

平成22年12月24日

『Hiroshima University
Quarterly Technology Newsletter』
の創刊について

広島大学産学・地域連携センターでは、大学発技術の海外マーケティングのためのツールとして、平成22年12月13日に『Hiroshima University Quarterly Technology Newsletter』（広大季刊技報）を創刊し配信しました。

このニュースレターは、本年6月にニューヨークで行った、中国地区5大学の研究・技術シーズ説明会「ニューヨークショーケース」のフォローアップを目的に創刊を決定したものです。

ニュースレターでは、本学の最新の研究成果や産学・地域連携関係のニュース、イベント情報および「ネイチャー」「サイエンス」など学術雑誌に掲載された最近の論文なども紹介していきます。

主として海外の企業、投資家、政府関係機関、大学等を対象に、広島大学の先端的な研究シーズや技術をわかりやすく紹介します。大学の研究成果や国際産学官連携活動の周知を促し、世界の産業界との連携や共同研究のきっかけとなるような情報提供を目指していきます。また本学研究者の国際産学官連携活動の推進への貢献もできると期待しています。

ニュースレターは季刊での発信を予定しています。今後より顧客ニーズにあった誌面・配信方法を検討していく予定です。

【お問い合わせ先】

産学・地域連携センター
国際産学連携部門
TEL:082-424-3709、FAX:082-421-3788
E-mail: crcinter@hiroshima-u.ac.jp

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広島大学季刊テクノロジー・ニュースレター創刊号

--- Center for Collaborative Research & Community Cooperation

産学・地域連携センター

Message from Director - "Welcome to our Quarterly Newsletter!"

センター長挨拶「季刊ニュースレターへようこそ！」

産学地域連携センター長 澤俊行

このたび当センターは広島大学季刊テクノロジー・ニュースレターを発刊し、今日皆様に創刊号をお届けできることをうれしく思います。ご存知の通り、当センターの使命は技術相談や共同研究を通じて産学官連携を推進し、大学の研究、技術、知的財産を産業界に移転し、社会全体としての成長と繁栄をめざすものです。本ニュースレターにより大学の研究の進捗をご理解頂き、今後の連携の参考にして頂ければと存じます。本ニュースレター発刊にあたり、皆様のご意見をお待ちするとともに、有用な情報源としてお使い頂けることを願っております。

Toshiyuki Sawa, Director, Center for Collaborative Research & Community Cooperation

I am pleased to announce that our Center has published the Hiroshima University Quarterly Technology Newsletter and to deliver the inaugural issue to you today. As you are aware, our mission is to promote industry-academia-government collaboration through consulting activities and collaborative researches, thus transferring our research & technology and intellectual property to industry for growth and prosperity of the entire society. This newsletter is to keep you updated of our recent research progress for your better understanding and reference of our research outcome for our future collaboration and partnership. As we launch this new publication, we welcome your feedback and hope you will find the newsletter a valuable source of information. Thank you.

New Technologies 新技術

Next Generation Sustainable Swine Farming - Swine Artificial Insemination Technique using Frozen-thawed Sperm

次世代型持続可能な養豚業—豚凍結精液を用いた人工授精法の開発

Masayuki Shimada, Associate Professor

Graduate School of Biosphere Science, Hiroshima University (joint research & development with Tetsuji Okazaki, PhD, Oita Prefecture Agriculture, Forestry and Fisheries Research Center)

Associate Professor M. Shimada has developed a technique for freezing boar sperm over

extended periods, potentially offering the farming industry a safe and high reproductive performance insemination technique at a low cost. This method can enable fast recovery from devastating outbreaks of foot-and-mouth disease and other epidemics. [Read more](#)

→ http://www.hiroshima-u.ac.jp/en/sangaku/HUQTN/p_ovry0s.html#detail1

In Japan, pigs are bred either naturally (60%) or by artificial insemination using liquid semen (40%). Technology using frozen semen has been in common usage for bulls, but not for swine. Professor Shimada's breakthrough could help farmers significantly by eliminating the need to transport sires for breeding and enabling the long-term preservation of prized pig lines.

Boar sperm cells are very fragile and suffer significant damage when simply frozen. Therefore, artificial insemination using sperm frozen by conventional methods yields a low conception rate and consequently fewer offspring. On the other hand, pig farmers who rely on sires for natural breeding incur higher costs because of transportation of the sires.

The new method involves isolating sperm from semen, which contains bacteria or other negative factors on sperm functions, and then dehydrating H₂O from sperm cytoplasm before freezing the cells at minus 196 degrees in liquid nitrogen.

After thawing, the sperm can be used for artificial insemination by adding a hormone called cortisol, known to suppress the immune function (this hormone was originally contained in the seminal plasma that was removed before freezing). Tests have shown that using this technique for artificial insemination, the conception rate is about 80%, with more than 10 pigs/litter, comparable to that of natural breeding.

Costing just 20 yen/straw, the 400mOsm/Kg hyperosmotic and 2% low-glycerol freezing extender and thawing solution with EGTA and cortisol will be sold for 1,500 yen/straw by Oita Prefecture.

	Natural Breeding	Frozen Spermatozoa
Investment	100,000-500,000yen/boar	500,000-1Mil yen
Farming Cost	50,000-100,000yen/boar/year	Frozen Spermatozoa 1,500yen/seed

Oita Prefecture has already placed 30,000 tubes of sperm from the prefecture's prized pigs in deep freeze.

Two patents are pending for this technology in Japan, and one internationally.

Professor Shimada has started research on application of this breakthrough technology to other animals including human beings.

Blue, Green and Red Light Emitting Silicon - Nanocrystals -- Breakthrough Technology Leading to a Sustainable Low Carbon Economy

光の3原色で発行するシリコンナノ結晶 -- 持続可能な低炭素社会への突破口となる新技術

Kenichi Saitow, Associate Professor

N-BARD (Natural Science Center for Basic Research and Development), Graduate School of Science, Hiroshima University and PRESTO, Japan Science and Technology Agency

Associate Prof. Saitow has invented the world's first technology to develop light-emitting silicon nanocrystals in Red, Green and Blue (RGB) colors. Silicon is normally known as a material generally unable to emit visible light as its luminescent wavelength is in infrared. His team has developed a unique method to fabricate nanomaterials by one-pot synthesis via a single step. That is, the pulsed laser ablation of a solid material was conducted in high-pressure supercritical fluid. By applying this method to the bulk silicon, they succeeded in fabricating light-emitting silicon nanocrystals.

Read more → http://www.hiroshima-u.ac.jp/en/sangaku/HUQTN/p_ovry0s.html#detail2

In addition, the emission color is controlled easily in the wavelength, ranging from near-ultraviolet, violet, blue, green and red colors, by adjusting the fluid pressure during the laser ablation of silicon. Since the three primary colors of light, RGB, give a full color in the visible region, one anticipates that the products in the present study provide novel applications based on silicon photonics, e.g. LED, biomarker, lighting, display, data storage, and so on. Silicon is the essential material for almost all electrics as well as solar cells and exists in huge abundance, comprising of 60% of the earth's total elements. It is low-cost, safe and environmentally harmless, whereas a commercial light-emitting devices are relatively high cost and involves toxic elements, e.g. mercury in fluorescent light tubes and arsine in LED, and rare earth elements in lighting and display. The new nanotechnology developed by the Prof. Saitow's team allows us to proceed towards sustainable and low-carbon societies and offers a low-cost and safe alternative material in the resource crisis to help us conserve rate earth supplies.

This research was accepted by the Journal of Physical Chemistry, April 16, 2009 issue.

Three patents are pending for this technology in Japan, and one internationally.

News and Upcoming Events お知らせ・イベント

- Invitation is out for **2010FY International Industry-Academia-Government Collaboration Strategy Symposium** to be held in Hiroshima on **Jan. 21, 2011**.

Read more → http://www.hiroshima-u.ac.jp/schedule/show/lang/en/id/232/dir_id/31

- The 3rd International Workshop on Manufacturing Engineering - Basic Technologies for Product Quality Management – held in Indonesia on Nov. 8-9 jointly with Institute of Technology Bandung (ITB) and Karawang International Industrial City.

Read more → http://www.hiroshima-u.ac.jp/news/show/lang/en/id/665/dir_id/31

- The Center visited Chennai, India on Nov. 8-12 as part of Hiroshima Pref.'s industry-academia-governmental mission.

Read more → http://www.hiroshima-u.ac.jp/news/show/lang/en/id/680/dir_id/31

From Recent Publication 最近の論文から

- **“Mutations of optineurin in amyotrophic lateral sclerosis”** by the group including Hirofumi Maruyama, Hiroyuki Morino, Masaki Kamada & Hideshi Kawakami, Department of Epidemiology, Research Institute for Radiation Biology and Medicine and Yasuhito Watanabe & Toru Takumi, Laboratory of Integrative Bioscience, Graduate School of Biomedical Sciences, NATURE, May 13, 2010 issue

筋委縮性側策硬化症におけるオプチニューリンの変異

<http://www.nature.com/nature/journal/v465/n7295/full/nature08971.html>

OPTN seems to be involved in the pathogenesis of ALS. They also indicate that NF-kB inhibitors could be used to treat ALS and that transgenic mice bearing various mutations of OPTN will be relevant in developing new drugs for this disorder.

- **“Directional control of light by a nano-optical Yagi-Uda antenna”** by Terukazu Kosako, Yutaka Kadoya & Holger F. Hofmann, Institute for Advanced Materials Research, NATURE PHOTONICS, March 14, 2010

光の波動性を利用したナノサイズの光アンテナ

<http://www.nature.com/nphoton/journal/v4/n5/full/nphoton.2010.34.html>

This nano-scale antenna makes it possible to enhance both emission and detection of light from nano-scale light sources (individual molecule and semiconductor quantum dot). It also enables to measure and recognize even extremely weak light using the sensor,

and to analyze molecule effectively using light. In the future, optical communication between molecules will be expected. It leads to improve the performance of a single photon source (a device to generate single photons which is particles of light) for quantum computers and quantum communication expected as a future information and communication technology.

- **“Abnormal Behavior in a Chromosome – Engineered Mouse Model for Human 15q11-13 Duplication Seen in Autism”**, Toru Takumi and Tadafumi Kato, Graduate School of Biomedical Sciences. CELL, June 29, 2009 issue
自閉症モデルマウスで発達期のセロトニン異常を発見
[http://www.cell.com/abstract/S0092-8674\(09\)00449-8](http://www.cell.com/abstract/S0092-8674(09)00449-8)

Chromosome-engineered mouse model for autism seems to replicate various aspects of human autistic phenotypes and validates the relevance of the human chromosome abnormality. This model will facilitate forward genetics of developmental brain disorders and serve as an invaluable tool for therapeutic development.

- **“Rules for Biologically Inspired Adaptive Network Design”** by Ryo Kobayashi, Graduate School of Science, SCIENCE, Jan. 22, 2010
真性粘菌によるより効率的ネットワークの形成
<http://www.sciencemag.org/content/327/5964/439>

Slime-inspired transport plan wins Ig Nobel!! The core mechanisms needed for adaptive network formation can be captured in a biologically inspired mathematical model that may be useful to guide network construction in other domains.

Hiroshima University Research Seeds Database

http://www.hiroshima-u.ac.jp/en/sangaku/p_06569c.html

Hiroshima University Researchers Database – English version will be available on Jan. 1, 2011

http://souran.bur.hiroshima-u.ac.jp/Scripts/websearch/top_1.htm?lang=en&cnt_up=0

Hiroshima University Collaborative Product Catalogue

http://www.vbl.hiroshima-u.ac.jp/sangaku/syouhinshu_e.pdf

Hiroshima University Collaborative Handbook

http://www.vbl.hiroshima-u.ac.jp/vbl_hp/Collaborative%20Research%20Handbook.pdf

Contact:

Industry-Academia Collaboration Division

Center for Collaborative Research and Community Cooperation

Hiroshima University

3-10-31, Kagamiyama, Higashihiroshima

Hiroshima, Japan 739-0046

E-mail: crcinter@hiroshima-u.ac.jp

TEL: 81-82-421-3709

FAX: 81-82-421-3788

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