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Two Personal Tributes to Art Chiu (see p. 7)

A failed communication tower in Silkwood one of the results of Cyclone Larry (see cover story)

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Eyes in the Sky: Remote Sensing of Hurricane Damage

J. Arn Womble, Ph.D., P.E.
Kishor C. Mehta, Ph.D., P.E.
Beverley J. Adams, Ph.D.

Recent advances in remote-sensing technologies – combined with the devastating hurricanes of 2004 and 2005 – have given wind engineers new perspectives on windstorm damage detection: a new view angle and a new method for quantifying windstorm damage based on remote-sensing data. The application of remote-sensing digital-image-processing technologies is the subject of a major research collaboration teaming Texas Tech University's Wind Science and Engineering Research Center (TTU WISE) with industry partner ImageCat, Inc. (Long Beach, CA, and London, UK). This project combines TTU's long history of windstorm damage investigation with the advanced-technology expertise of ImageCat – an industry pioneer in the application of remote-sensing technologies to earthquake damage assessment.

High-resolution commercial imaging satellites first became available in 1999, providing image resolutions of 1 m (sufficient to detect damage to individual buildings) with opportunities for collecting imagery for a given location every 1-3 days. Available image resolutions have since been refined to 61 cm and are rapidly heading toward 40 cm. Current satellite-image providers include DigitalGlobe and GeoEye (resulting from the recent merger of ORBIMAGE and SpaceImaging Corporations). Imaging satellites offer the advantage of rapidly recording the windstorm damage scene across an entire affected region.

NOAA's Remote Sensing Division has also launched a program to acquire

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The Effects of Cyclone Larry

John Holmes, Ph.D., JDH Consulting

Dr. John Holmes of JDH Consulting recently spent three days in the Innisfail district of North Queensland investigating the effects of Cyclone Larry to buildings and other structures, shortly after the event. He accompanied researchers from the Bureau of Meteorology, Geoscience Australia, TimberED and the James Cook Cyclone Testing Station.

Larry was a small storm, with an eye about 20 kilometres in diameter, that crossed the coast at the mouth of the Johnstone River to the east of Innisfail. The storm moved quickly inland, which probably helped to limit the amount of wind damage. However, significant damage was experienced between Babinda in the north and Silkwood in the south. Storm surge effects were felt at Cowleys Beach, Kurrimine Beach and Mission Beach, on the south side of the track.

Although initially classified by the Bureau of Meteorology as a Category 5 cyclone at landfall, subsequent analysis of recorded wind speeds and the failure of simple structures such as road signs indicated that, in fact, it was a high Category 3, or low Category 4, event. The original assessment as a Category 5 was of considerable concern to Dr. Holmes, in his role of Chair of the wind actions sub-committee of Standards Australia, as the current design wind speed for ultimate limit state design on

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post-hurricane digital aerial imagery for waterfront areas; the airborne platforms acquire imagery as fine as 37-cm resolution but require several days to cover a hurricane-affected area.

The satellite and aerial images offer a means of rapidly preserving such critical “evidence” as debris spread and roof damage, which is often removed or disturbed before field researchers can access the damage scene. The remote-sensing images also enable engineers to see damage conditions in inaccessible areas. Post-storm images are helpful for rapidly locating damage areas and for streamlining more-detailed field investigations. It is expected that remote-sensing surveys will not replace traditional forensic surveys, but will instead provide much-needed rapid information about the overall damage scene and will therefore complement the more-detailed surveys.

Digital images also form the basis for the automated detection of windstorm damage. An ever-growing library of archived satellite images provides pre-storm information for most urban areas. By comparing images acquired before and after a windstorm, building damage and debris spread can be identified as temporal changes in the images. Optical change-detection algorithms applied to digital imagery are used to quantify building damage and debris spread. Correlation of change-detection measures with actual damage conditions noted in the field are a critical part of the development of automated windstorm damage detection and are necessary to distinguish actual damage conditions from false indicators of building damage (e.g., lighting conditions and vegetation changes).

In 2004, Hurricanes Charley and Ivan provided the first opportunity for the TTU/ ImageCat team to collect before-and-after 61-cm satellite images as well as corresponding field damage observations. The field team used a GIS-technology-driven field-reconnaissance system to rapidly acquire building damage-state observations. This system, known as VIEWS™ (Visualizing Effects of Earthquakes with Satellites) was developed by ImageCat initially for the collection of earthquake damage conditions in the field. The system integrates continuous digital video footage, digital still images, satellite-image base layers, and real-time GPS observations to acquire field damage observations. The VIEWS™ system provides a set of georeferenced digital video and still images corresponding to the remotely sensed image base layer, enabling the damage conditions to be viewed from both the remote-sensing image and the ground. With the VIEWS™ system, the field team rapidly collected ground-based damage information for an average 2,500 buildings per day. Figure 1 shows a sample of building damage in Hurricane Charley, viewed from before-and-after QuickBird satellite images and from the VIEWS™ ground survey. Additional details of the field-reconnaissance survey are available from the Multidisci-

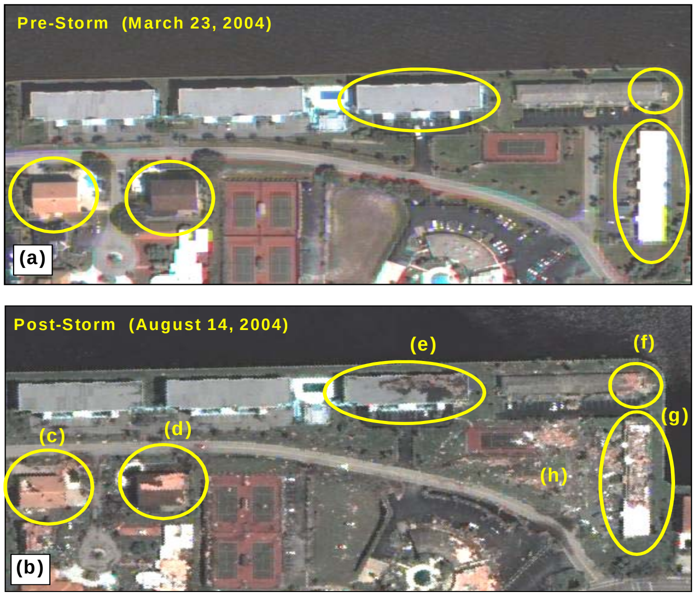

Figure 1. Comparison of pre- and post storm building conditions in satellite images, along with ground-survey photos. These QuickBird 61-cm natural-color satellite images of Punta Gorda, FL were acquired (a) five months prior to Hurricane Charley (March 23, 2004) and (b) one day after Hurricane Charley (August 14, 2004). Base imagery from DigitalGlobe, Inc. (www.digitalglobe.com).

Figure 1 (continued). Comparison of pre- and post storm building conditions in satellite images, along with ground-survey photos. Ground-survey photos demonstrate: (c) partial roof deck failure (combined internal and external pressures); (d) shingles partially removed but deck intact; (e) scoured roof gravel (not visible from ground survey); (f) partial roof structure failure; (g) severe roof structure failure; (h) windborne debris from nearby building deposited on parking lot, roadway, and tennis court.

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plinary Center for Earthquake Engineering Research and the Natural Hazards Center:

http://www.mceer.buffalo.edu/research/Charley/Charleyscreen.pdf
http://www.colorado.edu/hazards/qr/qr168/qr168.html.

This data set formed the basis for the investigation of manual and automated windstorm damage to buildings using remote-sensing imagery. Arn Womble's doctoral dissertation *Remote-Sensing Applications to Windstorm Damage Assessment* (TTU, 2005) provides an assessment of current and emerging remote-sensing technologies and their use in windstorm damage detection. It establishes a framework for the application of remote-sensing technologies for windstorm damage detection, including a guide for visual interpretation of damage and procedures for quantitative measures of building damage assessment and debris quantification using (1) image change-detection techniques applied to before-and-after digital imagery and (2) correlation of remote-sensing change signatures with field-based damage observations which will eventually help achieve automation of rapid windstorm damage assessment. The Remote-Sensing Damage Scale for Residential Buildings (Table 1) illustrates the description of building damage from a remote-sensing perspective.

Opportunities are abundant for continued research into the remote sensing of windstorm damage. Remote-sensing technology is progressing rapidly, enabling wind engineers to gain more rapidly gain information about the damage scene. Finer satellite image resolutions are quickly coming online. Active systems (systems which send signals and measure returns), such as microwave synthetic aperture radar (SAR) and light ranging and detection (LIDAR), show great opportunities for detecting damage in various light and weather condi-

Table 1

Damage Rating	**Most Severe Physical Damage**	**Remote-Sensing Appearance**
RS-A	No Apparent Damage	• No significant change in texture, color, or edges • Edges are well-defined and linear • Larger area of roof (and more external edges) may be visible than in pre-storm imagery if overhanging vegetation has been removed. • No change in roof-surface elevation.
RS-B	Shingles/tiles removed leaving decking exposed	• Nonlinear, internal edges appear (new material boundary with difference in spectral or textural measures). • Newly visible material (decking) gives strong spectral return • Original outside roof edges are still intact. • No change in roof-surface elevation.
RS-C	Decking removed leaving roof structure exposed	• Nonlinear, internal edges appear (new material boundary with difference in spectral or textural measures). • Holes in roof (roof cavity) may not give strong spectral return. • Original outside edges usually intact. • Change in roof-surface elevation. • Debris typically present nearby.
RS-D	Roof structure collapsed or removed. Walls may have collapsed.	• Original roof edges are not intact. • Texture and uniformity may or may not experience significant changes. • Change in roof-surface elevation. • Debris typically present nearby.

NOTES:

- Damage states apply to individual roof facets rather than the full roof.
- For all damage states, the presence of debris can indicate damage to walls, doors, and windows, which is not directly visible via vertical, optical imagery. Independent verification is necessary for such damage.

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tions, by measuring building forms (3-D surface data) and textures (distinguishing relatively smooth building surfaces from rubble and debris).

In August 2005, Hurricane Katrina provided the opportunity to explore the juxtaposed damage signatures of wind pressures and storm surge, again by combining remote-sensing imagery with field investigations. NOAA aerial images acquired along the Mississippi coast in September 2004 and again in August 2005 (Figure 2) give an example of the remote-sensing signature of storm-surge debris. Continuing research work targets the expanded use of remote-sensing technologies for the investigation of wind-pressure as well as storm-surge damage.

(a) September 2004 (b) August 2005

Figure 2. Comparison of 37-cm aerial images acquired before and after Hurricane Katrina shows storm-surge and wind-pressure damage in Gulfport, Mississippi (digital aerial imagery from NOAA's Remote Sensing Division).

This research was conducted with the welcome support of the National Science Foundation (SGER 0454564 and TTU IGERT Fellowship for Wind Science and Engineering 0221688), the Multidisciplinary Center for Earthquake Engineering Research (NSF Award #EEC-9701471 for related support in development of the VIEWS™ software), the Natural Hazards Research and Applications Information Center Quick Response Program, and DigitalGlobe, Inc. (QuickBird satellite imagery).

Failed road sign (used to determine local gust wind speeds)

(continued from page 1: The Effects of Cyclone Larry)

the Queensland coast (Region C) in the Australian Wind Actions Standard is at the Category 4 level. A Category 5 cyclone has never previously been recorded as crossing the Queensland coast.

For the general maximum gust wind speeds of 50-60 m/s (10 metres in open terrain) seen at locations near the eye wall of the cyclone, the performance of newer structures (built since Cyclones Althea and Tracy in the 1970s, and Winifred in 1986 (also affecting the Innisfail area) was generally satisfactory. However, some newer houses on a ridge in East Innisfail had failed – probably due to the lack of account of the topographic speed-up effects, as required by AS/NZS1170.2.

(Left) Good performance from a new elevated house, East Innisfail
(Right) Near complete destruction of high-set house, East Innisfail

Many older buildings had failed, however; the failures were very often attributed to the development of high internal pressures, resulting from debris damage to window glass, or the failure of roller doors due to direct wind pressure. The latter has been of particular concern to the Standards Committee for some time, and it is currently considering an amendment to AS/NZS1170.2 *requiring* roller doors to be treated as dominant openings for internal pressure assessment. This would be applicable to all types of extreme winds, not just cyclones. Unfortunately roller doors have a very poor track record in extreme wind events; John Holmes believes that it should be possible for manufacturers to supply cyclonic resistant locking/retaining systems for roller doors.

Prevention of debris generation due to roof failure of older buildings, and of small structures, such as garden sheds was important, as large debris items, flying at speeds approaching cyclonic wind speeds, had the potential to cause failure of newer buildings, that had themselves been correctly designed for wind loads exceeding those experienced.

The performance of engineered non-building structures was generally good in Larry, with the notable exception of a chimney stack at the Mourilyan Sugar Mill. The latter was apparently suffering from corrosion. Interestingly the chimney was equipped with helical strakes. The latter are effective at mitigating cross-wind vibrations at low-medium wind speeds, but would have significantly increased the wind loads during the Cyclone, because of the increased drag coefficient. Failure of some small communications towers, including a mobile telephone tower were also observed during Larry.

Collapsed chimney stack – Mourilyan sugar mill

An Update on the "Three Little Pigs" Full-Scale Testing Facility

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University of Western Ontario, London, Ontario

Background

The "Three Little Pigs" research project was developed to examine all aspects of house construction, including wind and snow loads, effects of wind-driven rain, heat and moisture movement through the building envelope and mould growth. The Canada Foundation for Innovation, Ontario Innovation Trust, the University of Western Ontario and corporate donors funded the $6.8M facility in 2004. This brief note is intended to provide an update on the progress over the past two years.

The overall, long-term objective of the research is to develop anticipatory mitigation strategies to save people's homes from the destructive environmental forces of nature. Houses are complex structures because, from a structural engineering point of view, the load paths are ill defined, and, from a building science point of view, the moisture paths are ill defined. The structural system is also the environmental barrier since the walls consist of bricks or siding, a vapour barrier, structural framing and the interior wallboard meaning that the system behaviour can only be understood by examining both of these aspects. In addition, both aspects need to be considered in the development of mitigation strategies and in the design of new products and retrofits. It is intended that research results from the project will be implemented by: (1) modifying building codes to advance safer, yet less expensive houses; (2) working with the insurance industry and government to develop implementation strategies; (3) developing cost-effective mitigation devices for retro-fitting the existing housing stock; (4) working with manufacturers to develop wind and rain resistant building products; and (5) developing quality-control strategies to minimize human error in construction.

Construction of the laboratory space was completed in Fall 2005 at a site at the London International Airport, London, Ontario. Figure 1 shows a photograph of the "hangar" building, as we are calling it. The hangar building is mounted on rails so that it can be moved to allow the house (seen inside, under construction) to be exposed to the natural environment. When the large, bi-fold door is opened completely, the hangar can slide past the house. The house is constructed to current Canadian standards, including climate control. The west wall of the house, the one in view in the photograph will be instrumented with heat, moisture and mould sensors to evaluate its performance over the winter of 2006-7. Figure 2 shows a photograph of the house, with the brick being installed by students from Fanshawe College, London.

Figure 1. The hangar building covering the first house specimen (under construction).

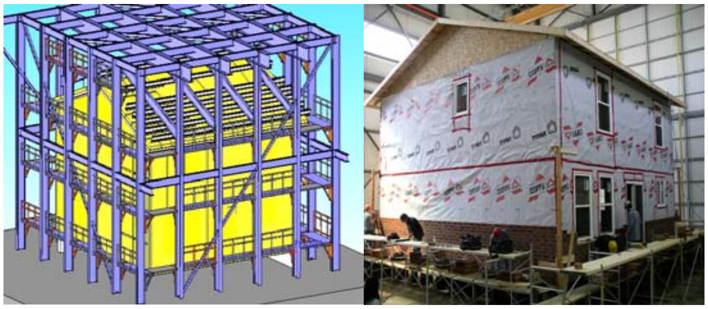

Figure 2. 3D CAD drawing of the two-storey test house with the reaction frame surrounding it (left) as well as a photograph of the house in May 2006 (right).

Wind Loads

The project will permit the application of realistically simulated temporally- and spatially-varying wind loads to full-scale structures, in a controlled manner, up to failure. The idea is simple: rather than instrumenting a house and waiting for a hurricane to come, or building an enormous wind tunnel capable of housing a full-scale structure, we are replicating the basic effects of wind blowing over a structure, that is, we simulate the resulting fluctuating pressures. Basically, a scale model of each full-scale specimen is tested in a boundary layer wind tunnel to determine the time histories of the pressures experienced over all of the exterior surfaces of the building. These time histories are then converted to full-scale and applied to the building with a loading system. This idea has been used before, in the testing of panels, with a system developed by Nick Cook and associates at the British Research Establishment. The resulting panel testing system was called BRERWULF and it could apply spatially-uniform, temporally fluctuating pressures over a

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segment of cladding or roofing. The idea of spatially-varying loading using wind tunnel data was first developed by Ralph Sinno and colleagues and Mississippi State University using a magnetic loading system that applied point 'suction-type' loads at 34 locations. The current methodology is essentially these two ideas put together into a single system. The major differences with the previous experiments are that (i) every building surface will be covered (except soffits and fascia) and (ii) the large leakage flows through typical cladding materials, such as bricks and siding, will be accommodated. Note that both the metal roofs tested at Mississippi State and the metal panels tested with BRERWULF were nominally sealed in contrast to the typical porosities around windows and doors or siding. The new system is much more compact to allow high spatial resolution in regions where the pressures have high gradients, such as windward corners of the roof. Each loading actuator will have one input pressure trace to replicate, the pressure traces coming from the wind tunnel study.

Figure 3 shows a time history of pressure from a 0.36 m^2 area near a roof corner, obtained from a wind tunnel experiment and scaled for a full-scale 3-second gust speed of 360 km/hr (i.e., extreme Category 5 conditions). This is a typical 10-minute segment of a pressure trace that a pressure loading actuator, for that area, must be able to replicate, and which the prototype loading system has already replicated to within 2%. The particular challenge, quite beyond what the BRERWULF system could accomplish, is to do this with high leakage flows. The requirements for the peak attainable pressures and flow rates are given in Table 1, as well as the required frequency response of the pressure loading actuators to smaller (1-2 kPa) fluctuations. Figure 4 shows a photograph of two prototype pressure loading actuators connected to pressure boxes.

Houses are complex structures because of their highly redundant and vaguely defined structural systems. For example, resistance to lateral movement is largely derived from the drywall nailed to both load-bearing and non load-bearing walls inside the house. The Three Little Pigs Facility will generate necessary data to validate the next generation of computational analyses of houses that will accurately predict behaviour up to failure. Full-scale component tests, and even the static loading of complete structures, do not adequately predict true behaviour under transient peak wind loads that fluctuate dramatically over the surface of the building. Thus, the precise response mechanisms up to failure are not yet known. The pressure loading actuator system of the Three Little Pigs Facility offers the opportunity to "engineer the wind" and so apply rigorously controlled temporally- and spatially-varying loads to full-scale light frame components and structures in order to fully understand the complete structural system. This will allow accurate assessment of the relative performance of different forms and materials of

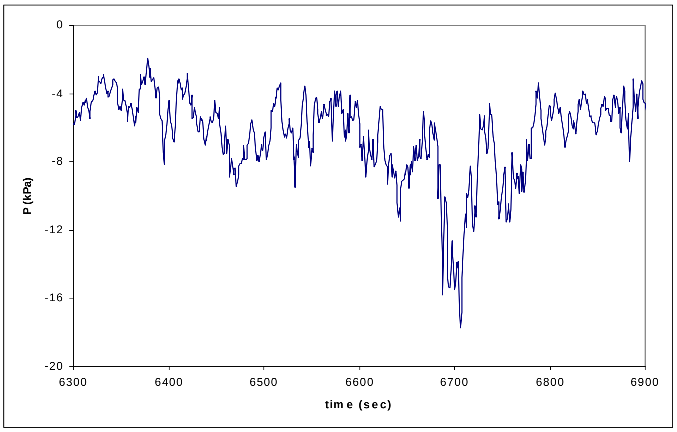

Figure 3. A 10-minute segment of the pressure acting on an area of 0.36 m^2 near a roof corner, scaled to a 10m, 3-second gust speed of 360 km/hr (200 mph).

Pressure Box Dimensions	Quantity	Max Pressure (kPa)	Min Pressure (kPa)	Leakage Flow Rates (m3/s)	Frequency Response (Hz)
0.6m x 0.6m	16	+5	-18	0.2	6
1.2m x 1.2m	36	+5	-15	0.7	4
2.4m x 2.4m	47	+4.5	-11	1.0	4

Table 1. Design specifications for the Pressure Loading Actuators and quantities for the first house tests

Figure 4. Photograph of two prototype pressure loading actuators connected to the (blue) pressure boxes, the flexible membranes connecting the PLAs to the house surface to allow the pressures to be applied.

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construction, and different connection details, and also the “calibration factors” for various component tests and then to relate these to the component response within the system. A panel testing rig is being developed in order to study pressure equalization and water penetration through different wall systems and to understand how standard ASTM-type tests under static, uniform pressures relate to real system behaviour under dynamic loading.

The steel reaction frame, constructed of modular components, that envelopes the specimen to facilitate the application of load to the roof, end walls and sidewalls and transfer these loads to a strong floor. Parts of the steel frame are removable and adjustable to suit the configurations of different test specimens. The reaction frame, shown in Figure 2, is being erected in June 2006. In order to measure how the load is transmitted through the structure to the ground, a system of load cells is installed at the base of the house to record the load distributions, and so verify and validate computer analyses of the structural behaviour.

Concluding Comments

The new facility has been designed and built. The novel pressure loading actuators have been proven to work as desired and are currently being manufactured. The first tests will be on wall panels in August 2006. Thermal and moisture tests will be performed on the house specimen through this coming winter. The first structural tests on the house will occur in spring 2007.

Arthur N.L. Chiu (1929-2006)

A personal tribute by Alan Jeary

It is with deep sadness that I write of the death of Arthur Chiu. Art was not just a wind engineer, but he was (and this will come as a comfortable warm feeling to all wind engineers), a friend of wind engineering. I personally counted him as a friend, but I really mean this in the larger sense, he was a person who was easy to talk to; easy to get on with, and always had a perspective that was breathtaking. This didn’t just apply to his professional colleagues; it applied to his students too.

On the 28th January of this year I received an email from his son Greg, saying that Art had had a stroke. In fact, it had been a massive stroke. Art was an emeritus professor at the University of Hawaii at Manoa, and as was usual, he had been talking to a student late into the evening. As he made his way through the car park after the meeting he collapsed, and never recovered consciousness.

The career of Art Chiu spanned more than 4 decades, and he was one of the leading lights in wind engineering worldwide. During the vast majority of this time (42 years) he worked at the University of Hawaii at Manoa. He worked ceaselessly with students, to make them (where they had the ability) to become good engineers, and to help them in finding employment in local and mainland companies. To those who were not going to make good engineers, he helped to identify where their real skills lay, and helped them to find other fields in which to develop their talents.

He produced his PhD dissertation in 1961, and at a time when wind engineering was just poised to enter the modern era of understanding, he investigated not just the gustiness of the wind (which he termed ‘wind pulses’), but also the dynamic effects on structures. Indeed it was in the international arena, working with the effects of wind on structures, that he made an enormous impact.

He was an early pioneer of making full-scale measurements, and played a very large part in validating methods of testing structures in wind tunnels. Without such a validation, the correlation between predictions and real responses were, potentially, so poor, that the entire exercise would otherwise have been futile.

Being based in Hawaii, it became evident to Arthur, that there was a considerable amount to be gained from a full research cooperation between the US and Japan. Together with Dr. Hatsuo Ishizaki, he set about arranging for regular US-Japan conferences on wind engineering. The results of this cooperation have been enormous, with engineers on both sides of the Pacific newly enthused with ideas after each round of conferences.

Arthur became heavily involved with hazard mitigation. This involved work on both wind and earthquake problems, and as President (1996-2002) of the Applied Technology Council (ATC), he made sure that current research was passed quickly to practitioners, rather than waiting for codes of practice to reflect the new knowledge.

Arthur was the epitome of the perfect engineer/academic. He managed to appreciate both sides of the coin, and to provide a brilliant link between the theorists and the practitioners. His attention to detail was legendary.

His family, but especially Greg, his son, arranged for a ‘celebration of life’ in Honolulu in March of this year. It was a large event, and it included guests from all over the world. It was very apparent that Arthur Chiu had left a large impression on many people throughout his life. People spoke of all aspects of his life, his early years, his difficult life in the war years in Singapore, of his degree and his guest teaching at the University of Hawaii, where they made him an offer he simply couldn’t refuse. He was then based there for the rest of his professional career.

Arthur’s life was structured around his professional pursuits – being available for students, being involved with codes, funding and with Chi Epsilon. He served as the National Chair of Chi Epsilon, as a Member of the Board of Directors of the Applied Technology Council, and Chair of the National Research Council’s Committee on Natural Disasters. In 1982 he was awarded the University of Hawaii Award for his accomplishments

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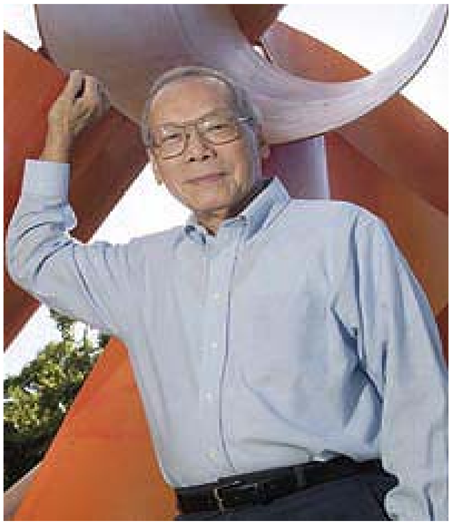
as a teacher and the Hawaii Council of Engineering's Lifetime Achievement Award.

Arthur and I had met several times at conferences in various parts of the world. The professional relationship soon grew into a much deeper friendship, as we were drawn together from a common interest in the way structures behaved in the wind, rather than as being in the aerodynamics area of the subject. At the last wind conference, in Lubbock, Art and I were constant companions, interacting especially with the Japanese colleagues that he had worked with so often over the years. He was there when I met Yvonne who I would later marry.

Greg, his son, and I also got on extremely well, and formed a company that works on Structural Integrity assessment. The advice of Arthur, in the background, was always welcome, had enormous perspective, and was always well received. After I had delivered a short speech, at the Celebration of life, I received a handwritten note from Greg, to thank me, and when I commented on how much it meant to receive thanks in that form, Greg told me that the touch was a product of his father. The very personal touch spoke volumes of the effect that Arthur Chiu had not only on the people he met and interacted with, but also on the generations to come. It is one of the highlights of my life to have been the 'meat in the sandwich' of the "Chiu, Jeary, Chiu" paper.

Arthur, we will miss you, your dedication, your warm good humor, and that enigmatic smile, and wind engineering is the poorer for your absence.

Aloha.



Art Chiu

A tribute by Ahsan Kareem

Arthur N. L. Chiu, a professor emeritus at the University of Hawaii at Manoa, passed away on January 30, 2006. Art was a native of Singapore; he earned his bachelor's degree from Oregon State University in 1952, a master's degree from MIT in 1953 and a doctorate from the University of Florida in 1961. His doctoral studies involved full-scale measurements of towers, an interest which he continued through his long, illustrious career at the University of Hawaii, where he taught a total of 42 years. During 1966-68 he served on the faculty of Asian Institute of Technology in Bangkok, Thailand. He also held administrative positions at Hawaii that included Chair of the Department of Civil Engineering and Associate Dean. He retired from Hawaii in 1995, but remained very active in professional societies and maintained regular office hours when he was in Honolulu. His professional involvement included service as the National Chair of Chi Epsilon, Member of the Board of Directors of the Applied Technology Council, and Chair of the National Research Council's Committee on Natural Disasters. He was awarded in 1982 the University of Hawaii Award for his accomplishments as a teacher and the Hawaii Council of Engineering's Lifetime Achievement Award. For those of you who entered the world of wind engineering around my time may recall that he edited a publication called the Wind Engineering Digest under the auspices of then WERC (Wind Engineering Research Council), the predecessor of AAWE. He is survived by his wife, a son (Dr. Greg Chiu) and a daughter.

On a personal note, I arrived at the University of Hawaii as an East West Centre (a Fulbright Program) scholar in August of 1971. I did not have the opportunity to meet with Art or to take any course from him as he was in the Dean's office during that period. I was introduced to him by Dr. Jack Cermak (my doctoral advisor) at Colorado State University in perhaps 1974, during his visit as a seminar speaker. Art was very kind to remember me from Hawaii. It was a beginning of a great friendship in which we always kidded with each other. He was very generous with his time and served as my advisor and a confidant from personal matters to the politics of academic world. I can vividly recall his telephone calls from Honolulu at the end of our day as he began his ….. those calls are being missed.

We served for an extended period on the Committee on Natural Disasters of the National Research Council, which brought us together twice a year. He always had very insightful contributions to these meetings and people sought his opinion. Full-scale measurements were his main interest from his doctoral studies in Florida to measurement programs in Taipei and Honolulu. He made major contributions in these areas, as full-scale measurements are perhaps the most challenging research fraught with uncertainties and things beyond one's control.

On a flight from Madras to Delhi, we went through very rough weather, and I kept on nudging Art about the severity of the storm and possible consequences as he was sleeping or trying to. He finally said jokingly to me to settle down kid the plane is not going anywhere as long as the Indians do not know that you (a Pakistani) are aboard! Upon arrival in Delhi for the International Wind Conference in 1995, searching for a room in Samrat Hotel was a real undertaking (We went through several rooms but did not like any!). The manager finally gave Art a bunch of keys so we could find a room we liked. Since my early days in academics, Art

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criticized my sloppy handwritten multi-color transparencies. I am delighted that he finally gave me thumbs up in April 2005 at Structures Congress in New York. He told my student that her slides were great and left the room and then came back and advised her against the use of red, as it is hard to read from distance. A perfectionist… wasn't he! This trip to New York also gave us, and our families, the opportunity to have dinner together, kindly hosted by Les Robertson and his wife. Later last year, I had the pleasure of Art's company for the last time in Baton Rouge for the Americas Conference on Wind Engineering.

Before closing, I must add that Art acted as a great physician for us as well. During long travels, when one felt a little slow or when there were early symptoms of cold, Art always insisted that we took vitamin C, which worked miracles for us.

I can go forever remembering our interactions, but I recall what Art would have said now… "Time is over kid," while waving his hands (this was our signal in conferences for me to wind up my presentations that went often beyond allotted time, especially when the transparencies started flying, making the audience dizzy and the contents lost their coherence!)…May his soul rest in peace as he has left us with great memories!

Mahalo!

Ahsan Kareem
Notre Dame

President's Corner

It's been a busy year. Following on the heels of a successful America's Conference on Wind Engineering in Baton Rouge, I was invited to testify in late June before the Senate Subcommittee for Disaster Prevention and Prediction, representing LSU, ASCE, and AAWE. A significant focus my testimony and remarks focused on the need for congress to appropriate funds for the authorized but as of yet unfunded Wind Hazard Impact Reduction Program. Tim Reinhold also testified before this same panel. Several current and past AAWE officers and board members met in July in Washington (kindly hosted by Jim Rossberg) to plan further strategy to get the wind program funded.

Then came Hurricane Katrina in August, which destroyed much of southeast Louisiana and coastal Mississippi and Alabama, followed several weeks later by Rita, which took care of the rest of Louisiana and southeast Texas. Researchers from Texas Tech, Colorado State, Louisiana State, and Clemson teamed up to submit a series of coordinated proposals under the AAWE umbrella to the National Science Foundation to committed to provide matching funds for a workshop and miniconference to bring together researchers and their results. Unfortunately NSF funded only one of the proposals. The Senate Subcommittee on Disaster Prediction and Prevention called me back to testify again about what happened and how to prevent it in the future. Again—a major theme of my remarks was the importance of funding the wind program.

Spring 2006 saw the formation of a National Science Board committee to formulate policy recommendations for national needs in Hurricane Science and Engineering, for both the White House and for NSF itself. Bogusz Bienkiewicz attended the second meeting in Colorado. I made a presentation at the third and final committee meeting in Florida in April. Forrest Masters and Chris Letchford were also in attendance at this meeting. Unfortunately, most of the focus of these meetings seemed to be on meteorology and social dimensions of disasters. As AAWE representatives, we did our best to emphasize that the main problems to be solved were with the built environment.

One of the regrettable casualties of Katrina and Rita was the AAWE newsletter. We've been so busy here in Louisiana with storm response and reconstruction issues that I had no time to pull it together. My thanks go out to Leighton Cochran and others for getting this issue of the newsletter out, and to Leighton, Steve Cai, Mike Gauss and others for their work keeping AAWE running since the storms.

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- The advancement of science and practice of wind engineering.
- The solution of national wind engineering problems through transfer of new knowledge into practice.

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