

Bioencapsulation Innovations

December 2011

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DO YOU WISH TO CONTRIBUTE TO FUTURE ISSUES OF THE NEWS LETTER ?

By providing information about an event, your thesis presentation, an open position or any information that you wish to share with other members, contact us at contact@bioencapsulation.net

You are also invited to submit proposals of contribution for one of the next full issues:

 January 2012 - **Cosmetic applications of microcapsules**

 Avril 2012 - **Innovative materials for microencapsulation**

 July 2012 - **Biomedical encapsulation**

 October 2012 - **Innovations in encapsulation technologies**
EDITORIAL
XIX INTERNATIONAL CONFERENCE ON BIOENCAPSULATION

The XIXth International Conference on Bioencapsulation (ICB) held in Amboise, France, October 5-8, 2011 was attended by 207 participants coming from 40 countries and the 5 continents. Of these 207 participants 28 % were PhD students, 46 % academic scientists, 18 % industrialists, and 8% were exhibitors. Forty seven participants were granted with a scholarship.

innovation, their products, and their technologies during the new dedicated exhibitor's session.

The social programme consisted of a guided tour and a visit of the Château le Clos de Lucé. Participants also enjoyed the high quality French food provided by the Meteor Val de Loire.

A GREAT SUCCESS WITH MORE THAN 200 PARTICIPANTS AND 170 CONTRIBUTIONS

As much as 171 scientific contributions were submitted. Of these 171 contributions 39 were accepted as oral presentation and 92 were accepted for poster presentation. The quality of the contributions is increasing every year which makes the selection of the oral presentations and the granting of the scholarships increasingly difficult.

Best contribution prizes

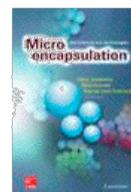
During the conference, prizes were proposed to the best student oral and poster contributions consisting in books provided by **Wiley, World scientific** and **Research Signpost publishers**.

Evaluation of milk protein matrices to protect probiotic cells in simulated gastric fluids.

Jennifer Burgain, LIBio, INPL, Nancy, France

Development of in situ gellable and fast degradable hydrogel under the presence of serum for cell-enclosing microcapsule

Hitomi Inagaki - Osaka University, Japan



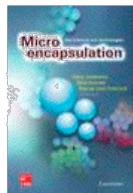
Microencapsulation of a polyphenol extract derived from apple pomace for utilization as food additive

Sabine Kühn - University of Bonn, Germany



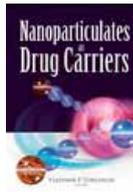
Human pancreatic islet encapsulation in microfluidic device

Prisca Dalle - CEA-LETI, Grenoble, France



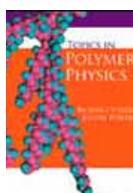
Adipose-derived stem cells as drug stores in alginate capsules

Giulia Lucconi - University of Pavia, Italy.



Stability of microencapsulated enzymes produced by Fusarium oxysporum

Tamara Ângelo - FCFRP-USP, Sao Paulo, Brazil.



Effect of Digestive Processes on Encapsulated Lactic Acid Bacteria

Elzbieta Gorecka, Technical University of Lodz, Poland



Oral absorption enhancement of insulin-loaded chitosan-coated solid lipid nanoparticles

Pedro Fonte - CICS, Norte, Spain



BRG 20th Anniversary

The BRG 20th anniversary was celebrated during the gala dinner in a friendly atmosphere. The first Poncelet Award for innovative research on the bioencapsulation was given to the principal founder of the BRG, Denis Poncelet. This price of 1000 euros is made possible by Procter and Gamble and will be given on an annual basis from now on.



The gala dinner was also the opportunity to thank many persons who largely contributed to the success of the conference ... with a Loire Valley French bottle of wine.



Organizers wish to thank

- LVMH for their sponsorship that allowed to attribute 20 scholarships;

LVMH RECHERCHE

PARFUMS & COSMETIQUES

- The exhibitors for their support that also allowed to attribute 15 scholarships;
- P&G for providing the prize for Poncelet award;



- Wiley, World scientific and Research Signpost publishers for providing books for the best contributions during the conference:



- The scientific committee for their support in establishing a very interesting programme;
- The attendees for the really good scientific level and content of their proposed contributions;
- The Meteor Val de Loire Resort staff for their high quality service, kindness and availability.



NEXT BRG CONFERENCE

XX INTERNATIONAL CONFERENCE ON BIOENCAPSULATION

Orillia, Ontario, Canada
September 21-24, 2012



Our 20th annual international conference will take place in one of the most beautiful touristic area of Canada, the natural peninsula on Lake Couchiching, only 90 minutes from Toronto, Ontario, offering a rare combination of extraordinary natural surroundings and proximity to urban amenities.

Canada is the «mother» country of the Bioencapsulation Research Group and coming back to Canada for our 20th annual international conference, let expect us an even greatest success than in 2011.

Benefit from those 3 days to exchange with other experts on bioencapsulation coming from all over the world in a professional but friendly atmosphere, a lifetime away from the stress of daily life... Join us ... and let's celebrate together the BRG 20th annual international conference, in the course of a 2,5 days residential conference ... that, we hope, will remain for everyone an unforgettable event !



MORE INFORMATION
http://bioencapsulation.net/2012_Orillia

UPCOMING EVENTS

15TH INDUSTRIAL SYMPOSIUM & 6TH TRADE FAIR ON MICROENCAPSULATION

Archamps/Geneva, France - March 20-22, 2012

Why this symposium ?

Over the last 20 years, BRG organized more than 50 successful events on microencapsulation. BRG acquired a unique expertise in organizing industrial events based on one of the largest address books in the domain. This event will bring together leaders in microencapsulation & nanoencapsulation from a variety of industries. We expect up to 150 industrials coming from all over the world and we plan to schedule more than 600 individual meetings.

Organization



- Conference Program : 14 lectures from leading experts in microencapsulation.



- Technology Trade Fair : based on your pre-selection among the list of participants, get up to 20 one-to-one 40 minute appointments.



- Exhibition : a broad state-of-the-art showcase presenting R & D, Equipment, Material & Chemicals.



MARCH 20, 2012

Session 1 : Overview

- Encapsulation: Overview on Technologies and Applications - Ronald Neufeld, Queen's Univ. Canada
- Opportunities and challenges in encapsulation for Home & Personal Care Products - Katherine Thompson, Unilever, UK
- One-to-one meetings + exhibition

Session 2 : Technologies

- Spray drying technologies and applications - Stephan Druch, Technical University of Berlin, Germany
- Fluid Bed Coating: Theory and Practice - Charles Frey, Coating Place, USA
- Commercial Scale Microencapsulation : from lab bench to commercial manufacture - Brian Frost and Hugues Forget, Encapsys Microencapsulation, USA
- One-to-one meetings + exhibition

MARCH 21, 2012

Session 3 : Materials

- Microencapsulation by chemical methods - Dennis Vriezema, Encapsion, Netherlands
- Silicon sol gel encapsulation - Leon Marteaux, Dow Corning, Belgium
- One-to-one meetings + exhibition

Session 4 : Innovations

- Colloidal Polyelectrolyte Complexes for the Delivery of Pharmaceuticals - Thierry Delair, Lyon University, France

- Cosmetics and microencapsulation - Sven Gohla, La prairie, Switzerland
- Performance of industrial enzyme formulations through the years, with respect to wear resistance - Gabrie Meester, DSM, Netherlands
- One-to-one meetings + exhibition

MARCH 22, 2012

Session 5 : Applications

- Food and feed ingredient encapsulation - Jean-Antoine Meiners, MCC, Switzerland
- Flavour encapsulation - Jenny Weissbrodt, Symrise, Germany
- One-to-one meetings + exhibition

MORE INFORMATION

http://bioencapsulation.net/2012_Archamps

EXHIBITORS DEAL

We would like to offer the exhibitors a deal. Each registered exhibitor will receive a promotion code, which can be shared along with symposium invitations to customers, suppliers and partners. Use the code for:

- **5 registrants: half-price registration for exhibitor**
- **10 registrants: FREE registration for exhibitor**



Journal of Microencapsulation Volume 28, Number 8 (2011)

<http://informahealthcare.com/toc/mnc/28/8?ai=9j8&ui=cwt3&af=H>

- **Microencapsulation using vibrating technology** - Micheal Whelehan and Ian W Marison - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 669-688.
- **Gastroretentive microparticles for drug delivery applications** - Adeola Adebisi and Barbara R. Conwa - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 689-708.
- **Nanoparticles and the skin – applications and limitations** - Majella E. Lane - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 709-716.
- **In vitro physicochemical characterization and short term in vivo tolerability study of ethionamide loaded PLGA nanoparticles: potentially effective agent for multidrug resistant tuberculosis** - Gaurav Kumar, Samir Malhotra, Nusrat Shafiq, Promila Pandhi, Gopal Krishan Khuller, and Sadhna Sharma - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 717-728.
- **Long circulating PEGylated PLGA nanoparticles of cytarabine for targeting leukemia** - Khushwant S. Yadav, Sheeba Jacob, Geetanjali Sachdeva, Krishna Chuttani, Anil K. Mishra, and Krutika K. Sawant - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 729-742.
- **Formulation of sustained-release**

microspheres of granulocyte macrophage colony stimulating factor by freezing-induced phase separation with dextran and encapsulation with blended polymers - Xin-ran Zhang, Ying Zheng, Tuo Jin, and Albert H. L. Chow - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 743-751.

- **Nano self-assemblies based on cholate grafted poly-L-lysine enhanced the solubility of steroid-like drugs** - Jingxia Gu, Woei Ping Cheng, Clare Hoskins, Paul Kong Thoo Lin, Lingling Zhao, Lijun Zhu, Xiaozhong Qu, and Zhenzhong Yan - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 752-762.
- **Sustained release of low molecular weight heparin from PLGA microspheres prepared by a solid-in-oil-in-water emulsion method** - Jintian He, Zhitao Zhou, Yangyang Fan, Xianglian Zhou, and Huijuan Du - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 763-770.
- **Biofriendly bonding processes for nanoporous implantable SU-8 microcapsules for encapsulated cell therapy** - Krishnamurthy Nemani, Joonbum Kwon, Krutarth Trivedi, Walter Hu, Jeong-Bong Lee, and Barjor Gimi - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 771-782.
- **Preparation and evaluation of easy energy supply property of medium-chain fatty acids liposomes** - Weilin Liu, Wei Liu, Chengmei Liu, Jianhua Liu, Huijuan Zheng, Shuibing Yang, and Jiahong Su - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 783-790.
- **Effect of PLGA hydrophilicity on the drug release and the hypoglycemic activity of different insulin-loaded PLGA microspheres** - C. Presmanes, L. de Miguel, R. Espada, C. Álvarez, E. Morales, and J.J. Torrado - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 791-798.
- **Biofunctional textiles prepared with liposomes: in vivo and in vitro assessment** - Meritxell Martí, Vanessa Martínez, Laia Rubio, Luisa Coderch, and José L. Parra - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 799-806.
- **Lecithin/chitosan nanoparticles for transdermal delivery of melatonin** - Anita Hafner, Jasmina Lovrić, Ivan Pepić, and Jelena Filipović-Grčić - Journal of Microencapsulation 2011, Vol. 28, No. 8, 2011: 807-815.



Brace GmbH is a German company leader in the production of microcapsules by dripping and developing machines for these technologies. They are looking for :

- Labmanager for development and production (http://www.brace.de/PagEd-index-topic_id-1-page_id-68.phtml)
- Project engineer for units (http://www.brace.de/PagEd-index-topic_id-1-page_id-135.phtml.)
- Other open positions may be found on <http://www.brace.de/PagEd-index-topictoview-1.phtml>



Food Science and Technology – Industrial Research Chair Position - Université Laval

Université Laval, a prestigious institution anchored in Quebec society from its beginning, invites expression of interest for visionary academic leaders and researchers for an Industrial Research Chair Position and Grant in the field of dairy science to help lead the way in the following areas Dairy processing eco-efficiency

For more information, please contact : Yves.Pouliot@fsaa.ulaval.ca

NanoFar

10 Doctorate fellowships will be offered in 2012 by the EMJD NanoFar consortium "European Doctorate in Nanomedicine and Pharmaceutical Innovation".

NanoFar is an Erasmus Mundus Joint Doctorate programme newly selected by EACEA involving the Universities of Angers and Nantes (France), Liège and Louvain (Belgium), Nottingham (United Kingdom) and Santiago de Compostela (Spain). NanoFar aims to train the best students in the field of nanomedicine at a doctoral level.

All information is available on the NanoFar website and selection process is open until 4th february : <http://www.erasmusmundus-nanofar.eu/>

UPCOMING EVENTS

SOUTH AMERICAN SYMPOSIUM ON MICROENCAPSULATION

Limeira, Brazil - April 30 - May 2, 2012

Organized in collaboration with



APRIL 30, 2012

Session 1 : Methods

- Microencapsulation Introduction & Applications - Denis Poncelet, Oniris, France
- Particle engineering using spray drying - Maria Inès Ré, EMAC, France
- Nanobiotechnology : strategies to medical , environmental and agricultural encapsulation - Nelson Duran, UNICAMP, Brazil
- Coacervation and hydrogel encapsulation - Carlos Grosso, UNICAMP, Brazil

Session 2 : Case studies

- Encapsulation technologies for herbal products- Wanderlei P. Oliveira, USP, Brazil
- Liposomes - Maria H. Santana, UNICAMP, Brazil
- Electrospinning process: A versatile method for the encapsulation technology - Maria Helena Ambrosio Zanin, IPT, Brazil
- 3 open lectures

MAY 1, 2012

Session 3 : Industrials

- Encapsulation Challenges and Future - James Oxley, SwRI, Texas
- Engineering aspects of microencapsulation - Denis Poncelet, Oniris, France
- Microencapsulation: applications for cosmetic industry - Jenny Ling, Natura, Brazil
- Microfluidic devices applications to Microencapsulation - Mário Gôncora, IPT, Brazil
- Microencapsulation of Functional and Nutraceutical ingredients: challenges and achievements - Eduardo Cárita, Mikron, Brazil



Session 4 : Demonstrations

- Hydrogel beads and microcapsule, Denis Poncelet, Oniris, France
- Coacervation, Carlos Grosso, UNICAMP, Brazil
- Polymerisation, Nelson Duran, UNICAMP, Brazil
- Spray drying, Izabela Alvim, UNICAMP, Brazil
- Spray coating, Ana Siliva Pratas, UNICAMP, Brazil May 1st, 2012

MAY 2, 2012

Session 5 : Applications

- History, challenges and perspectives of cell microencapsulation - Paul de Vos, UMCG Groningen, Netherlands
- Applications of encapsulation for food ingredients - Gary Reinecus, University of Minnesota, USA
- Aquaculture: microdiets for fish larvae - Maria Cella Portella, UNESP, Brazil
- Cosmetic: particles for skin applications - Silvia Guterres, DF/UFRGS, Brazil
- Environment: Ecosystem protection by effluent bioremediation - Oswaldo L. Alves, IQ/UNICAMP, Brazil

Session 6 : Applications

- Medicine: Microencapsulation of pancreatic islets- Thiago Mares Guia, USP, Brazil
- Nutrition: Probiotics microencapsulated- challenges applications- Carmem Favaro, USP, Brazil
- Nutrition: Probiotics in dairy products - Mirna Gigante, UNICAMP, Brazil
- 3 open lectures

MORE INFORMATION

http://bioencapsulation.net/2012_Limeira

CALENDAR

	<p>9th International Conference on Biological Barriers February 29 - March 9, 2012, Saarbruck, Germany http://www.uni-saarland.de/info/wirtschaft/kwt/messekongresse/biologicalbarriers-2012.html</p>
	<p>1st International Conference on Food Digestion March 19-21, 2012, Cesena, Italy https://colloque.inra.fr/cost_infogest_fooddigestion2012</p>
	<p>8th World Meeting on Pharmaceutical Biopharmacy March 19-22, 2012 - Istanbul, Turkey http://www.worldmeeting.org</p>
	<p>XV industrial symposium & VI trade fair on Encapsulation March 20-22, 2012 - Archamps/geneva, France http://bioencapsulation.net/2012_Archamps</p>
	<p>TTC workshop : Fluid bed processing March 20-22, 2012 - Binzen, Germany http://www.ttc-binzen.de/cm/index.php?id=312</p>
	<p>TTC workshop : Granulation & Tableting April 24-26, 2012 - Binzen, Germany http://www.ttc-binzen.de/cm/index.php?id=368</p>
	<p>South American Workshop on microencapsulation April 30 - May 2, 2012 - Limeira, Brazil http://bioencapsulation.net/2012_Limeira</p>
	<p>BIONANOTOX 2012 «Biomaterials and Bionanomaterials 6-13 May, Heraklion, Crete-Greece http://www.bionanotox.org</p>
	<p>TTC workshop : Functional Filmcoating - practical session April 24-26, 2012 - Weimar, Germany http://www.ttc-binzen.de/cm/index.php?id=399</p>
	<p>9th International Conference on Protein Stabilisation May 2-4, 2012, Lisbon, Portugal http://prostab2012.ist.utl.pt</p>
	<p>TTC workshop : Fluid bed: Maintenance & Troubleshooting July 3-5, 2012 - Binzen, Germany http://www.ttc-binzen.de/cm/index.php?id=379</p>
	<p>9th Internat. Symposium on Polyelectrolytes - ISP 2012 July 9-12, 2012 - Lausanne, Switzerland. http://isp2012.unige.ch/</p>
	<p>2012 CRS Annual Meeting & Exposition July 15-18, 2012, Quebec City, Canada http://www.controlledreleasesociety.org/meetings/annual/Pages</p>
	<p>XX International Conference on Bioencapsulation Sept. 21-24, 2012, Orillia, Ont. Canada http://bioencapsulation.net/2012_Orillia</p>
	<p>4th Industrial Workshop on Microencapsulation September 26 - 27, 2012 http://www.bioactivesworld.com/microencapsulation.html</p>



Shemyakin-Ovchinnikov Institute of
Bioorganic Chem., Rus. Acad. Sci.,
Moscow, Russia.

Hybrid Microspheres For Cell Encapsulation

Redouan Mahou

Supervisor: Prof. C. Wandrey

Thesis successfully completed October 28, 2011, at the EPFL, Switzerland

Cell microencapsulation is an active interdisciplinary research field. It requires the input from materials sciences, organic and physical chemistry, biology and medicine. Hydrogels are particularly suitable materials to form microspheres for cell entrapment. The thesis describes the development of two novel types of hybrid microspheres, their physical properties, *in vitro* and *in vivo* biocompatibility as well as the application for the microencapsulation of three different cell types.

The first part presents the production of hybrid microspheres by combining fast ionotropic gelation of sodium alginate (Na-alg) with calcium ions and slow covalent cross-linking of poly(ethylene glycol) (PEG) derivatives. A one-step extrusion process yields under physiological conditions alginate-poly(ethylene glycol) hybrid microspheres (alg-PEG-M) consisting of a PEG chemical hydrogel network interpenetrating the physical calcium alginate hydrogel network. The physical properties of alg-PEG-M such as mechanical resistance, elasticity, permeability, and water uptake are adjustable by the macromolecular characteristics of the components, their concentration as well as the process conditions.

In vitro cytocompatibility tests did not show cytotoxic effects upon incubation with alg-PEG-M. The immune response to alg-PEG-M intraperitoneally implanted into mice was similar as the response to injected medium used as control. The feasibility of cell microencapsulation within alg-PEG-M was confirmed by encapsulating human islets of Langerhans and human mesenchymal stromal cells.

In the second part, heterobifunctional β -amine- β -thiol PEG was grafted onto Na-alg. The grafted alginate maintained the gelling capacity in presence of divalent cations, while a novel chemically cross-linked hydrogel was obtained via simultaneous spontaneous disulfide bond formation. The combination of these two gelling mechanisms yields Ca-alg-PEG hybrid microspheres in one step under physiological conditions. Microencapsulation of human hepatocellular carcinoma cells (Huh-7) in Ca-alg-PEG demonstrated cell viability, metabolic activity, and proliferation post encapsulation *in vitro*.

The two novel types of hybrid microspheres avoid the incorporation of polycations for mechanical reinforcement and tuning of the permeability and can be produced by a one-step microencapsulation technology under physiological conditions. They thus fulfill important requirements for biocompatible cell encapsulation materials.

Multicellular Tumor Spheroids in Microcapsules as 3-dimensional *in vitro* Model to Study the Effects of Photodynamic Therapy

D. Zaytseva-Zotova

Supervisor: Prof. E. Markvicheva

Date of thesis presentation : Feb 2012

Recent fast development of photodynamic therapy (PDT) and new photosensitizer (PS) delivery systems requires an efficient and high-throughput PS screening and testing *in vitro* system which could be able to faithfully mimic light-accessible solid tumors *in vivo*. Multicellular tumor spheroid (MTS) is one of a very well known cell-based *in vitro* model that mimic 3D structure of small size solid tumors. Unfortunately, commonly used techniques for MTS formation do not allow to produce significant quantities of MTS with narrow diameter distribution. In this regard microencapsulation of tumor cells seems to be an effective strategy to generate uniform MTS. Thus, the main objective of this thesis was to elaborate biocompatible polyelectrolyte microcapsules based on polyanion (alginate) and novel polycations, to demonstrate capability of these microcapsules to support cell growth and formation of MTS, to estimate response of microencapsulated MTS to PDT. In this project dextrans modified with chloramines, novel chitosan-graft-poly(vinyl alcohol) copolymers and oligochitosans as water-soluble at physiological conditions polycations were chosen to prepare smart biocompatible microcapsules. The physicochemical properties of the obtained microcapsules such as diameter and membrane thickness, mechanical stability and swelling at various environmental conditions were characterized. The results indicated that microcapsules containing chitosan were stable in cell culture medium but could be dissolved by changing pH value of the medium (up to 8.0-8.2), thus making possible a simple release of the entrapped cells. The novel microcapsules were shown to provide growth and proliferation of 8 mammalian cell lines, including normal and tumor cells, at long-term cell cultivation *in vitro* and allowed the formation of 3D MTS. The effect of PDT (PS: chlorin e6 and Photosence(R)) was evaluated on microencapsulated MTS. The proposed MTS-based model was found to be more resistant to the PDT than 2-dimensional monolayer cell culture model. Thus, MTS entrapped in polyelectrolyte microcapsules could be considered as a promising 3D *in vitro* model to estimate the doses of drugs or parameters for PDT *in vitro* before carrying out preclinical tests.

NETWORKING & COMMUNICATION

- **Bioencapsulation Research Group** is a non-profit association promoting networking and research in the encapsulation technology of bioactives. It organizes academic conferences and industrial symposiums, publishes a newsletter and manages a service web site. More information : <http://bioencapsulation.net>

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- **Registration with** bioencapsulation.net is based on a voluntary annual fees. If you wish to simply get the newsletter and be advised about future events, register online at: <http://bioencapsulation.net>

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- **Be an active member.** For a greater level of service, pay the registration fees :

Class	Annual fees
Industry members ¹	100 €
Researchers ²	60 €
Students ³	30 €

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- ² public and non-profit organizations, contact us for group registration
- ³ regularly registered for a master or PhD program, less than 30 years old.

Registration fees may be paid by credit card, bank transfer or check (from a French bank). For more information or invoice, see your registration page on <http://bioencapsulation.net>

- Full access to conference proceedings (> 1700)
- Access to the forum and internal mailing
- Possibility to contribute to the newsletter
- Reduction for the conference registration
- Priority for awarding of conference grants

Thanks to **Agence I** (<http://www.agence-i.eu/>) for designing the newsletter and **Geraldine Brodkorb** (gbrodkorb@eircom.net) for English corrections, and the editorial board for their help.

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