 1	TRENTA/30 E LODE
GEOMETRIA	TRENTA/30
FISICA 1	TRENTA/30 E LODE
CHIMICA	TRENTA/30
DISEGNO 1	VENTOTTO/30
ANALISI MATEMATICA 2	TRENTA/30
ELETTROTECNICA	TRENTA/30 E LODE
FISICA 2	TRENTA/30
FISICA TECNICA	TRENTA/30
MECCANICA RAZIONALE	TRENTA/30 E LODE
PROGRAMMAZIONE DEI CALCOLATORI ELETTRONICI	TRENTA/30 E LODE
RICERCA OPERATIVA	TRENTA/30 E LODE
COMPLEMENTI DI ANALISI MATEMATICA	TRENTA/30
ELETTRONICA NUCLEARE 1	TRENTA/30 E LODE
FISICA ATOMICA	TRENTA/30 E LODE
MECCANICA DELLE MACCHINE	TRENTA/30
SCIENZA DELLE COSTRUZIONI	TRENTA/30
TECNOLOGIE MECCANICHE (CON DISEGNO)	TRENTA/30 E LODE
FISICA DEL REATTORE NUCLEARE 1	TRENTA/30
FISICA NUCLEARE	TRENTA/30 E LODE
COSTRUZIONI MECCANICHE PER IMPIANTI NUCLEARI	TRENTA/30
MACCHINE	TRENTA/30
TECNOLOGIA DEI MATERIALI NUCLEARI	TRENTA/30
IMPIANTI NUCLEARI	VENTOTTO/30
COMPLEMENTI DI IMPIANTI NUCLEARI	TRENTA/30
PROTEZIONE E SICUREZZA NEGLI IMPIANTI NUCLEARI	TRENTA/30
CONTROLLO DEL REATTORE NUCLEARE	TRENTA/30 E LODE
FISICA DEL REATTORE NUCLEARE 2	VENTINOVE/30
SEPARAZIONE DEGLI ISOTOPI	TRENTA/30

MILANO, 28 AGO. 1979

IL CAPO DELL'UFFICIO DI SEGRETERIA

(L. Citterio Quillasi - Segretario Capo)

DIRITTO DI SEGRETERIA DI L. 250

MARCA DA BOLLO LIRE 700

rilasciato con imposta di bollo da L. 700
ensi dell'art. 4 D.L. 26-5-78 n. 216