BROWN

Brown University Faculty Bulletin

Volume XI/Number 1
Current Issue: January 2011

FACULTY BULLETIN
TABLE OF CONTENTS

JANUARY 2011

PAGE

EDITORIAL INTRODUCTION

Peter Wegner and Peter Richardson
Editors

This issue has been published late because the number of articles submitted was smaller than usual. The article submitted by Maurice Glicksman, from his perspective as Provost Emeritus and University Professor Emeritus, entitled "Whither Brown?" is timely. His main question is a broad one: how are the faculties into which faculty members are appointed best organized for Brown, especially to continue attracting the balance between students and faculty to keep the spirit which provided the New Curriculum alive and effective? The Fall semester, now concluded, has been remarkable for the intensity of Faculty activity in addressing questions raised regarding details of promotion and tenure, and to revise the Faculty Rules regarding these. The process began in the previous academic year, and has continued with Faculty Forums and Faculty Meetings with unusually vigorous attendance with numbers present not merely covering the quorum requirements, but happily well in excess. A consequence for the Faculty Bulletin has been a shortage of articles submitted, and we hope that a substantial number of articles will be submitted for the next issue in April-May 2011.

Events other than the Faculty debates have been going on, however, including the passing late in November of Sir Maurice Wilkes FRS, who may not be familiar to many faculty, staff and students, but whose early and continuing contributions to digital computer technology have impacted every one of us through our use of digital computers today. While his career is clearly linked to the University of Cambridge in the UK, he also spent some years in nearby Massachusetts with DEC and he was an adjunct professor at MIT. Fortunately Peter Wegner has known him well from his time as a post-graduate student at Cambridge in the 1950s, frequently returning to visit him, and provides a personal memorial.

Professor Wilkes was elected to Fellowship of the Royal Society in 1956, and may well have attended the Convocation celebrating its 300th Anniversary in 1960; a description of this was given at Brown by Professor Evans, a discoverer of Vitamin E and known also for Evans Blue stain used widely in biology, who was a Foreign Member of the Royal Society and held a professorship at UC Berkeley. The 350th Anniversary of the Royal Society was celebrated with a Convocation in June 2010 in London, and Peter Richardson gives an eye-witness account of this in an article in this issue. In this he adds a description of a meeting he attended in July at the Royal College of Physicians, founded even earlier in 1518.

Peter Wegner has contributed a review about a book of considerable interest, by Stephen Hawking (born 1942, and who now has vacated the Lucasian Chair at the University of Cambridge, UK, by retirement), and Leonard Mladinow (a physicist turned to full-time authorship of books), written for the general public on *The Grand Design*. This title has some whimsy about it, as a thesis discussed in the book is that one does not need to invoke a divine being to ‘explain’ the universe as we know it, even in the theory of everything – Peter Wegner stresses that he believes it is very difficult to achieve even lesser goals, such as a uniform theory of computing, and is reserved about accepting M-theory while recommending the book for its up-to-date review of scientific principles.

Finally, Peter Richardson has contributed reflections on arriving at Brown from a rather different academic tradition, recounts some details of Brown 50 years ago and major issues such as the New Curriculum and the evolution of faculty governance here which have occurred since then, with some comments for future directions, all as part of collecting reflections about Brown as we go forward to our 250th Anniversary in 2014.

WHITHER BROWN?

Maurice Glicksman
University Professor Emeritus; Provost Emeritus

When I accepted Brown's invitation to join the faculty over forty year ago, Brown's Acting President Stoltz described a vision of a Brown seeking to emulate its neighbor Harvard in size but not complexity. Several years later Brown's Corporation stepped in with a term-limited "Watson" committee, whose recommendation to keep the size at its year-earlier level was approved. The addition of an MD degree was approved, but not a medical school, and the expansion of student body and faculty was halted.

Almost forty years have passed since those days of uncertainty. Brown has mounted and successfully concluded three major fund drives, the most recent one expected to achieve its goal of $1.6 billion by the end of 2010. Under Ruth Simmons' inspired leadership Brown University is in an expansion mode, having increased and improved its physical space, the number of undergraduate, graduate and professional students, and the size of the cohort of faculty to work with them. Brown continues to attract a large number of College applicants, who are anxious to benefit from the Brown curriculum.

At the core of Brown is its Faculty, organized in a large number of departments. The Medical Program has become the Alpert Medical School, with a School of Public Health on the books to come; the Engineering Division has become an Engineering School; there is a growing number of Institutes, among them the Watson Institute of International Studies, the Annenberg Institute for School Reform, the Joukowsky Institute for Archaeology, the Institute for Molecular and Nanoscale Innovation, the Institute for Computational and Experimental Research in Mathematics, and the Institute of Brain Sciences. There continue to be academic interdisciplinary Programs and Centers. Two professional schools not on the horizon are Law and Business, since the growth of entities has, until now, been based on maturation of strengths, rather than grafting on new areas from the outside. But Brown now looks like a complex institution.

The changes and new structures are also evidence of the creativity and innovation in the academic area. As one of the proponents for a robust interdisciplinary approach, I surely support the continuing signs of academic growth, with the bonus to our students of the opportunity for excitement at the very frontier of academic creativity. Although many changes are in the sciences, the Humanities and Arts Initiatives provide similar venues for those vital parts of a high quality University.

As we move forward, we also need to look at what Brown *is* and what kind of Brown we want it *to be* in the future. Brown has developed a reputation as an attractive school for undergraduates in part because of its curricular experimentation over many generations. The essence of the forty-odd-year-old New Curriculum is its expectation that the student will choose almost all of what she or he studies, with advice/counsel available. Despite a lack of many other collegiate followers, the faculty and the students continue to support this curriculum. Faculty members appreciate having students in their classes who take the course because they want to, not because they must meet some distribution requirement.

Brown is also attractive to undergraduates and graduate students because of the outstanding quality of its faculty. Faculty members are expected to teach both undergraduates and graduate students. I believe it is important in the hiring and promotion of its faculty, that Brown University continue to expect its faculty members to be so engaged.

And that is where the expansion and development of professional schools provides a challenge for the future: how are the faculties to be organized? This question needs to be addressed now, as the schools are developing, to ensure that what the Brown University Corporation, faculty, alumni and students want is what they will get.

It is often the case that funding flows more readily to the latest developments, and hence resources can and do build up in the professional schools. A fellow Ivy League university ran a capital campaign years ago that included the need for a large number of endowed professorships. The need was in their basic arts and sciences, but the donors wanted them in their business, law, and medical schools. The result: that campaign brought them very few arts and sciences endowed chairs.

I was once an advisor to a University with credible professional schools but an arts and sciences faculty less distinguished. Its governing Board and president wished to build up the University and sought advice on how to do it. The undergraduate student body needed to be increased in quality and quantity. To do so, that University had to slow down its build-up of the professional schools and build up its arts and sciences faculty. Without the strength in its core arts and sciences, it could not hope to attract the students of the quality desired.

In coming to embrace the right organization for the future, Brown University needs to make sure that neither of these scenarios plays out here. It needs strong initiatives well funded in the sciences in its core faculty departments, since it is often the sciences that tend to get swayed towards the professional schools. For example, moving the Medical School and its teaching to a satellite campus should not preclude continuing to strengthen the campus departments with life science attributes. And I would hope that undergraduates would find ways of interacting with faculty members using these satellite facilities, as they do now on campus.

Brown will need to use creativity in choosing how to organize the University faculty, but it will surely lose some of its value and attractiveness to students, faculty, alumnae/i and donors if it forgets its basic mission of service in the teaching of its students and the continuing exploration of scholarship at the frontiers. In spite of the many parts which make up the University, the members of its faculty must continue to place their loyalty to Brown University first, ahead of their departments, programs, centers, institutes or schools. I look forward to seeing this new template for greatness that Brown University will develop for the complex institution it has become.

A PERSONAL APPRECIATION OF SIR MAURICE WILKES

Peter Wegner
Emeritus Professor of Computer Science

Maurice Vincent Wilkes, born June 26, 1913, died in Cambridge, England on November 29, 2010, at the age of 97. He read mathematics and physics at Cambridge in the early 1930s, worked at the University's Cavendish Laboratory, and was involved in improving the efficiency of radar during World War Two, thus contributing to the British defense against German bombers.

In 1945, Wilkes became Chair of the Cambridge University Computer Laboratory. He built the first British computer (the EDSAC) in 1949, based on proposals by John Mauchly, Presper Eckhert, and John von Neumann at the Moore School of the University of Pennsylvania. He was elected a Fellow of the Royal Society in 1956, was the first President of the British Computer Society from 1957-1960, and received numerous awards for his work on computing, including the US Turing award in 1967. He retired from the Computer Laboratory in 1980 at age 67, and worked for several years at the Digital Equipment Corporation in the United States, returning to Cambridge as an Emeritus professor in 1986. In recognition of his services to computer science, Maurice Wilkes was knighted by the Queen in the 2000 New Year Honours List. He remained in Cambridge until his death in November 2010.

My personal acquaintance with Maurice Wilkes dates back to the 1950s, when Douglas Hartree, while lecturing on computers at Imperial College London, invited me to work on the EDSAC in the summer of 1953 on my graduation from Imperial College. This led to my becoming, in 1954 one of three students to take the first-ever postgraduate diploma in Numerical Analysis and Automatic Computing. Wilkes, who was my supervisor, asked me to write historical papers on Leibniz and other early contributors to models of computing. My thesis, "Programming for the EDSAC", describes my mathematical research on differential equations for the K-electrons of mercury and EDSAC's method of computational problem-solving, focusing on the EDSAC's support of both problem solving techniques and the emerging model of computing.

During my year at Cambridge I attended a course on quantum physics and went to tea at the Cavendish laboratory where I talked to physics students. I also became interested in the ongoing research on biology and visited the laboratory where Crick and Watson's work on DNA was being exhibited soon after their discovery of the double helix in 1953. On one occasion, a fellow-diner whom I encountered at a local restaurant turned out to be Professor Crick.

I continued to interact with Maurice Wilkes during my academic research in the USA, and in the 1980s invited him to lecture at Brown University on his work at the Digital Equipment Corporation. I visited him frequently after his return to Cambridge -- most recently in 2007, to take afternoon tea with him and his wife Nina (Lady Wilkes) who died in 2008. On that occasion, Maurice (then aged 94) drove me five miles to the station to catch the train back to London.

Wilkes wrote several valuable books on computer science. His first book (with David Wheeler and Stanley Gill in 1951) on the preparation of programs for digital computers, was among the first to discuss computer libraries and debugging, and was widely studied in my Cambridge research course. He kindly sent me copies of his later books soon after their publication, including his book on time-sharing in the 1970s and his personal biography in the late 1980s.

Our discussions included an analysis of Alan Turing, about whom we both wrote during later years. Sir Maurice had been Turing's fellow-student at Cambridge in the early 1930s, and was aware of Turing's failure to construct a computer in the late 1940s, when Wilkes built the EDSAC. Wilkes' assertion that Turing was a brilliant theorist but weak in his management of those who were building the machine was criticized by Turing enthusiasts, for whom Turing could do no wrong; and Wilkes was sympathetic to my view that Turing machines, though a useful model of the 1930s did not constitute a complete model for all forms of computation. This matter is still open for discussion, and in 2008 Springer Verlag published my book on Interactive Computing, with articles by eighteen well-known colleagues on open-ended questions about the nature of computing. Wilkes's contributions to computer science were impressive and wide-ranging. The computer discipline has now existed for over 50 years. Sir Maurice Wilkes will be remembered as one of its principal founders, who lived longer and contributed more than many others. I feel honored that Maurice was both one of my early mentors and a continuing acquaintance over many years.

THE ROYAL SOCIETY OF LONDON AND ITS 350TH ANNIVERSARY CELEBRATIONS

Peter D. Richardson
Professor of Engineering and Physiology

On January 4th, 1961, I attended a lecture given by Professor Emeritus Herbert M. Evans (from Berkeley, CA) in the Special Collections Room of the John Hay Library on "The Role of the Royal Society of London and its Tercentenary Observation" – Prof Evans, a Foreign Member of the Royal Society, spoke with great enthusiasm about the history and vigor of the Royal Society. At the time I did not know why he had been elected a foreign member, or even what was required to qualify for that[1]. My PhD thesis advisor at Imperial College London, Professor Sir Owen Saunders, had been elected a Fellow in 1958 when I was in the writing stage of my engineering thesis, and I recalled congratulating him at the time. I knew that very few engineers were elected each year – usually not more than two or three.

I was very impressed that the Royal Society planned such observances, including a Convocation of Fellows and Foreign Members, to occur at 50-year rather than 100-year intervals. Otherwise, because many Fellows are elected well into their careers, some would not have a chance to attend such a celebration in their lifetimes. An esteemed professor of mine at Imperial College, Sir Hugh Ford, was elected a Fellow, but despite living to 96, he passed away a month before the most recent Convocation.

Attending the lecture in 1961, I had no idea I might attend the 350th anniversary celebrations myself. But 25 years later I was elected a Fellow, and thus was privileged to attend the 2010 celebrations. A highlight was the Convocation of the Fellowship held on June 23rd 2010 at the Royal Festival Hall. So many were attending that we were not sent individual name badges, but instead we had been sent *boutonnieres*, rather like those used for members of the *Legion d'Honneur*. In our Admission ceremonies we had each signed *The Obligation of the Fellows of the Royal Society,* as recorded in the great Charter Book. *The Obligation,* inscribed at the top of every page except those for Royal Fellows, includes our promise to attend the meetings of the Society, *especially upon extraordinary occasions.* This was clearly one such - so here we were.

---

[1] In preparing this essay I checked out the research that had made Prof. Herbert Evans famous. This included the co-discovery (with Katharine Scott Bishop) of Vitamin E -- described in a Science article in 1931 (before I was born) -- and also credit for developing the Evans Blue dye used in clinical or biochemical experiments to avoid unwanted side effects. I had used Evans Blue for diverse purposes without ever realizing that I had met the actual Evans for whom it is named. In view of the vast scope of the sciences, I find such coincidences interesting, as well as illustrating the enduring value of such research discoveries, a modesty inherent to most scientists directs people's attention more to the discoveries than to the discoverers.

The doors of the Festival Hall would not open until 2 pm and the proceedings would not begin until 3:30 pm, but it was a splendid sunny afternoon, and many who had arrived early strolled or sat nearby on the South Bank with their guests. There was tight security for the event, and when I moved towards the entrance I noticed one young man being ejected by five guards. We had all brought ID cards that had been provided along with tickets for assigned seats. Once these had been checked we could browse through the Summer Exhibition and chat with friends, or join the steady trickle of Fellows and designated guests to the seating located on the upper level.

I had been assigned an aisle seat about one-third of the distance from the front, which I regarded as an ideal location. We had been asked not to photograph the proceedings for obvious reasons. The stage had been set with a table at the front center – this was the very table used by Robert Hooke for demonstrations for the early Fellows, and for performing experiments. There were two speaker's stands, set off at the sides, with two tall and splendid floral displays. Arrayed across the stage were two rows of chairs, whose backdrop displayed five paintings from the Royal Society's portrait collection. Above these, in an arc behind the main stage, were two curved rows of seats, used on this occasion by the London Philharmonic Orchestra and Choir, all dressed in black. More centrally above the stage were two large screens for video displays.

To my surprise, above us floated three large, shiny, silvery creatures -- two penguins and a stingray. Steered by remote control, they were propelling themselves. I thought this made a good visual pun, by combining the physical and biological sciences into which the Royal Society had long divided its members (the A stream for the physical sciences and the B stream for the biological Sciences) in both Philosophical Transactions and Proceedings of the Royal Society. In the past 50 years those streams have intermingled. I recalled a moment in the Imperial Senior Common Room in the late1960s when Sir James Lighthill was asked if he was still the Physical Secretary (of the Royal Society) and had answered, "Yes -- very Physical," a tongue-in-cheek reference both to his size and to his approach to certain biological questions; he was then publishing papers on such issues as how fish swim from a fluid-dynamic point of view. We soon realized that the silvery stingray carried a video camera in its blunt nose, as the moving view it captured was shown in real time on the video screens. Besides the fact that this feat that would not have been possible 50 years earlier, there was the visual pun that we would be examining ourselves for what had changed during that time.

At 3:30 pm, the outgoing President, Lord Rees of Ludlow, made a short welcoming speech and then introduced Lord Bragg of Wigton, FRS, who gave a dynamic video presentation on the Royal Society and its 350th anniversary. Lord Bragg emphasized the many ways in which the Society currently supports science and scientists, underlining that it strongly supports the participation of women in the sciences as well as men -- consonantly with changes in society at large during the past fifty years. Throughout this 20-minute introductory portion of the program, the chairs on stage remained empty, with only the illuminated five portraits providing an added human presence on the stage.

A fanfare by the London Philharmonic then introduced the bearer of the Royal Society Mace. This dates back close to its origin 350 years ago, and is always present at Admission ceremonies; it was brought forth in procession onto the stage, together with the Charter Book, both items being displayed on the center table. Then came the members of Council, who filled the back row of chairs on the stage, and the royal party -- including HM Queen Elizabeth, Prince Philip, Princess Anne and Prince William -- who occupied chairs in the front row, accompanied by the President and Prof. C.N.R. Rao, FRS, who was to give the congratulatory address.

The President presented Prince William to be inducted as a Royal Fellow. Through the history of the Royal Society it has embraced in that capacity some members of the Royal Family. Like all Fellows, they sign the Charter Book, but do so on illuminated pages free of the *Obligation* that heads the pages signed by regular Fellows and Foreign Members. This maintains the connection of the Society with the Royal Family over the centuries; thus, its name does not merely reflect the granting of the original Charter by a monarch back in the 17th century. After the President's proclamation declaring the Prince a Royal Fellow, Prince William signed the Charter Book (left-handedly) with a quill-style pen. (I recall having done the same, realizing at the time that the material of the pages and the durability of the ink were designed to outlast the individual -- as indeed they have for the approximately 8,000 Fellows who have thus far signed the Charter Book). Prince William acknowledged his admission with a short acceptance speech of thanks and respect.

Then followed the principal speech, Lord Rees' 350th Anniversary Address. The text of this is available in *Notes and Records of the Royal Society*[2], so I will not attempt to summarize it. However, he did note that few, if any, of those present were likely to be present at the 400th Anniversary in 2060, unless unanticipated changes occur in medical science, and that of those present today, only HM Queen Elizabeth had been present also at the 300th Anniversary Meeting in 1960. He mentioned that the silver hand bell she had presented to the Society on that earlier occasion had actually been used to herald the ceremonial entrance on the present occasion.

The Royal Society has held a generously wide umbrella over scientists and engineers deemed eligible for election to the Fellowship. Scientists and engineers who have worked in the UK for at least three years, even if still holding foreign citizenship, can be candidates. This rule had permitted refugee scientists who fled Nazi Germany before WWII not only to be welcomed to high academic positions in the UK but also to be

[2] The Anniversary issue of Inside Science, for Autumn 2010, accessible on the Royal Society website, http://royalsociety.org/inside-science/ includes photos from the Convocation (some illustrating my verbal descriptions above) and other Anniversary events, links to anniversary journal issues completely free to access, and other links. Please see Notes and Records of the Royal Society, vol. 64, no.3, 20 Sept 2010, pp. 217-227 for texts of the speech of acceptance by Prince William; Address by the President, Lord Rees, Response by Prof. C.N.R. Rao, FRS, and Concluding Remarks by the President.

recognized by this national academy of sciences for their contributions -- a collegial generosity that may not have been highlighted as much as it deserved. Scientists and engineers from Commonwealth countries and the Republic of Ireland, although now governed autonomously, can also be candidates for Fellowship, as can British nationals working in other countries; so the world-wide population of those eligible by location is very large. However, the number elected each year is restricted by Society Statutes.

The broad international influence of the Royal Society was emphasized by Prof Rao in his speech of Congratulation. The text of this speech is available in full via the Royal Society, in "Notes and Records," a regular publication of the Society highlighting matters of historical interest (as mentioned below in the final Footnote).

The National Anthem was sung, after which a Recessional, again led by the Mace Bearer, took the platform party off the stage; and the attendees left the Hall to join in the Gala Reception and Summer Science Exhibition downstairs. This was so crowded that it was somewhat difficult for friends to meet -- but it also provided an opportunity to meet persons known by reputation but not previously encountered in person. Members of the Royal Party (attended by security personnel and official photographers) strolled around conversing with some of those present.

Many other events have been organized to support the 350th anniversary celebration. These have included recognition of 'local heroes', which help point out that notable scientists have started out in many different parts of the UK. The Post Office issued a set of Commemorative Stamps, celebrating 10 selected Fellows (including Dorothy Hodgkin, a Cairo-born British chemist credited with the development of protein crystallography) and reproducing their signatures from the Charter Book. The Festival of Science + Arts, a ten-day series of events in the Southbank Centre, commenced with the Convocation. Books, TV, radio and other media have all been used in outreach, and museums, both national and local, likewise participated. In the UK there has always been a level of public awareness of the Royal Society, possibly more than there is of the National Academy of Sciences in the US. I was reminded of this when my last remaining aunt died and I picked up her effects from the hospital; although I had never discussed my work with her, I found folded in a pocket of her purse the yellowed clipping from The Daily Telegraph that had contained the announcement of Fellows elected in 1986, she had obviously kept it handy for pointing out the name of her nephew to her friends and acquaintances!

Superficially, perhaps, the Convocation might seem to resemble a religious service or ceremony, especially in the Western tradition. There was a sort of altar (the central table), a carried symbol (the Mace), and a "sacred Book" -- also a processional and recessional accompanied by music. But the sacred book comprises only signatures to the *Obligation*, together with Royal pages, and gives no instructions or advice save for the motto of the Royal Society: *nullius in verba.* "Take no one's word for it." For the advancement of natural knowledge, one should not simply rely on a 'given scripture', but should examine carefully, with whatever experimentation may be needed. Very soon after its foundation, the Royal Society began publishing the *Philosophical Transactions,* with peer-reviewed papers. This helped define the intellectual mold of the Enlightenment. Our presence gave us the opportunity to reaffirm our desire for the good of the Royal Society, and the pursuit of "the ends for which the same was founded", as the *Obligation* puts it.

Let me conclude by noting that, by happenstance, another 350th anniversary celebration in 2010 commemorated the birth of Sir Hans Sloane, the only person thus far to have been both President of the Royal Society and President of the Royal College of Physicians (founded in 1518, nearly a century-and-a-half before the Royal Society itself). He had been a great collector, doubtless facilitated by his successful career as physician to royalty and the wealthy elite. His collection formed the basis for the British Museum and for the Natural History Museum in London. I was fortunate to be admitted in July as an Honorary Fellow of the Royal College of Physicians in front of the painting of William Harvey which had been rescued from the original premises of the Royal College before they were consumed by the Great Fire of London. Harvey himself died in 1657, a few years short of the founding of the Royal Society; I imagine he could have been a founding Fellow of that too, otherwise.

THE GRAND DESIGN:
STEPHEN HAWKING AND LEONARD MLADINOW, SEPT. 2010

Book Review, Peter Wegner
Emeritus Professor of Computer Science

The Grand Design, published after Hawking had resigned his professorship at Cambridge, expresses Hawking's comprehensive final model of scientific theory. Stephen Hawking, born in 1942, wrote his doctoral thesis on "Black Holes" under Roger Penrose in 1965-70, and served as Lucasian Professor of Physics at Trinity College Cambridge for 30 years from 1980-2010. His books include *A Brief History of Time (1981)* and *The Cambridge Lectures (1996),* which examine aspects of science to which he has contributed, while his new book *The Grand Design (2010)* focuses on universal models of scientific theory that go beyond unsuccessful attempts by Einstein, quantum theory, and string theory to establish a theory of everything. Leonard Mlodinow, Professor of Physics at Caltech, explores the views of Richard Feynman and other Caltech professors who present new scientific models.

Hawking presents M-theory as a theory of everything. M-theory is a family of different theories that express multiple scientific models, just as Mercator's projection in an atlas expresses multiple models of a complete world. To understand the universe, scientists need to know and explain not only how but also why it exists, including why there is something rather than nothing, why humans exist, and why the universe has laws of a particular form.

This book includes the chapters "They Mystery of Being", "What is Reality?", "The Theory of Everything", "Choosing our Universe", and "The Grand Design", which pursue the foundation of Hawking's comprehensive model of scientific design.

Greek reality, as defined by Aristotle, accepted the geocentric idea that the earth is at rest while the planets and the sun move around it. Ptolemy in 150 AD accepted that the earth was the center of the universe; and this was endorsed by Catholic Christianity, based on its interpretation of the biblical creation story in the Book of Genesis. But in 1543, Copernicus asserted that the planets moved around the sun. This was denied by the Church, which later (in 1630) prosecuted Galileo for contradicting Catholic beliefs. Rene Descartes concealed publication of a book on physics that supported Copernicus and Galileo. However Newton's *Principia,* published first in 1687 in a non-Catholic country, established a Copernican model of physics and developed a scientific mathematical theory that persisted until it was modified by Einstein's theory of relativity and Bohr's quantum theory in the 20th century.

Einstein's model initially accepted a static universe of stars and galaxies, but Hubble in the 1920s showed that galaxies were moving away from each other at a speed that increased with their distance from us. Newton thought light consisted of particles (corpuscles), but "Newton's Rings" suggested that light can be better described by waves in certain contexts and that light should be modeled by both particles and waves where the choice would be determined by the substance of the experiment. Many scientists claim that reality is model-dependent, in the sense that the behavior we observe may have different forms of specification, whose truths may differ legitimately in different applications.

Hawking examines the evolution of scientific programs in the 18th and 19th centuries aimed at developing a theory of everything. The science of electricity and magnetism was developed by Faraday's (1791-1867) experimental models of electromagnetism and later by Maxwell's (1831-1879) mathematical theory (Maxwell's Equations). The ether was proposed by Maxwell and others as a scientific medium for the propagation of light and electricity; but Michelson and Morley's attempt to measure the speed of light in the ether failed, and Einstein's theory of relativity (1905) suggested that the ether did not exist. Quantum theory in the early 20th century went beyond Einstein's relativity theory, claiming that the uncertainty principle changed human power to observe the universe. String theorists in the late 20th century proposed the specification of scientific models by strings rather than particles, but have been unable to develop experiments to prove their model correct. Hawking's M-theory is an extension of string theory that suggests that a theory of everything should include a large number of alternative models of the world, capturing multiple examples of potential universes of which our own universe is one relatively small example.

Our universe has many features that facilitate the support of human life. The circulation of our planet around a single sun contributes to our equitable temperature. Kepler's elliptical circulation theory (just 2% beyond circular) and the sun's temperature itself also comprise equitable conditions appropriate for human life. Hotter or colder temperatures, or higher or lower elliptical circulation, would weaken the quality of support for human life. Moreover, the distance from the sun to the earth is just right, creating a habitable ("Goldilocks") zone that can support the existence of water and the evolution of plants and animals.

The chemicals created in space after the Big Bang are (primarily) hydrogen, whose particles have just a single proton, with a smaller number of helium atoms that have two protons. To create the carbon necessary for life, stars combine three helium atoms to create a carbon atom with six protons. Stars containing carbon explode to create new stars like the sun and planets like the earth, which makes use of carbon to create human life. To support the creation of carbon from hydrogen by the explosion of stars takes more than 10 million years; and the universe has in fact has existed 13.7 million years following the Big Bang to create the chemicals and temperatures of our world.

The fact that our planet's structure contributes greatly to the support of life is asserted by various religions to be due to divine creation; but Hawking maintains that it is just one of billions of cosmological designs that happen to meet human requirements by serendipity. Many scientists believe that a single unified theory of everything could evolve, combining electromagnetic and gravitational theories of matter into a complete scientific model. Einstein spent the last 20 years of his life attempting to develop such a theory, but did not succeed. Quantum theory expanded relativity theory but likewise failed to develop a science of everything. String theory was developed in the late 20^{th} century as a potential theory of everything, but has not yet managed to provide a complete explanation of physical phenomena. Hawking proposes M-theory as a theory of everything, which supports multiple models for multiple applications, but he concedes that it has not yet been confirmed by observation.

In the final chapter, called "The Grand Design" the book explores John Conway's "Game of Life," whose board contains live and dead squares that can be changed by well defined operations: a live cell with two or three live neighbors survives, a dead cell with exactly three live neighbors becomes a live cell, all other cells die or remain dead. Conway's simple rules determine an interesting world of changing objects that can support intelligence, machine learning, and other forms of human behavior, suggesting that very simple forms of behavior can produce complex systems modeling human behavior. This suggests that the actual universe could create systems with human components having very simple laws.

A set of laws describing our world will have a concept of energy with zero energy for empty space, positive energy for particles, and negative energy for gravity. The theory of everything must be consistent and must predict finite results for quantities that can be measured. According to Hawking, M-theory is the only candidate that has the laws and properties to describe the universe. However, not all of its actual properties, such as finiteness and the ability to model fundamental particles, have yet been completely established.

Hawking believes M-theory is the grand design that provides a basis for a theory of everything to explain all scientific phenomena. I personally do not accept Hawking's view, in part because I do not accept his concept of a theory of everything. Hawking describes science as a theory for all possible universes that go well beyond the description of our world while remaining compatible with M-theory. I believe it is inappropriate to claim that potential scientific models going beyond our world should be classified as scientific.

We lack a comprehensive understanding of science because we cannot completely understand individual sciences, such as physics or even mathematics. As a computer scientist, I find it difficult to completely describe the discipline of computing -- especially as we do not entirely understand disciplines that have been around much longer. Our knowledge of the world is less perfect than we realize, and though our partial understanding of scientific facts is substantial, we cannot achieve a complete grand design of everything expressible by scientific disciplines.

If Hawking succeeds in establishing a complete theory of everything (which I believe to be unlikely), I will accept its validity; but I will maintain my skepticism until he conclusively establishes the accuracy of his beliefs. Despite my disagreement with his theory of everything, I find this book an excellent review of scientific principles, and strongly recommend it to readers.

COMING TO BROWN FROM THE U.K. 50 YEARS AGO: AN ACADEMIC CULTURE SHOCK

Peter D. Richardson
Professor of Engineering and Physiology

Approaching Brown's 250th anniversary (2014), it is amazing to reflect on the changes that have occurred in the past fifty years. I came from academic life at Imperial College, then part of the federal University of London, where from 1952 to1955 I experienced an undergraduate curriculum more liberal in some aspects than even the New Curriculum now at Brown. We matriculated as 'Freshers' (a deliberately gender-neutral term) - and, together with a distinctly international group of students, without registering for specific courses (as done here), we attended lectures, completed labs (our approved logbooks and written reports were required in order to register for the Part I exams at the end of the first academic year), and worked over problem sets, with each question listing the numerical results we would obtain if we completed it correctly. There were group tutorial sessions, the previous year's final exam questions were available for purchase at the university bookstore, and a technically skilled librarian helped us access our subject matter. It was our individual responsibility to register and prepare for the Part I exams -- administered at the end of the first academic year for six hours daily on four consecutive weekdays, plus four hours on the final weekday. (There were no make-up exams.) Successful candidates would be notified by receiving a printed pass list during the summer, bearing only the names of successful candidates. Gaps in the candidate numbers indicated those who had not managed to pass. No actual grades were assigned, nor were graded exams returned, although I believe a record of marks was kept – away from us.

We were also expected to select some "general studies" (a sort of distribution requirement), offered during lunch breaks in our fixed schedule of lectures, labs and tutorials (I chose poetry, music and so forth, as well as joining a University-wide Philosophy of Science group); we were not examined in general studies but were simply expected to complete them adequately for ourselves.

Gaps in the candidate numbers indicated that 39 per cent had failed Part I that year. However, our ranks were partially replenished during the second year by students, typically from poorer backgrounds, who had worked in factories and other practical settings while taking evening classes and had obtained Higher National Certificates with sufficient distinction to win scholarships and exemption from Part I exams. For instance, our professor of applied mechanics, Hugh Ford, had himself come from a humble background with a prestigious Whitworth Scholarship to attend Imperial as an undergraduate (and would attain additional distinctions, including a knighthood, before his death at age 96 in May 2010).

I noticed no widespread race, class, or gender discrimination in college admissions; during one term break I invited a dark-skinned south Asian, Tharmalingam, to my home in a Surrey village to work on a lab report we needed to complete. My mother was very concerned to cook food he would enjoy, and he was happy to be visiting a village outside

London (only later did I learn that one villager had asked if we were 'all right' after his visit!). Imperial College then had on-site accommodation (in the form of single rooms) for only about 10 per cent of the students; the rest had to rent rooms somewhere in the city -- except for a few who lived at home. Single-room accommodation was likewise the norm at other U.K. universities, so far as I could tell.

Academically, the second year was organized essentially like the first. For Part II of our "tripos" we continued not only with studies in our major field but also with general studies (music was an exceptional opportunity, as Gustav Holst's daughter Imogen was on the staff, and the Royal College of Music was located nearby; also the student union building was situated right behind the Royal Albert Hall). As before, no actual grades were assigned, and the failure rate I assessed from the pass list was now down to 25 per cent. We had an active Student Union, and managed the non-academic activities through two major committees, for athletic and social clubs respectively (for some mysterious reason, the Gliding Club was classified as a social club); but club activities were recreational and I don't think an individual's sports or other skills played any part in admission as a student – it might, however, be relevant throughout the country in applying for scholarships from local education authorities.

The third and final year of our tripos was marked by more flexibility. During two of the three terms (= trimesters) we could spend one day a week at the London School of Economics (which I elected to do), where a special program of courses had been established for us. Students then ranked in the upper half of the class could also spend a quarter of their time in "special tasks" (essentially equivalent to Independent Study in U.S.A.) which I elected to do, and we were also allowed to take 12 points' worth of various electives, knowing that while there would be exams in those subjects, only the six best points-worth would actually be counted towards our degree requirements. (This anticipated the spirit of the S/NC grade system later adopted at Brown, giving students the opportunity for some experimentation.) Also, for the first time in our studies, the exam results for those electives were posted, so we would know from which courses our six best points had come -- but none of that information appeared on our official transcripts, as none were issued.

In our final year, the Pass List assigned students either "first class honours", "second class honours", or "pass" degrees. Instead of transcripts, we received form letters from our Department Head, listing the course subjects we'd had to study, and select between. Of the 44 who had selected the same "major" as myself as freshers, 13 of us had managed to graduate together in the minimum possible time. The graduating group was augmented by those who had completed requirements by repeating a year or more in order to pass the various Part exams, and included students up to the age of 30. None of our assignments were graded, except in mathematics, and exams were graded by full-time academic staff with permanent appointments (few if any "TA"s were involved in teaching). Many of my classmates proceeded to distinguished careers; one later became Chairman of Rolls-Royce. (Our prime facilitator for outside job interviews had been a member of the departmental faculty with excellent connections in industry.)

Having been recruited into post-graduate study, I picked as my adviser Prof. Owen A. Saunders, who had come to engineering from a strong mathematical background. Largely due to the need to develop technology, he had worked first with a woman engineer, Margaret Fishenden, with whom he wrote a classic book on heat transfer, and later on the development of technology needed in World War II. Post-graduate research was largely Darwinian in its organization, self-reliance and self-criticism being expected, just as in the undergraduate years. In classic British style, a topic would be suggested, after which much was left to the initiative of the individual student -- including the building of equipment. My fellow students had a distinctly international flavor -- the group sharing the labs included an Egyptian, a Lebanese, a Turk, a Channel Islander, and a Welshman returned from years spent in Australia. Graduate courses were available in many subjects, and my selections included a course in computer programming, which was in a rather primitive state back then; I recall a grad student in aeronautics with a computer that used radio-style 'valves' (usually triodes) and could be thrown off very easily by random burn-out of any one of its numerous valves, and a grad student in mathematics whose computer – the size of a wardrobe! – persistently miscalculated a test square root! Today, looking back at the career of Sir Maurice Wilkes (who passed away on November 29, 2010 -- he had recently built the EDSAC computer at Cambridge when I was a student), I realize that we were entirely "state of the art" for those days.

From 1955, I held the position of "Demonstrator", the lowliest academic instruction title, assisting one elderly faculty member by tutoring solid mechanics and another by tutoring engineering drawing for chemical engineering students. One of the few controls over grad students was the requirement to submit the thesis title to the University of London at least one year before the thesis itself would be completed. Prof. Saunders, who in our discussions had shown me what it took to run the organization – during my visits to him in his office his personal secretary routinely brought in business involved in running the Department -- was elected a Fellow of the Royal Society while I was writing my thesis, a rare distinction for an engineer. He told me some of his unique experiences, such as being present at the first flight of a jet-propelled aircraft, together with a group of fellow engineers and scientists invited to witness the event; he mentioned with a chuckle (but without naming names) that some of them had not believed an airplane would be able to take off and fly without a propeller. He later became the Rector (i.e., president) of Imperial College and subsequently Vice-Chancellor of the University of London.

As students in the U.K., we were all aware of current international politics; our science base had been much enhanced by the immigration of distinguished German scientists fleeing Nazism in the 1930s, as well as by refugees with scientific backgrounds who trickled in during and after World War II, usually with fascinating stories of their escapes. A few students, including myself, had experiences of living a civilian life under periods of almost daily bombing; it took the life of a kindergarten schoolmate girl friend when she was 6. Students demonstrated against the Anglo-French invasion of the Suez Canal zone in 1956 and the Soviet invasion of Hungary soon after that. In practical terms, my most useful role in the latter conflict consisted of feeding coins to a refugee scientist who was telephoning home from one of the famous red public phone boxes to tell his family he had succeeded in reaching London.

Coming to Brown

In 1958 I was offered and accepted a position at Brown. After traveling to New York by ship, a voyage during which we encountered a hurricane (if you've seen the movie *Das Boot* you'll know how exciting that can be – I personally loved it) and taking a train from Grand Central to Providence, I was soon struck by the differences between British undergraduate education and its American counterpart. Students were expected to attend every class; there were physical education requirements, including a swimming test that all able-bodied students must pass; there was even a practice of photographing Pembrokers in their underwear, justified by the claim that this would help them develop correct posture! These requirements were truly extraordinary to me: admission and graduation in London required no medical exam or certificate at all. Furthermore, most U.K. students had already completed the equivalent of Brown's freshman year as part of their secondary school education. Also, our childhood experiences in World War II had led us to mature quickly -- and the foreign undergraduates from various European countries and further afield, exhibited a similar maturity. I liked the faculty advising role at Brown, which seemed to help avoid the wasted years experienced by some U.K. undergraduates for lack of counseling -- although at the same time imposing a degree of *in loco parentis* that tended to slow the attainment of maturity while at university. The awarding of course grades seemed to me to promote the idea of learning just enough to get by, rather than the concept of learning and knowing a subject well enough to be able to apply it responsibly at some defined level. Then there were distribution requirements, as well as the physical education requirements, to fulfill. Absent special permission, Pembrokers had to be back at their dorms by 10:30 PM -- otherwise their parents would be notified by telephone!

The Graduate School, by contrast, was run more efficiently than in the U.K. at that time. PhD students, no matter what their field of study, had to demonstrate reading proficiency in two foreign languages used in scholarly publications in that field. Graduate courses were offered in many subjects, and many graduate students in the physical sciences came from overseas because of the University's high international reputation in those subjects. Many science faculty members had European backgrounds, including the doyen of the physical sciences, William Prager, who came in the early 1940s from a professorship at Istanbul; and appointments and promotions were handled by the Physical Sciences Council. A regular daily meeting place for the physical sciences and applied mathematics faculty was Lloyd's, a coffee shop on Waterman near Brook Street; many research problems were scribbled on paper napkins there, and it was a place where many fruitful collaborations began. This recalled for me the tea rooms in U.K. university lab settings that hosted similar free-wheeling discussions seen in retrospect to lubricate many important research projects.

The IBM 650 in place when I arrived at Brown was soon replaced by an IBM 7070, (reportedly the fourth one ever made), and we soon learned that the compiler did not match the Fortran manual supplied with it -- so frequently reverted to programming in Autocoder, which was basically machine code. Numerical analysis skills were important, so I wrote an improved code for an iteration that had previously required four-and-a-half minutes to settle within the bounds of acceptable error; I produced a code that could execute within a quarter of a second with absolute convergence. To obtain an intelligible printed output from the computer's punched cards, one had to hardwire a patch-board rewired by previous users. Using a computer became essential for many papers I wrote subsequently.

As a fledgling faculty member I had of course been advised to "publish or perish"; I had received little mentoring in this, and explored the practices of different journals, discovering to my dismay that some accepted manuscripts could languish for up to three years before appearing in print -- which was not helpful, given the impending deadlines for tenure consideration. I had another incentive to publish: it was possible, with sufficient good publications, to apply for a Higher Doctorate from my *alma mater* (London) as these were "awarded for published work of a sufficiently high standard as would give the candidate an authoritative standing in his subject and in his particular field of research." This seemed useful should I ever decide to return to the U.K. and seek a high-level academic position there.

There were no University start-up funds, and the NSF perceived the PhD as basically a demonstration of ability to perform research. Thus to propose further research in one's Ph.D. thesis area would be seen as demonstrating a serious lack of imagination! One was expected to publishing in the leading journals in the field, and the *monthly Applied Mechanics Reviews* included not only an invited leading article but signed commentaries on noteworthy recent publications, which could serve to establish reputations of newcomers and enhance those of established scholars. Without my knowing who had been asked to write references for me, and with no knowledge of the administrative process (how different things are now!) I was promoted to Associate Professor after five years as an Assistant Professor -- and to full Professor three years later without even being informed that this was under consideration! I was on leave in Europe at the time, learning some human physiology in order to carry out research in that area. By then, it was clear that Brown planned to develop a program in medicine, and I already had my first publication in that field.

Fifty years ago, faculty governance existed in vestigial form at Brown. There were just two faculty officers (Secretary and Parliamentarian); the Faculty Rules were in a slim booklet updated by the Registrar; faculty meetings were held in the Corporation Room of University Hall; and the then President, Barnaby Keeney, a former faculty member in history and Dean of the Graduate School who enjoyed wide support, knew well what it was like to be a faculty member here.. He left in 1966 and was replaced by Ray Heffner, in what were becoming turbulent times at universities. More faculty showed up for Faculty Meetings, necessitating relocation to Carmichael Auditorium. We had already affirmed our support for the civil rights movement by committing ourselves to a long relationship with Tougaloo College, and there was growing unease among the undergraduates with many aspects of their lives and the curriculum, and I was pleased to participate in the debate and vote on the New Curriculum in 1969. The New Curriculum changed the Faculty Advisor's role profoundly, and entirely for the better. I was also glad the New Curriculum swept away most requirements I saw as anachronistic.

President Ray Heffner came under strong faculty criticism when he described at a faculty meeting his efforts to promote the possible establishment of ROTC, with officer-instructors selected by ROTC and courses that would carry credit. Hostility to this was so strong that he had to stand down from chairing the meeting in order to respond to the criticism, which claimed, in essence, that the proposal would sidestep the faculty's long-held right to approve selection of new faculty members; moreover, given the ROTC's agenda of preparing officers for the military (where dissenting opinions would not receive full consideration), it would likely involve courses in which full and free discussion would not prevail -- contrary to the Charter's assurance of full, free, absolute and unhindered liberty of conscience. Heffner had clearly lost the support of the faculty -- as did a later President who, ignoring the fact that a faculty committee was considering a certain issue, acted without waiting for its recommendation, was gently criticized for this in a Faculty meeting, and resigned.

Meanwhile the faculty had organized itself to facilitate self-governance, first by the Faculty Policy Group, which however proved too unwieldy with 18 members. This was replaced by the nine-member Faculty Executive Committee, three of whom are also Faculty Officers, combined with a well-defined group of faculty committees and a structure that not only required reporting both to the faculty and the administration but also has direct access to some members of the Corporation (the late John Tukey '36 was a useful commentator for me, among others.)

Looking Forward: Curriculum and Teaching

Participating in curriculum reforms at the departmental level, I have noted the tendency of faculty members to promote as ideal the curriculum they experienced as students. That is understandable; after all, it had worked for them! However, times change, as have the backgrounds of typical students. Features I'd like to introduce would promote less "grade-grubbing," whereby students try to fine-tune their effort to the minimum required for achieving the grade they desire for a given course -- which may lead to skimping in an area of the course that could be useful to them in later life. The same goes for other skills in the sciences, such as drawing a laboratory apparatus accurately, which requires correct observation, recognition of what is or is not important, and a level of diagrammatic description appropriate to the purposes of the experiment at hand. Yet all too often, students glean what they think will do from the Web, and cut-and-paste it in, even when it differs from what they had actually used, thus demonstrating that they did not examine the apparatus actually used -- and plagiarized, to boot! (Plagiarism of course is nothing new. An ancestor of mine who was a professor of music at Oxford observed that some "original" compositions submitted to him were actually existing compositions he knew well.)

Conversely, soon after the institution of the New Curriculum, I frequently observed a small group of students in each course (typically three to five in a class of 50 to 70) who would compete against each other vigorously even when it was clear they were going to get A's. These students tended to do very well later on.

Looking Forward: Promotions and Tenure

Publications submitted for promotion and tenure often have multiple authors. I suggest it would be helpful to follow the British "Higher Doctorate" requirements discussed earlier: whenever a substantial portion of the work submitted is not in the candidate's sole name, the conjoint work must demonstrate that the candidate has personally originated and conducted important research. In any conjoint work submitted a candidate must produce satisfactory evidence of his part in the initiation, direction and conduct of the work. Some scientific journals have begun to require that papers include such information, but the practice is not yet widespread.

Looking Forward: Joint Appointments

There has been an increase in use of joint appointments, partly in recognition of multidisciplinary activity among the faculty. However, we as faculty do not have in the Faculty Rules and Regulations a way for defining what is required. If the disciplines involved are within the same grouping of faculty, e.g., Physics and Chemistry within the Physical Sciences, then within our regulatory guidelines, those are sufficiently close not to raise many questions. However, I have noticed some universities give joint appointments with different ranks, such as 'Associate Professor of Field A and Assistant Professor of Field B.' For my joint appointment one of the criteria was that 'successful candidates must satisfy the same academic criteria as those being appointed or promoted to that rank who have primary appointments in the [academic unit]; that is, the candidate must have demonstrated productivity in physiological research with a recognition among peers in his/her field commensurate with the rank'; another required letters from leaders in the field from outside the university to be solicited. If the University is to be held in the esteem we wish it to rise to, I suggest such a requirement would be useful for joint appointments.

Looking Forward: University Ratings and Accreditation

One responsibility that accompanies faculty participation in governance is that of developing various modes of accreditation. Universities have been a 'growth industry' in many parts of the world, substantially because interesting lifetime occupations have been increasingly seen as more readily attainable through university education. Thus the fraction of the population that is age-eligible to pursue tertiary education and in fact aspires to do so has risen tenfold in the past 50 years in the U.K. and other countries. The response of local, state and national governments in extending financial support to tertiary education institutions has generated drastic fluctuations in levels of support over modest time-scales (such as political election turnover times) as for instance (in the U.S.A.) in the funding of state universities in California, and (in Britain) in Parliament's recently increasing student tuition costs threefold. Accompanying such shifts has been an 'audit culture' using questionable evaluations for assorted purposes. Magazines have published annual ratings of universities in the style of Consumer Reports on cars. In his first anniversary address as President of the Royal Society nearly 20 years ago, the mathematician Sir Michael Atiyah repeated a quip by the President of the Royal Academy that the great divide in universities was no longer between the arts and the sciences, but between the scholars and the accountants: '… we have little confidence in the foundations on which the great accountancy edifice has been built …' (Notes and Records of the Royal Society of London 46(1): 155-169, 1992).

Recently we questioned some aspects of the NEASC accreditation report regarding Brown; and no less an institution than the National Academy recently produced a report on doctoral research programs that allow users to adjust the balance applied to different features in the report for which data had been compiled. However, errors in the methodology of some of their data gathering should not be allowed to go unchallenged. My clear example is in the selection of awards and honors to which they assigned additional points as indications of external recognition. The compiling of lists of international, national and disciplinary scholarly awards began in 2006 with a dual classification: "highly prestigious" and "prestigious." For obvious reasons, I looked for international awards in the Life Sciences – from my times in Italy, France, Germany, Turkey and the U.K. I had some on-site observations of these as well as a general familiarity for my fields. To my surprise, I found leading honors such as election to the National Academy of Sciences of Paris completely absent, even though I scanned the list of its elected members and saw several U.S.-based honorees who should be listed by their institutions as faculty members associated with sciences research doctoral programs. The same was true for Fellows and foreign members of the Royal Society of London -- many resided in the U.S. and were associated with institutions having research doctoral programs. However, the list includes many U.S. institutions (such as the Poultry Science Association with 10 awards, which were being recognized) whose comparability I would question. The preponderance of U.S. awards and absence of leading non-U.S. awards impugns the fairness of the National Academies in choosing which awards and honors to recognize. It is up to distinguished faculty to review such lists, and pinpoint unjustified omissions. We may hope this will be accomplished by wide peer review before publication, otherwise open criticism may be needed to avoid repetition and as a caution to users of such analyses.

Looking Forward: Brown's 250th Anniversary

The 250th anniversary of the founding of Brown University is only four years away, and we hope that the Faculty Bulletin can include commentaries and reminiscences that embrace the past 50 years so that by 2014 we can print a wide-ranging set of contributions, doubtless reflecting divergent views on Brown's evolution during this period. The editors eagerly invite such contributions.

FACULTY BULLETIN

INFORMATION FOR CONTRIBUTORS

GUIDELINES FOR SUBMITTING ARTICLES:

A second issue of the *Faculty Bulletin* will be published in the spring. Articles should be submitted by March 28, 2011 for publication in May.

Please submit text electronically in Word format to:

Cheryl_Moreau@Brown.edu

Articles should be approximately 1,000 words (two to three pages). If space permits, longer papers will be considered.

Articles and/or questions should be directed to:

Cheryl A. Moreau, Manager
Office of Faculty Governance
402 University Hall
Box 1830
Phone: (401) 863-9440