MONASH University
Engineering

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ChemEng focus

TEACHING AND RESEARCH NEWS FROM THE DEPARTMENT OF CHEMICAL ENGINEERING, MONASH UNIVERSITY

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Inside this issue:

Monash Fellowship Awarded	2
Dr Lian Zhang	3
Carbon capture project	4
Open Day	5
Finkel Scholarship	6
Update—Saptarshi Kar	7
Alumni Profile	8
News in Brief	9

Prof Frank Lawson awarded Doctor of Engineering

With nearly 50 years association with Monash University's Faculty of Engineering, Professor Frank Lawson was awarded the Doctor of Engineering on the 28 October 2009. This was the first ever " Doctor of Engineering" award in Chemical Engineering.

The Doctor of Engineering is the university's highest award. The degree gives formal recognition to scholars who have made a substantial, original and distinguished contribution to knowledge. Eligibility for the award of the degree is assessed on the basis of scholarly published work that is judged by national and international peers to indicate the candidate's authoritative standing in the field and his or her achievements in the advancement of knowledge.

Professor Lawson began his career with Monash in December 1962 when he was appointed to the position of Lecturer. In 1966 he was promoted to a Senior Lecturer. During his time spent teaching at Monash, Professor Lawson completed his PhD in 1970, having being supervised by Professor

Owen Potter. Professor Lawson still contributes to the Department of Chemical Engineering through his work as a sessional lecturer and continues his research interests.

The day after the ceremony, Prof Lawson spoke to all the current Chemical Engineering postgraduate research students at a special Friday lunch, and gave a history of Melbourne, the establishment of Monash University and the history of the Department of Chemical Engineering. The presentation was very well attended by the next generation of chemical engineering researchers.

ARC Discovery Project Successes!

Australian Government
Australian Research Council

Monash has attracted $67.6 million in government funding in the latest round of grants from the Australian Research Council (ARC).

Monash received $33.8 million from the ARC, including more than $29 million for 94 Discovery Projects grants, a 42 per cent increase in the number of grants funded and a 44 per cent increase in the value of funding awarded.

Monash also received $4.8 million for 17 Linkage Projects grants, with a further $8 million in cash and in-kind support pledged from partner organisations. Details of the two successful Discovery Projects are below, and our successful Linkage project is on the next page.

Dr Huanting Wang & Prof M Tsapatsis

Approved Zeolitic Nanoflake-Polymer Composite Membranes for Low Energy Desalination

The project will investigate the desalination of seawater. Desalination is becoming an important source of drinking water for Australia. The current desalination process using polymer membranes is energy-intensive. The proposed project will contribute to the development of low energy desalination technology by advancing membrane design and fabrication techniques. The use of zeolitic nanoflake-polymer composite membranes developed in this project is expected to substantially reduce energy consumption in the desalination process. This research will produce important economic and environmental benefits by developing a green technology for fresh water production and water treatment for power generation, irrigation and other industrial uses.

Dr Wei Shen, A/Prof SD Kolev, Dr CF Hogan, Prof G Whitesides

Approved Paper Fluidics - A novel approach to low cost printable microsensors

The project will investigate that printing is perhaps the cheapest means of mass production available, yet it is used almost exclusively to mass produce only one thing, i.e. the printed word! This project will enable the development of disposable printed sensors for assessing the quality of water or the health of an individual. Sensors are generally relatively expensive, but the ability to print them on paper by the thousand will bring down the cost to a few cents. Such cheap, portable, easy-to-use sensors if widely available could profoundly affect the lives of people living in remote areas and developing countries.

Monash Fellowship awarded

Dr Jianfeng Yao has been awarded the Monash Fellowship in the Department of Chemical Engineering to further his work on "Synthesis and catalysis of crystalline micro/mesoporous zeolites and zeolite monoliths".

The Monash Fellowships are very competitive and only four awards were made for 2010. A committee consisting of the Chairs of the Monash Fellowship interview panels and the Senior Deputy Vice Chancellor and Deputy Vice Chancellor (Research) considered the recommendations of the selection panels and decided on the winners of the Fellowships.

"My research proposal is focussed on the preparation and catalysis of nanomaterials. I look forward to working in the Faculty of Engineering as both the research environment and research infrastructure are top class" said Dr Yao.

Professor Paul Webley, the Head of Department of Chemical Engineering, was excited by the Fellowship appointment of Dr Yao "We can look forward to strong research growth and success in the years to come".

Another ARC Linkage Project Success!

Australian Government
Australian Research Council

Have you had wet paper bags rip or stacks of boxes collapse during shipping? Thanks to another excellent result during the Round 2 ARC Linkage Projects scheme the Department of Chemical Engineering has again secured funding for research through the Australian Pulp and Paper Institute (APPI).

This is the 2nd ARC linkage grant awarded to APPI during 2009 and consolidates the new mission of APPI as the Australian bioProduct and Process Institute. We extend our congratulations to the following investigators on this research project; Gil Garnier, Warren Batchelor and Wei Shen (Department of Chemical Engineering), George Simon (Materials Engineering) as well as the industrial partners Nopco and Visy.

The project will investigate novel polymer strength agents by combining nanoparticles to develop very strong paper packaging resisting frequent moisture changes while remaining fully recyclable. These strengthening agents will be produced and used in Australia to manufacture the fibre for packaging which is needed to ship our manufactured and agriculture goods within Australia as well as for International export.

The paper industry is the largest manufacturing industry in Australia with sales of $4 billion per year. The paper industry employs 5,900 direct and 85,000 indirect jobs throughout Australia.

Overall, 20 Monash University ARC applications were successful, bringing in close to $6 million in ARC funding to Monash University. Monash's success rate was just over 54%, well ahead of the average for the round, 45.6%.

Funding for world-first carbon capture project.

Researchers from the Department of Chemical Engineering at Monash University are taking part in a unique carbon dioxide pre-combustion capture project that will trial three technologies to find the most cost-effective for removing CO_2 from brown coal gasification power generation.

The Monash technology component is one of three being tested by the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC), one of the world's leading carbon capture storage (CCS) research collaborations, in partnership with HRL Developments.

The $4.11 million CO2CRC/HRL Mulgrave Capture Project, at HRL's gasifier research facility at Mulgrave in Melbourne is supported by the Victorian Government's ETIS Brown Coal R&D fund and will evaluate solvent, membrane and adsorbent technologies for efficiency and cost-effectiveness in syngas power generation.

Australian carbon capture and storage research is part of an international drive to make deep cuts in global greenhouse gas emissions by capturing and storing CO_2 from major sources such as power stations.

If successful, the technology could reduce CO_2 emissions from the next generation of high-efficiency coal gasification power stations by 90 per cent.

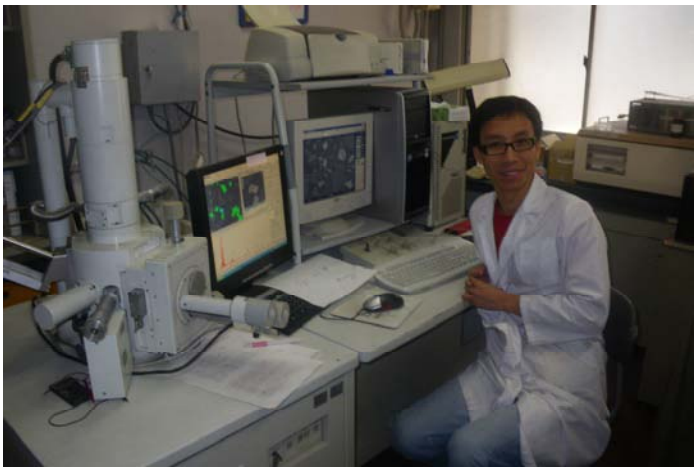
Associate Professor Alan Chaffee from the School of Chemistry said the Monash team, which includes Professor Paul Webley from the Department of Chemical Engineering, postgraduate and postdoctoral students, was excited about getting out of the lab and undertaking research in an industrial environment. "The Monash Chemical Engineering group is testing adsorption technology," Associate Professor Chaffee said. "We all know that the production of CO_2 contributes greatly to climate change. If successful, this technology could be used across the world – it's great that Monash can be a part of that."

Dr Lian Zhang awarded an inaugural Australian Research Council Future Fellowship.

Congratulations to Dr Lian Zhang, from the Department of Chemical Engineering. Dr Zhang received an inaugural Australian Research Council Future Fellowship. The Future Fellowships were announced at Parliament House Canberra, by Senator Kim Carr, Minister for Innovation, Industry, Science and Research.

The Future Fellows scheme was introduced in October 2008 to "promote research in areas of critical national importance by giving outstanding researchers incentives to conduct their research in Australia" and "attract and retain the best and brightest mid-career researchers."

Lian's research is "Generation of Ultra-Clean Fuel from Victorian Brown Coal and Its Oxygen-Enriched Combustion Characteristics". Dr Zhang said "Completion of this project can significantly contribute to the national priority of developing alternative energy technologies and ecologically sustainable power generation systems, as well as provide solutions to reduce and capture greenhouse gas emissions during



Victorian brown coal firing. Improvements in the quality of Victorian brown coal and its value in national/ international trade markets can be achieved through the generation of ultra-clean fuel from coal. Substitution of ultra-clean fuel for Victorian brown coal in energy industries would greatly improve the competitiveness of the Victorian economy in a carbon-constrained future, and ensure power generation near-zero emissions."

Visit to Chubu University, Japan.

Dr Eleanor Binner and **Dr Lian Zhang**, research fellows from the Coal Science group, visited Chubu University in June to use a range of chemical analysis techniques including Computer-controlled Scanning Electron Microscopy, a powerful analytical tool not available at Monash (pictured right).

In addition to having unlimited access to the laboratory facilities at Chubu University, they undertook initial training in the use of FactSage from the laboratory director Professor Ninomiya. The Coal Science and Plastics group will soon acquire this software, a very useful predictive means for pyrolysis, combustion and gasification research.

Drs Binner and Zhang also visited IHI oxy-fuel combustion pilot plant, the precursor to the Callide-A oxy-fuel demonstration plant in Queensland. As well as gaining a plethora of data for their research, the visit has strengthened relations with Chubu University and IHI. This is set to continue with a PhD student from Chubu visiting to spend up to three months at Monash towards the end of the year, benefiting both Australian and Japanese research projects.

Monash University Open Day 2009

Each year, Open Day takes a huge amount of planning, work and effort from staff across the whole university in order to showcase Monash to prospective students and the public and it was reported that a whopping 3618 people passed through the Engineering Halls on the day.

Wren Schoppe assembled the Chemical Engineering troopes together to showcase activities as well as provide a knowledgeable team of academic staff members and current undergraduate students who explained "What employment opportunities are available to a Chemical Engineer, how is Chemical Engineering used in society and what a degree in Chemical Engineering will provide".

Hands on displays helped the general public understand the principles around Chemical Engineering and how a Chemical Engineer has impacted their everyday life. These displays have also proven to be great entertainment for all "the children at heart"!

Congratulations to our student group SMUCE who provided a fantastic BBQ on the day for all visitors to the Engineering Halls. They not only managed to provide fantastic food but also managed to hand out course information whilst people waited…is there anything a Chemical Engineer can't do?

Lastly, thank you to all the staff, postgraduate and undergraduate students for their wonderful efforts on the day.

Our talented SMUCE group BBQ

Staff/Student information desk

Bouncy Balls

Jeremy the duck

Finkel Scholarship PhD research scholarship

In August 2009, Mr Aashish Jain was one of three outstanding engineering graduates celebrating their success as successful recipients of the Finkel PhD scholarships. The Finkel Scholarship to make it possible for undergraduate students to stay on and pursue their research dreams.

(L-R): Aashish Jain, Adam Risborg, Dr Alan Finkel, Dr Elizabeth Finkel, Sarah Clark.

Monash University Chancellor, Dr Alan Finkel and Dr Elizabeth Finkel wished to support PhD research by providing financial support to enable three outstanding graduate scholars to pursue research in the Faculty of Engineering. Funding for the award is provided by the A&E Finkel Foundation. Dr Finkel is an engineering alumnus and is the first alumnus to be appointed as Chancellor to Monash University. Dr Finkel received his Bachelor of Engineering in 1976 and Doctorate in Electrical Engineering from Monash University in 1981.

Regarding his future research, Aashish said, "My PhD thesis involves the study of materials that give cells their elastic properties. A cell's elastic properties are largely determined by the intracellular cytoskeleton. The unique properties of the cytoskeleton stem from the fact that it is a cross-linked network (or gel) of proteins called F-actin, which are semiflexible polymers. Semiflexible polymers have a certain stiffness that makes bending them energetically unfavourable, and they are to a large extent inextensible. I will investigate theoretically and computationally the behaviour of solutions of semiflexible polymers to understand the nature of the connection between molecular characteristics of semiflexible polymers and macroscopic properties of networks of such polymers, and ultimately insight into the origin of the elastic properties of a cell."

60 seconds with Dr Cordelia Selomulya

What challenges you in your job?

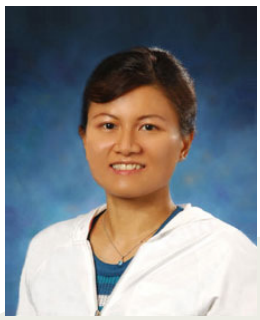
Managing research and teaching especially during the semester.

What is the most satisfying part of your job?

The freedom to define my research direction and scope, and the daily interactions with students. My department is relatively small but the people are pleasant to work with, which makes it an enjoyable working environment.

What is your favourite place in the world?

I've just been to Japan where I took part in an invitation program sponsored by the Japanese International Cooperation Centre. The trip included visits to the high-tech Toyota plant in Nagoya where they manufacture the Prius, the Japanese Chamber of Commerce, and a reception at the Australian Embassy in Tokyo. I was very impressed with how everything there runs so seamlessly. The Shinkansen (Bullet Train) is very convenient for travel and always on time. If only Melbourne trains would be as efficient.



What is the best advice you have ever received?

To keep everything in perspective.

What is something about yourself that most of your colleagues wouldn't know?

I'm a gym junkie. My after-hours revolve around the group exercise schedule at the University gym

Update from Saptarshi Kar—Fayetteville, USA

Upon conferment of my PhD in October 2008, I started looking for a post doctoral position. I was particularly looking for a position, where fundamentals studied in chemical engineering, such as heat, mass and momentum transfer along with reaction engineering principles could be applied to the area of biomedical engineering. On browsing through various job advertisements on the web, I came across this position at the University of Arkansas in Fayetteville. The project involved the study of nitric oxide transport in vascular systems (blood vessels). Nitric oxide in dilute concentrations is produced in the blood vessels as a result of shear stress exerted on the vascular walls. The vascular walls are lined with endothelial cells, which under the influence of shear release nitric oxide. Nitric oxide plays key role in numerous physiological functions including endothelium-derived relaxation, platelet inhibition, smooth muscle proliferation, neurotransmission vascoditation.

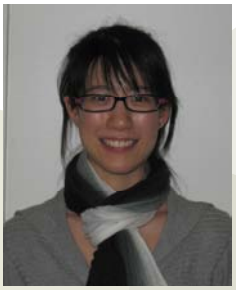
The transport of nitric oxide through blood vessels is essentially a diffusive process. This was an advantage with respect to my PhD project where I was involved in modeling the moisture transport across skin, which is also a diffusive process. The only difference is that in this particular case of vascular transport, the nitric oxide released undergoes several oxidative reactions. Therefore on applying for this job, I got a favorable response. I decided to take up this offer as it opened up a completely new avenue for me as far as my research career is concerned. Finally in December 2008, I was officially selected as the candidate for the position. Thereafter the visa procedure was initiated, which unfortunately turned out to be an agonizing experience, both for me and my employer. Finally in May 2009, my visa was granted and after a brief vacation, I arrived in Fayetteville on 21st July 2009.

My work here will involve studying the fate of NO when it enters the bloodstream, which is still not established. The overall objective of the proposed research will be to use computational modeling and in vitro experiments to improve our understanding of the NO biotransport in the microcirculation. Detailed computational models will be developed to simulate NO metabolism in in-vitro experimental system and simulate NO transport in the microcirculation. I will also be performing experiments to measure the end-products concentration of NO metabolism to quantify NO interactions with biomolecules including plasma constituents and red blood cell. This study could have major impact in regards to development of therapeutics for disorders as diverse as sickle cell anemia, pulmonary hypertension, septic shock and nitric oxide inhalation. My personal experience in the US has so far been good. Fayetteville is a safe small laid back college town with very friendly people. While it may be a small town, it houses the headquarters of three of the biggest corporate giants (Walmart, J.B.Hunt and Tyson foods). My workplace is located slightly off campus, where a new engineering research centre has been opened recently. All the diverse research activities across the different departments in the engineering faculty are conducted here.

Overall, I am enjoying my time in the USA.

2008 McGrawHill Book Prize

Congratulations to **Ms Ee-Wei Tan** who is the winner of the 2008 McGraw-Hill Book Prize. The prize, a hard cover copy of "Perry's Chemical Engineering Handbook" is awarded annually to the student who gains the highest composite mark in ENG1010 Process Systems Analysis (which runs in both Semester 1 and 2) and subsequently enrols into Chemical Engineering. With a score of 95HD and undertaking a double degree in Chemical Engineering and Pharmaceutical Science, Ee-Wei was a well deserving winner.



Alumni Profile: Russell Scott, Managing Director, Udhe Shedden

Degree: Bachelor of Engineering (Chemical Engineering)
Graduating Year: 1969

It's been a long and enjoyable journey since I attended Monash University in the sixties, and what a different place Monash is today compared with the "Farm" in my days!

Employment options were a plenty when I graduated with both the mining and energy/petrochemical sectors undergoing significant development in Australia. I chose the growing petrochemical industry and joined the then Altona Petrochemical Company Ltd now a part of Qenos) managed by Esso Chemicals. During my time APC built the first ethane cracker in Australia as part of a major revamp of the total plant. This major development offered great experience for the many young engineering graduates working at APC.

After 6 years with APC, I joined Davy Ashmore Pty Ltd in 1974 and this started my 35 year career (so far) with the engineering services industry. I remained with Davy for 17 years, which since I departed in 1990 has undergone several ownership and name changes and is now Aker Solutions Pty Ltd. During my time at Davy, I was fortunate enough to work on the Cooper Basin Gas Liquids Project, Australia's largest onshore upstream development managed on behalf of the Cooper Basin Producers by Santos Ltd. This assignment was undoubtedly the highlight of my engineering career capped off by 3 very enjoyable family years living in Adelaide. My last project assignment with Davy McKee was as Project Manager for the engineering phase of new Residue Catalytic Cracking Unit for Shell at the Geelong Refinery, this was also a very enjoyable and challenging project.

During 1990, I joined Kinhill Engineers as Head of the Process and Mining Division. During my almost 10 years at Kinhill, the company continued to develop as one of Australia's leading, locally owned engineering companies serving the mining and oil & gas industries. In 1997 the Board of Kinhill Limited (of which I was a director) voted to accept an offer of acquisition from Brown & Root Inc of the USA. Following a further ownership change, the company transformed into its current trading name of Kellogg Brown & Root (KBR).

My last career move was to join Shedden Uhde Pty Ltd in 1999 and the following year I took over as Managing Director. As with my previous 3 companies, Shedden Uhde also went through an ownership and name change. In 2002, Clough Ltd from Western Australia acquired a 50% interest in Shedden Uhde and remained a shareholder until the end of 2007 when Uhde re-purchased Clough's share to return Shedden Uhde to a wholly-owned subsidiary of the Germany technology contracting company, Uhde GmbH. To signify the change in ownership, the name of the company was reversed to Uhde Shedden Pty Ltd.

During my time with Uhde Shedden, we have enjoyed a pre-eminent position in the engineering of the "Clean Fuels" upgrades for several of the Australian refineries over the past 5 years. This has seen us develop a very strong chemical engineering department, which together with our overall refinery engineering experience, is now helping us secure similar assignments overseas.

An exciting development for our company was the acquisition of a small Uhde subsidiary in Thailand in 2004. Since we took ownership, the company has grown from 40 to over 300 staff and is now a major contributor to the refining and petrochemical industry in Thailand.

In mid-2008, Uhde Shedden assumed operational control of 2 other Uhde subsidiaries in Mexico and China and earlier this year Uhde Asia Pacific was formed as the holding company for the Uhde Shedden controlled companies in Australia, Thailand, China and Mexico. As Managing Director of Uhde Asia Pacific I now travel regularly to our 4 sector companies and to headquarters in Dortmund, Germany.

Each of the 4 sector companies is headed by a former Uhde Shedden colleague, so a strong connection remains with the Australian 'mother' company offering many opportunities for our staff in Australia to work on projects with our other Asia Pacific companies.

As a chemical engineer with a career now spanning 40 years, each decade has produced personal highs and some lows, particularly during the credit squeezes and recessions. However, my choice of chemical engineering has certainly allowed me to enjoy a variety of exciting working experiences and to fulfil many of my personal ambitions.

MONASH University
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NEWS in brief.....

- **Professor Paul Webley** was made a visiting professor at Northeaster University for 3 years in the School of Materials and Metallurgy. Professor Zhai (who visited the Department of Chemical Engineering recently) will be collaborating on projects with Paul in the near future. Professor Zhai graciously hosted Paul during his time in China
- Congratulations to **Mohd Razif Harun** and **Anushi Rajapaksa** who won the Monash "Research Matters" student poster exhibition held in August. This poster exhibition showcases the contribution Monash research students are making to positively impact on the world we live in. Two hundred and forty posters had been selected University wide to showcase the depth and breadth of student research. Razif and Anushi have received a cash prizes and a certificate.
- Congratulations to **Mohid Khan** who was awarded an AusBiotech-GlaxoSmithKline Student Excellence National Award for his work on Bioactive Paper.
- **Associate Professor David Brennan** attended the 2nd International Congress on Green Process Engineering held at Venice on 14-17 June. David presented two papers – a keynote on 'Education Priorities for Chemical Engineers in Green Process Engineering' and a poster on "$B^2E^2P^4$ - Framework for enviro-economic assessment'.
- **A/Prof Sankar Bhattacharya** has been invited to give a keynote lecture at the International Coal Science and Technology Conference in Capetown in October Before returning to Australia Sankar will give another invited presentation at the 3 rd International Symposium in Fukuoka, Japan. The second trip was generously sponsored by the Clean Coal Symposium.
- **Mark Toner** has been appointed to the National Board of the Centre for Engineering Leadership (CELM) of Engineers Australia (EA). Engineers Australia is Australia's professional institution for all engineers and has 90,000 members.
- **Rothman Kam** represented Monash University in the Men's Badminton Team Event during Southern University Games 2009 (SUG 2009) and as a team they won GOLD! The annual SUG was held as a regional championship for Victorian, South Australian and Tasmanian Universities, the event aims to promote and increase student participation in activities through competitive sport.
- **Prof Dong Chen** was nominated for the IChemE 2009 Innovator of the Year award. Congratulations to Dong on his nomination.
- **Congratulations to our recent Postgraduate graduates (May-November 2009): PhD -** Tri Thanh Pham (RJ), Dan Li (HW), Ali Akhavan (MR), Yin (Susan) Han (GF), Firas Ridha (PW), Khagendra Thapa (AH), Farhana Rahman (MR), Woo Jin Lee (C-ZL),
- **Congratulations to our recent Postgraduate graduates (May-November 2009): Masters -** Nada Abubakr (DC), Shan Liu (GF), Hue Chen Au Yong (C-ZL), Thanh Huynh Nguyen (KH)
- **Recent graduates joining the Department:** Ali Akhavan (Gasification project) and Kamleshkumar Patel ("Researchers in Business" funded through a collaborative funding arrangement between DIAL/Government).
- **Congratulations to the graduating Department of Chemical Engineering 4th year students**. The Department would like to take this opportunity to wish all 2009 graduating Department of Chemical Engineering 4th years students. We wishing you all every success in your chosen careers and hope that you will continue your affiliation with the Department, reading the Newsletters, and sending us your company's employment opportunities for future graduates.

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Company participation?

Would your company like to offer any of the following?

* Vacation Work Experience to our undergraduate students?
* Graduate Position (Undergraduate and Postgraduate)?
* Speak to undergraduates students at a lunch time seminar about your company? Then send a email to either Wren.Schoppe@eng.monash.edu.au or Lilyanne.Price@eng.monash.edu.au with the details and they will get back to you shortly.

Would you like to receive future issues of ChemEng Focus?

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