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The Davenport Medal: A tribute from the International Association for Wind Engineering to Alan Garnett Davenport

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1. The Davenport Medal by *Giovanni Solari*

The International Association for Wind Engineering (IAWE) was founded in 1975, during the 4th International Conference on Wind Engineering (ICWE), in London, UK. It operated, mostly informally, until 2003, when the IAWE Steering Committee Meeting at the 11th ICWE, in Lubbock, Texas, approved new by-laws and a renewed organisation, coherent with the impressive development exhibited by wind engineering in the last 25 years.

The night on which I was elected as the first IAWE president is still vivid in my memory. My satisfaction for the trust that I had received from the international community of our discipline was great; however, just as great was my concern about the difficulty of the position and the work that I would have to carry out. Little did I know that these contrasting feelings would accompany me throughout the years of my mandate.

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Following the decisions assumed in Lubbock, the Executive Board of the IAWE promoted several actions aimed at offering the international wind engineering community a more operative and efficient service, and new initiatives for advanced and renewed prospects. With this spirit numerous problems were tackled, nearly always new and complex, giving life to a thousand paths that became interwoven and guided me, sometimes with pride and enthusiasm, sometimes with fatigue and misgiving, from Lubbock to Cairns. The events were so pressing that I often had the feeling that I lived that period as a privileged onlooker.

One of the paths undertaken was not only very particular but also very engaging. It was in 2005 when, during frequent exchanges of ideas between Member Associations and the IAWE Executive Board, the idea of setting up a form of recognition to be awarded to those who had given the most significant contributions to the growth and evolution of wind engineering was born.

Thus a committee was nominated and the latter elaborated an operative proposal in a very short time. This proposal was distributed to all the IAWE members to find out the opinion of our community. We received some suggestions and much appreciation. The Executive Board made use of the suggestions received and approved the rules for the new initiative in Seoul, Korea, in 2006.

In accordance with the established rules, up to four Senior Awards and four Junior Awards may be awarded at each ICWE. Nominations shall be called for by the Executive Board, and may be made by IAWE Members. The recipients of the Awards shall be recommended to the Executive Board by an Awards Committee. The nature and the value of the Awards shall be determined on each occasion by the current Executive Board.

Consequently, in the summer of 2006, a Call for Candidatures was distributed, with the deadline on 31 January 2007. At the same time an Awards Committee was nominated made up of Chris Baker (Chair), Giorgio Diana, Chris Letchford, Robert Meroney and Yukio Tamura. On 30 March 2007 this committee communicated to the Executive Board three winners of the Senior Awards—Nicholas Cook, Ahsan Kareem and Shuzo Murakami—and three winners of the Junior Awards—Luigi Carassale, Kurt Gurley and Tetsuya Kitagawa.

While this procedure was being developed, the Executive Board began to reason about the award to be attributed to the winners. An evident truth came out. Many of those who are currently considered the fathers of our discipline, are remembered and recognised today by various institutions in different ways. Kit Scruton and Martin Jensen are linked with the numbers by the same name through two resolutions assumed by the IAWE in 1987 and 1991, respectively. The American Society of Civil Engineers (ASCE) set up two medals with the names of Jack Cermak and Robert Scanlan, in 2002 and 2003, respectively. In the same period Windtechnologische Gesellschaft (WTG) set up a medal with the name of Otto Flachsbarth. It was immediately evident from this gallery of illustrious scholars and engineers that the person who more than any other is deemed the pioneer of modern wind engineering, indeed he is the true symbol of it, was missing: Alan Garnett Davenport.

Instantaneously and with great passion the idea was therefore born that the IAWE Senior Award should be a Davenport Medal, and that this medal should become, in the years to come, the permanent award given by the IAWE to its most distinguished members. The idea, stemming from the Executive Board and submitted to all the IAWE members, gave rise to reactions of extraordinary enthusiasm and approval, bearing witness

to the enormous esteem and affection that our community attributes to Alan Davenport, a master of humanity, science and engineering.

I can still recall my concern about transforming the painting of Alan Davenport, realised at the time of his conference in Western Ontario in 2002 (Fig. 1), into a medal with his image (Fig. 2), of adequately arranging the ceremony for the conferring of the awards, on the other side of the world, in the 3 "very short" months between April and June 2007, about receiving the medals just a few days before the conference, knowing that there would be no time to correct any mistake.

Above all, however, I remember those brief "everlasting" moments spent on Green Island, in the Great Barrier Reef, with a garland of flowers around my neck and Alan Davenport in front of me. Once again I see the moment in which I shook his hand and gave him the first sample of his medal (Fig. 3), with a crowd of friends and colleagues who rose to their feet to give him an interminable standing ovation (Fig. 4). I still remember the emotion in his words (Fig. 5), especially aimed at the young who are starting out on their studies of wind engineering, and the moment in which he personally handed his medal to the winners of the awards (Fig. 6). I am very aware that in those instants a tradition was beginning that over the years would remain one of the IAWE's fixed points. I feel very privileged to have lived that extraordinary moment with the person who had inspired the studies in my youth, the person who had contributed in a crucial way to addressing my academic and professional career and who had often transmitted words of great knowledge and humanity to me.

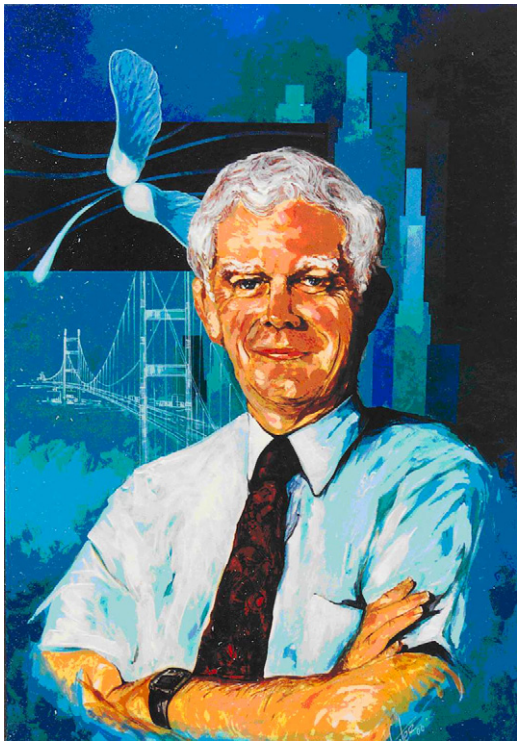

Fig. 1. Original painting of Alan Davenport created by Mr. Ted Hunter, retired BLWTL model maker and artist.

Fig. 2. The Davenport Medal.

Fig. 3. Giovanni Solari gives Alan Davenport the first sample of the Davenport Medal.

Being the IAWE president has been a great adventure and above all an honour. Having lived through the creation of the Davenport medal and the ceremony giving it to Alan Garnett Davenport was an unrepeatable sensation.

Fig. 4. The participants at the 12th International Conference on Wind Engineering tribute a standing ovation to Alan Davenport.

2. The Boundary Layer Wind Tunnel Laboratory at the university of Western Ontario by *David Surry*

For many years after its inception, the research group at Western was known by the title above, which, in a sense, really says it all for Alan Davenport's early contributions to the field of Wind Engineering. Although there was no original intention to be so self-serving, there was just no real need to be more specific than to talk about *The Boundary Layer Wind Tunnel Laboratory*.

Throughout its years of existence, the Laboratory has been a centre of both fundamental and applied research. It has attracted talented faculty and staff members who have been extraordinarily loyal to the Laboratory; and the Lab has hosted a never-ending stream of excellent students, researchers and visitors from all over the world, not to mention world-renowned engineers and architects. It has been a three-ring circus, marrying together research, education and engineering practice in a self-funded university laboratory. Alan made this unique environment work. Not just through his well-documented contributions, but perhaps more by his attitude towards life and the people who have surrounded him. He has always been supportive and encouraging in any endeavour, and generous in sharing the clear visions that he always seemed to have of the wind engineering processes. Alan has always had a knack for pursuing the important issues and not getting carried away by the intriguing sidelines that emerge. He has been equally generous with his support of other researchers all over the world. In all of this, he leads by example. He has never lost sight of the need to balance his professional and personal life: He has worked and played hard, and his interests are spread over the complete spectrum of human activities. His colleagues at

Fig. 5. Alan Davenport speaks to the Wind Engineering community.

the Lab are very proud to have renamed themselves to be the Alan G. Davenport Wind Engineering Group.

All of us here at the Lab who have been fortunate enough to work closely with one of the giants of our field greatly appreciate the initiation of the Davenport medal in recognition of Alan's contributions to Wind Engineering.

3. Recollections of earlier days by *Nicholas Isyumov*

I first met Alan Davenport in the spring of 1963 at the University of Western Ontario. I came to visit my Alma Mater and to inquire about graduate studies. Alan was a young assistant professor in the Department of Civil Engineering with a Ph.D. from the University of Bristol in 1961 and a background on natural loads from his stay at the Division of Building Research (DBR) of the National Research Council (NRC) of Canada. While at the NRC, he was instrumental in starting the renewal of the wind loading provisions of the National Building Code of Canada (NBCC). Alan remained involved with the NBCC throughout his professional life and his gust factor approach, where the mean wind loads are factored upwards to recognize the influence of dynamic action, remains the centrepiece of the Canadian wind loading provisions. At the time of our meeting, Alan had published several papers, which are key to current wind

Fig. 6. Alan Davenport awards Ahsan Kareem with the Davenport Medal.

engineering. Also he had been hired as a wind consultant for the New York World Trade Center (NY WTC) Towers. I was unaware of these achievements at that time.

I was a researcher in the Canadian Forest Project Laboratory (FPL) in Ottawa, just down the road from the Division of Building Research, where Alan left his mark. One of my projects was the design and proof testing of timber trusses and I visited DBR on several occasions in order to discuss snow loads, which were proving to be a major impediment to my truss designs. At that time I came to realize the now obvious that uncertainties in the performance of a structure were caused not only by uncertainties in materials and methods of analysis but also by the uncertainties in the magnitude and distributions of the loads. Mr. Bill Schriever, one of Alan Davenport's mentors at DBR, drew my attention to Alan's work and in particular his probabilistic approach to the performance of buildings and structures. When planning my graduate studies at Western it was my aspiration to study under Professor Davenport in order to shore-up my understanding of snow and other natural loads and probabilistic methods and then to return to work at the FPL. Little did I know at that time that my meeting with Alan would be the beginning of a lifetime association, where the initial teacher–student relationship grew into an ongoing professional collaboration and a personal friendship.

When first meeting Alan Davenport I was impressed by the width and depth of his engineering and scientific knowledge and understanding and his ability to grasp and define particular problems and to find rational methods for their solution. At that time he already had a graduate student (George Steels) working on the dynamics of massive cables. Also he had initiated measurements of the full-scale response of the London CFPL guyed

Television Tower and was conducting experiments to measure wind forces on a bill-board. The objective there was to measure the aerodynamic admittance $\chi_a(fL/V)$, which describes the spatial and temporal correlation of wind forces due to the buffeting action of atmospheric turbulence. He was interested to take me on as a graduate student in his wind related research. However, upon hearing me out and understanding my reasons for looking to him as a thesis advisor he agreed that a study of snow loads may well be my best option. The main building blocks of my research were defined, permission for a leave of absence from the Forest Products Laboratory was requested and granted and I returned to Western as a fresh M.E.Sc. student in September of that year. My M.E.Sc. research was never submitted as such but was expanded and directed toward a Ph.D. degree. I did return to the Forest Products Laboratory for 1 year in order to satisfy the conditions of the leave of absence which had been granted to me. However, on Alan's invitation I returned to Western in September of 1965 and joined him as a research engineer at his new Boundary Layer Wind Tunnel Laboratory (BLWTL). The BLWTL officially opened on 10 November 1965.

The early days of the Laboratory were demanding on time and energy yet exhilarating by the achievements made. Experiments of the behaviour of buildings and structures in turbulent boundary layer flow were cutting edge research and required new ideas, experimental methods and instrumentation. Random signal RMS meters, necessary to measure turbulence and its effect on structures were rarities at that time. There were many firsts. Aeroelastic model tests of hyperbolic cooling towers indicated that wind-induced peak tensile stresses can be more than twice their steady or mean values. This was an important finding for cooling tower designers, who at that time were reeling from the disastrous collapse of a group of cooling towers at Ferrybridge in the UK. Alan's close relationship with Mr. Leslie E. Robertson for whom he consulted on wind related issues of the NY WTC Towers prior to the opening of the BLWTL also brought in several significant new studies. These included studies for the Seattle First National Bank Building, the various lower satellite buildings of the NY WTC and the US Steel Building in Pittsburgh. The U.S. Steel Building study started with parametric measurements of a number of building shapes in order to select the preferred design and included a small scale topographic model study in order to determine the influence of local topography on winds at the project site. Alan's association with Les Robertson continues to this day and he was instrumental in the awarding of an honorary doctoral degree to Les for his contributions to wind engineering.

Another first for those early days was a multi-degree of freedom model study of the New York Federal Reserve Bank Building for Bill LeMessurier, a leading designer of tall buildings. This lead to many other aeroelastic model building studies, including the Sears Tower in Chicago where we worked with Dr. Fazlur Khan, Hal Iyengar and others at Skidmore, Owings and Merrill. A full aeroelastic model study was carried out to assist in the design of the Murray A. McKay suspension bridge across the Narrows in Halifax. This was the first ever study of a full aeroelastic model of a suspension bridge in simulated turbulent boundary layer flow. The list of these early projects would be incomplete without the CN Tower, which only recently has been overtaken by the Burj Dubai as the world's tallest free-standing structure. Full aeroelastic models were studied both for its initial design with three constant diameter concrete tubes tied together with shear braces and the final design of the Tower as it now exists. The initial design was abandoned, as wind tunnel tests showed it to be prohibitively expensive.

In closing my recollections of earlier days, I would like to thank Alan for the opportunities which he has given to me and for the special relationship which has grown between us. He has motivated and inspired me, like he has many, many others. I will always remember Alan for his vision, leadership, good counsel and above all his excellence as an engineer and his ability to apply engineering principles in order to find solutions to wind related problems. May future recipients of the Davenport Medal become fully aware of Alan's monumental contributions to wind engineering and be proud of their association with his name.

4. A tribute to Alan Davenport from a Davenport student by *Ted Stathopoulos*

The Editor of this journal was really fortunate to carry out his research, both at the Masters and Ph.D. level, under the supervision of Alan G. Davenport, or AGD as everybody in the Lab was always calling him. Davenport introduced him to the area of wind effects on buildings and gave him the opportunity and motivation to carry out interesting and innovative experiments, the results of which were of direct and extreme interest to the building industry. This lasted for a full 5 years of ongoing interaction with only pleasant memories of learning and loving the wind engineering discipline.

Meetings and interactions with AGD were always stimulating, whether they were taking place on a Saturday morning in his university office, in which we were arriving riding our bicycles regardless of season (!), in airports waiting for planes to take us to the places where research meetings with industry partners would occur or, even better, in the airplanes during some really long flights!

Alan has always a very sound engineering judgment and can address any issue or problem of wind engineering in a very constructive, innovative and at the same time simplified way. His deep and thorough knowledge of statistics is extremely helpful to guide him in the right direction. What a learning experience for all his really privileged graduate students. However, Alan's contribution to the education of his graduate students goes even beyond the intellectual stimulation, direction and enthusiasm that he amply provides, always with a good dosage of humor. He is also a caring individual, who is genuinely interested in the progress and well being of all people associated with his group.

There are several incidents that could be mentioned regarding Alan's handling of students' matters, related to their studies, work and lives. Every one of his students would have several stories to share. I would only mention the encouragement I received to come to Montreal in 1979 and develop the area of building aerodynamics in the then newly established Centre for Building Studies of Concordia University by designing and building an atmospheric boundary layer wind tunnel, the main facility of what became the Building Aerodynamics Laboratory. Several years later, AGD visited this laboratory and was really pleased with its development and status.

On behalf of all his graduate students, I would like to express our warmest congratulations to AGD for the naming of the senior IAWE award after his name. I am fortunate and proud to be a member of the committee that decided the institution of the Davenport Medal.

5. … After the Australasian Ensemble by *John Cheung*

Last July 2007, I had the pleasure of organising the ICWE12 in Cairns, where the first presentation of the Davenport Medal was made. This is indeed the most prestigious award

from IAWE, named after the internationally most recognised and acclaimed in Wind Engineering—Alan Davenport (AGD).

I started to study Davenport's publications in 1978, under the supervision of Bill Melbourne (WHM) at Monash University on the other side of the globe from Canada. With little idea of how the author actually looks like, Davenport's published work laid the basic interest for my Wind Engineering study. My first glimpse of Davenport in person was near my graduation in 1983 when he was invited to play the first keynote at ICWE6 in Gold Coast, Australia, where he described metaphorically the Conference organiser (my supervisor) as galloping Conductor Melbourne and his Australasian Wind Ensemble team. I was fascinated by his capacious intellect and his contrivance for originating concepts and expressing them in simple, evocative terms. My next closer encounter was during my 2 months visit to the BLWT Laboratory at the University of Western Ontario in 1987 through the arrangement between AGD and WHM. Like all other visitors, I felt privileged with the warm welcome from everyone of the Laboratory and the unreserved exhibit of the wind tunnel facilities and their operations. Many of the features and techniques, such as automated floor roughness, programmed turn-table, force balance, etc., have also later been incorporated in Australia and other parts of the world.

I congratulate the recipients on receiving the Davenport Medal. And at last, we wind engineers world-wide have this eminent award to hope for.

6. My journey to Davenport Medal by *Ahsan Kareem*

During my master's research work at MIT, I was introduced to the issue of human response to the motion of tall buildings under winds by Professor Robert Hanson, which sounded very intriguing and quite extraordinary for someone interested in classical structural engineering. While researching this topic, I quickly realized that the estimation of wind-induced motion of tall buildings was the essential pre-requisite and most of the papers on this topic were written by Professor Alan G. Davenport. I wrote a short note to Professor Davenport requesting a copy of one of his papers and also expressed interest in exploring possibilities to continue for my doctorate in his program at Western. Very shortly after that I received a package from him containing a number of papers, reports and details of admission and financial assistance. I responded and was pleased to receive admission with financial aid. At the same time, I was in touch with the father of wind engineering in Colorado, Professor Jack E. Cermak, who also offered me the same academic opportunity.

Consultation with friends left me with the impression that Western was always under a cover of deep snow blanket, therefore, I decided to join Professor Cermak's group in Colorado. However, this did not stop my reading and admiring the works of Professor Davenport who served as an inspirational icon to emulate. I recall vividly, his paper at the 5ICWE in Colorado soon after I started my career as assistant professor. It was very unusual consisting of a dialogue among a sage wind expert Monsieur Gustaf Eiffel; an erudite researcher, Dr. Ventus Explorator, an assistant professor who had recently completed his Ph.D. thesis entitled, "Random Vibration of Random Structures in Random Wind"; and a construction specialist, Mr. Ingenius Constructus. It was quite an exchange and I recommend its reading to my younger colleagues and students. In my own mind I could relate to that young researcher, educated in new technologies, who saw everything as random, and who had in his own way a keen insight into difficult engineering

problems, which did not always garner the approval of Monsieur Eiffel and Mr. Constructus.

My own career advanced over the years, thanks to Jack Cermak, Bob Scanlan and Alan Davenport for their inspirational roles. I spent 12 years at University of Houston where I was able to expand my research portfolio to include dynamics of deepwater offshore platforms and hurricanes following Hurricane Alicia. Later, I moved to Notre Dame without realizing the blanket of snow and the proximity of Western. Regardless of the weather, at both places I have been blessed with some outstanding students who have made path-breaking contributions in a wide range of areas from bluff body aerodynamics/aeroelasticity, dynamics of tall buildings, bridges and offshore platforms, wind tunnel experiments, stochastic and numerical simulation to risk-related issues and multi-hazard mitigation and more recently cyber-enabled technologies. Most of this was initiated by the opportunity afforded by the inaugural Presidential Young Investigator award from the White House Office of Science and Technology and administered by NSF. The work of "TeamKareem" got me the honor of receiving ASCE's inaugural Jack E. Cermak Medal for contributions to wind engineering. A few years later, I was honored again, this time by ASCE's Robert H. Scanlan Medal for contributions to engineering mechanics. Last summer, I was truly thrilled to learn that I will be receiving one of the inaugural Alan G. Davenport Medals introduced by IAWE as a senior award. It was even more humbling that two out of three junior IAWE awards went to my former students, Professors K. Gurley (University of Florida) and L. Carassale (University of Genoa). I could not be any more fortunate to have this unique triple distinction that honors three giants and pioneers of my field of research.

Last summer in Cairns, it was a very moving experience to receive the Davenport Medal from Alan personally. While he was handing me the medal, it brought back vivid memories of his lecture at the Colorado conference. I could clearly see in the eyes of this modern day Monsieur Eiffel, an *avant garde*, a positive nod to this "young researcher"! What more can one ask!

7. Looking forward to the appearance of the 2nd and 3rd Alan G. Davenports by *Yukio Tamura*, President of IAWE

It is my great honor to be given this opportunity to say a few words about the Davenport Medal. Needless to say, the state of modern wind engineering has been achieved through the efforts of many excellent researchers, not just one specific person. Furthermore, the reality is that our knowledge is far from complete, but is still growing. However, if wind engineers were asked to identify one particular person who has made a great contribution to our achieving the present state of wind resistant design system, and who has made the rational design of high-rise buildings and long-span bridges in strong wind regions possible, most would nominate Alan G. Davenport without hesitation. The name of Alan G. Davenport is well known to all researchers in wind engineering and other fields. Indeed, he has become an icon in our field.

When I began to study wind resistant design in the early 1970s, I first read his famous papers on "The application of statistical concepts to the wind loading of structures (1961)" "Note on the distribution of the largest value of a random function with application to gust loading (1964)", and "Gust loading factors (1967)". In these papers, he beautifully integrated S.O. Rice's theory of the maximum value in an electric field and Cartwright and

Longuet–Higgins' theory of ocean waves and experimental results of wind forces. These were landmark studies, and incorporated knowledge in the fields of meteorology, fluid mechanics, vibration and probability theory. I remember that I picked up many useful hints from these papers, and they greatly assisted me in acquiring background knowledge for my future research in wind resistant design.

It is difficult to say when the history of wind engineering started. It is also difficult to say when the beginning of the IAWE was. However, if we think back on the 1st Symposium on Wind Effects on Buildings and Structures that was held in Teddington in the UK in 1963, we will remember that many researchers from the fields of meteorology, civil engineering, architecture, electricity and mechanics attended this symposium, including A.G. Davenport, R.I. Harris, M. Jensen, T.V. Lawson, C.W. Newberry, G.V. Parkinson, C. Scruton, R.L. Wardlaw and others. The directions of wind engineering and wind resistant design were discussed at this symposium, and our wind engineering knowledge expanded from there. It definitely opened a new page for us. Since then, the symposium has been held every 4 years. The term Wind Engineering was first utilized by Jack E. Cermak of Colorado State University, and the name of the symposium was changed to the International Conference on Wind Engineering (ICWE) at the 5th symposium held in Fort Collins in 1979. The 8th ICWE was held at the University of Western Ontario in 1991, and was chaired by Alan G. Davenport.

Owing to the great contributions and efforts by those pioneers represented by Alan G. Davenport, we have obtained methods and technologies for designing various kinds of buildings and structures against wind load. We are now in the 21st century, and many super-high-rise buildings and super-long-span structures continue to be constructed all over the world. However, we have been still faced with a lot of wind engineering problems. Urbanization and industrialization have increased environmental and energy problems and also need to be taken into account. Climate change related to global warming and air pollution related to large-scale urban development are becoming more severe. As is commonly known, 85% of economic losses due to natural disasters around the world are caused by hurricanes and typhoons. One cyclone killed 100,000–300,000 people in Asia.

The wind engineering community will need to handle more and more serious problems in the future. I am confident that the many researchers and technicians who have chosen wind engineering as their careers will meet the challenge of these problems and contribute greatly to human society. The main purpose in establishing the Davenport Medal is to encourage our researchers in these activities and to give them a special goal to aim at.

I look forward with confidence to the appearance of the 2nd and 3rd Alan G. Davenports.