



国立大学法人 豊橋技術科学大学
エレクトロニクス先端融合研究所



<http://www.eiiris.tut.ac.jp/>

(日本語 <http://www.eiiris.tut.ac.jp/japanese/index.html>)

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国立大学法人
豊橋技術科学大学



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目 次
Contents

学長挨拶.....	3
Message from President Yoshiyuki Sakaki	
研究所長挨拶.....	5
Message from Director Makoto Ishida	
研究体制.....	6
Research Organization	
メンバー紹介	7
EIIRIS Researchers	
研究協力・協定大学.....	11
Advisers and Collaboration	
シンポジウムとセミナーの開催.....	15
Symposia	
ランチコロキアとイブニングコロキア	20
Lunch and Evening Colloquia	
EIIRIS が取り組む研究テーマ	25
Research Areas	
報道記事.....	27
Media Coverage	
論文リスト.....	35
Publications	
エレクトロニクス先端融合研究所（EIIRIS）フロアマップ ...	49
Floor Map	

新たなフロンティアの開拓を目指して Aiming for New Frontiers

21世紀に入り国際社会では経済・産業活動の大きな変化や、環境・エネルギー問題、食糧・人口問題など人類的課題が顕在化し大きな転換期を迎えています。また我が国は少子高齢化といった固有の問題も抱えています。このような国内外の激しい変化に対応して我が国の第4期科学技術基本計画ではライフイノベーション、グリーンイノベーションを掲げ、科学技術立国の再興を目指しております。本学も次の20年、30年を見据えた第2期中期目標・中期計画を設定し、様々な取り組みを進めてきました。その次の時代を見据えた本学の挑戦の中で研究開発の中核、「旗艦」に位置づけられるのがエレクトロニクス先端融合研究所です。本学では開学以来数々の優れた技術を開発し学術、産業の発展に貢献してきました。中でもエレクトロニクス領域では世界の最先端を走るセンサチップの開発や超大容量メモリー素子の開発に成功するなど国際的にも高く評価され、文部科学省のグローバルCOEプログラムの拠点にも選ばれた実績があります。エレクトロニクス先端融合研究所はこの本学のもつ優れたエレクトロニクス先端技術を医学・医療、農学・農業や情報・通信などの諸分野の「先端知」と



Message from President Yoshiyuki Sakaki

At the start of the 21st Century, the international community stands at a turning point. There have been major changes in economic and industrial activities across the globe compounded by issues that could impact the future of humanity in such areas as environment, energy, food, and population.

Japan is faced with unique problems in the shape of an aging population combined with a diminishing number of children. Responding to such momentous changes inside and outside Japan, the government has issued the Fourth Science and Technology Master Plan with the aim of achieving Japan's renaissance as a science and technology-based nation. The two key themes of the plan are 'life innovation' and 'green innovation'.

In response to this, and with a keen awareness of global challenges, Toyohashi University of Technology (Toyohashi Tech) has formulated a goal of advancing a variety of initiatives looking ahead to the coming 20 and 30 years. As we look to the next generation, we regard our Electronics-Inspired Interdisciplinary Research Institute (EIIRIS) as our flagship—the core facility of our research and development activities for the foreseeable future.

Ever since being established, Toyohashi Tech has developed an extensive range of outstanding technologies and contributed considerably to industrial innovation. In the field of electronics in particular, we have received international acclaim for successfully developing world-leading sensor chips and ultra-large capacity memory elements. The University was selected as a core facility under the Global COE program of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Based on this tradition of innovative research, EIIRIS aims to integrate our advanced electronics advanced technology with cutting edge research in fields including medicine, agriculture, and telecommunications, thereby opening new frontiers and integrating academia and technology. I take heart from the fact that, in only its first three years, EIIRIS has already made some outstanding achievements based on the efforts of its outstanding senior faculty members and highly motivated young and tenure track researchers.

Toyohashi Tech has recently been selected as one of 22 outstanding research universities and research institutes in the MEXT program for strengthening research activities in Japan, and also as a core university of the MEXT "Leading Graduate Course" program. This demonstrates recognition of our University's research achievements as a whole, as well as the outstanding contributions of EIIRIS. I am confident that EIIRIS will continue to act as the research engine at Toyohashi Tech, driving this "research university" and contributing to our future development.

Toyohashi Tech is committed to seeking further growth based on its achievements to date, and with EIIRIS at the forefront, we aim make concerted efforts in opening up challenging new frontiers. Thank you for your ongoing understanding and support.

Yoshiyuki Sakaki
President, Toyohashi University of Technology

研究所「EIIRIS（アイリス）」の展開

Evolution of the Electronics-Inspired Interdisciplinary Research Institute (EIIRIS)

本学では初めての研究所である「エレクトロニクス先端融合研究所(EIIRIS)」が設立(平成22年10月1日)され、本学の強みである「エレクトロニクス基盤技術分野」(センサ・LSI、フォトニクスデバイス)と、それを用いて研究を展開する「先端的応用分野」(ライフサイエンス、医療、農業科学、環境、情報通信、ロボティクスなど)との新たな融合を目指した異分野融合研究拠点として整備、拡充をこの3年間行ってきました。

研究所組織としては、先端融合研究3部門(アドバンストメディアカルテクノロジー、ブレインテクノロジー、グリーンテクノロジー)、研究支援・人材育成部門があり、学内の教員と共に研究活動を展開しています。EIIRIS専任スタッフは、11名の教員、技術支援員(2名)と事務職員(2名)、10名のテニュア・トラック教員(平成21年度から)がEIIRIS-1の3階フロアに集合し、物理的に毎日顔を付き合わせる環境で融合研究を進めています。

研究活動拠点は、EIIRIS-1(先端融合棟1,500m²:2010年完成)の1Fに先端材料開発クリーンルーム、2Fに光関係計測室、物理計測室、そしてバイオサイエンス実験室、3Fにスタッフ用フロア等が配置されています。EIIRIS-2(2,300m²)は、EIIRIS-1と3階でつながり、通称LSI工場と呼んでいるLSI・センサ・MEMSの設計からCMOS・センサプロセス、評価まで一貫して行うことができる「世界にも希有な施設」(21

The Electronics-Inspired Interdisciplinary Research Institute (EIIRIS)—the University's first eve research institute—was launched on 1st October 2010. The last three years have been spent developing and enhancing the institute as an interdisciplinary integrated research center. We are endeavoring to realize a unique fusion between our main strength in electronics technology (sensors, LSI, photonics devices) and state-of-the-art applied research on the life sciences, medical care, agricultural science, environment, telecommunications, and robotics, to name but a few.

The organization of EIIRIS consists of three innovative research departments: advanced medical technology, brain technology, and green technology. The research support and human resources development department also conducts research activities in collaboration with the university faculty. The full-time members of staff at EIIRIS consist of eleven researchers, two technical assistants, two administration staff and ten tenure track researchers (since 2009). The EIIRIS staff share a large open plan office on the third floor of EIIRIS-1 and are in daily contact with each other as they collaborate on integrated research activities.

The infrastructure for research activities includes the advanced materials development cleanroom on the first floor of EIIRIS-1—a dedicated 1,500 m² building completed in 2010, and designed as an advanced integration block for housing sophisticated instruments in the optical measurement room, physical measurement room, and bioscience laboratory on the second floor. Staff and administration offices are on the third floor.

EIIRIS-2—referred as the LSI factory—measures 2,300 m² and is connected to EIIRIS-1 via a bridge on the third floor. EIIRIS-2 consists of “facilities unique even from the international viewpoint,” according to the 21st Century COE interim evaluation. EIIRIS-2 allows staff to handle many integrated activities from the design of LSI, sensors and micro-electro-mechanical systems to semiconductors and sensor processes and measurements.



エレクトロニクス先端融合研究所 所長
石田 誠 副学長 教授

世紀COE中間評価)」を擁しています。EIIRIS-3は、ライフサイエンス実験施設として、動物を扱う本格的な実験施設を平成24年度に工学系大学では希であるが、完成させ、融合研究を展開しています。

特に、世界的な異分野融合研究を推進するために、国際会議(The Irigo Conf.)を研究所開設当初から毎年開催し、e-News Letter等で世界にEIIRISの活動を発信しています。また学内の融合研究推進のため、平成25年度から、EIIRIS異分野融合研究プロジェクトを開始し、現在45テーマを展開しています。また、学内の各分野の先生を話題提供者として毎月イブニングコロキウムを開催し、さらにテニュア・トラック教員によるランチコロキウム開催など融合研究の芽を出すべく全学での議論の場を設けています。また、EIIRISの活動状況をEIIRIS Bulletinとして毎月配布も行っています。このように、国内外、そして本学の多くの分野の先生や学生の皆さんのご理解と協力が異分野融合拠点形成には欠かせません。そして、そこから世界に発信する研究成果や産学連携活動成果が出てくると期待しています。最後になりますが、平成25度文科省の「研究大学強化促進事業(10年)http://www.mext.go.jp/a_menu/kagaku/sokushinhi/1338460.htm」に22拠点の一つに本学が採択されました。さらなる全学的な取り組みが期待されています。

Finally, EIIRIS-3 was completed in 2012 as a life sciences experimental facility conducting full-scale experiments using animals—an unusual research facility for an engineering university.

In order to promote world-class interdisciplinary research, EIIRIS organizes annual international conferences (such as the *Irigo Conference*) and also globally advertises its activities by means of the *Toyohashi Tech e-newsletter*. Moreover, in 2013 EIIRIS launched the 'EIIRIS interdisciplinary integrated research project' and is currently working on 45 topics aimed at advancing collaborative research within the university. The long term goal of the project is to stimulate intra-university discussion, leading to new ideas for interdisciplinary research, through monthly evening colloquia with presentations by researchers from a wide variety of backgrounds. EIIRIS also hosts 'lunch colloquia' as part of the tenure track program.

Furthermore, the activities of EIIRIS are disseminated in the monthly *EIIRIS Bulletin*. All these methods of communication enable us to continue developing this institute for interdisciplinary research, by highlighting the cooperation of faculty and students across the whole spectrum of expertise at the university, as well as collaborations with researchers across Japan and the rest of the world. We hope that EIIRIS will continue to communicate the fruits of its research and industrial-academic collaboration to the world.

Finally, Toyohashi University of Technology has been selected by the Ministry of Education, Culture, Sports, Science and Technology as one of 22 institutes in the 10 year program for strengthening research universities in the year 2013 (see http://www.mext.go.jp/a_menu/kagaku/sokushinhi/1338460.htm).

I am looking forward to further interdisciplinary initiatives in the future.

Makoto Ishida
Director, Electronics-Inspired Interdisciplinary Research Institute

研究体制とメンバー Organization and Members

所長：石田 誠 副学長 教授 副所長：菊池 洋 副学長 教授 Adarsh Sandhu 教授

Director : Professor and Vice President Makoto Ishida; Deputy Director : Professor and Vice President Yo Kikuchi; Deputy Director: Professor Adarsh Sandhu

専任教員 EIIRIS Researchers

Adarsh Sandhu 副所長
Deputy Director Adarsh Sandhu
岡田 浩 専任准教授
Associate Professor Hiroshi Okada
中鉢 淳 専任准教授
Associate Professor Atsushi Nakabachi
櫻井孝司 専任准教授
Project Associate Professor Takashi Sakurai
土谷 徹 専任准教授
Project Associate Professor Tohru Tsuchiya
大井英生 専任講師
Project Lecturer Hideo Oi
赤井大輔 専任助教
Assistant Professor Daisuke Akai
針本哲宏 専任助教
Project Assistant Professor Tetsuhiro Harimoto
広瀬 侑 専任助教
Project Assistant Professor Yuu Hirose
Tran Viet Thu 専任助教
Project Assistant Professor Tran Viet Thu
臼井支朗 特任教授
Project Professor Shiro Usui

テニュア・トラック教員 Tenure Track Researchers

鯉田孝和 特任准教授
Tenure Track Associate Professor Kowa Koida
南 哲人 特任准教授
Tenure Track Associate Professor Tetsuto Minami
手老龍吾 特任助教
Tenure Track Assistant Professor Ryugo Tero
真下智昭 特任助教
Tenure Track Assistant Professor Tomoaki Mashimo
三澤宣雄 特任助教
Tenure Track Assistant Professor Nobuo Misawa
高村 司 特任助教
Tenure Track Assistant Professor Tsukasa Takamura
Dzmitry Tsetserukou 特任助教
Tenure Track Assistant Professor Dzmitry Tsetserukou
Alexander Baryshev 特任准教授
Tenure Track Associate Professor Alexander Baryshev

学内共同研究者 Collaborating Researchers

澤田和明 教授
Professor Kazuaki Sawada
若原昭浩 教授
Professor Akihiro Wakahara
平石 明 教授
Professor Akira Hiraishi
中内茂樹 教授
Professor Shigeki Nakauchi
井上光輝 教授
Professor Mitsuteru Inoue
寺崎一彦 教授
Professor Kazuhiko Terashima
滝川浩史 教授
Professor Hiroshi Takigawa
福田光男 教授
Professor Mitsuo Fukuda
堀川順生 教授
Professor Jun Horikawa
三浦 純 教授
Professor Jun Miura
岩佐精二 教授
Professor Seiji Iwasa
北崎充晃 准教授
Associate Professor Michiteru Kitazaki
岡田美智男 教授
Professor Michio Okada
沼野利佳 准教授
Associate Professor Rika Numano

支援スタッフ
Support Staff
足木光昭 Mitsuaki Ashiki 橋詰恒雄 Tsuneo Hashizume 小林祐子 Yuko Kobayashi 柴田瞳 Hitomi Shibata
尾崎行春 Yukiharu Ozaki 小田悟 Satoru Oda 太田聰美 Satomi Ohta

研究テーマ概要 Research themes

- ニューロセンシング
Neurosensing
- 農業及びプランツサイエンス
Agriculture and Plant Science
- 先端ゲノム科学及び表面科学
Advanced genome science and surface science
- 環境浄化・モニタリング技術の開発
Environmental monitoring
- フォトニックメディカルデータストレージ・情報ディスプレイ・情報処理
Photonic medical data storage·Communication display·Information processing
- グラフェン系物質生成及びナノ・バイオ・磁気エレクトロニクス応用
Graphene synthesis and nano/bio/magnetoelectronic applications
- 基礎物理学(超伝導現象及び量子ホール効果関連)
Basic physics (superconductivity and quantum Hall effect)
- Integrated hybrid Si/III-V optoelectronic circuits
Integrated hybrid Si/III-V optoelectronic circuits
- Robotics, actuators and systems control
Robotics, actuators and systems control
- NEMS・MEMS物理センサ
NEMS・MEMS Physical sensor



エレクトロニクス先端融合研究所

エレクトロニクス先端融合研究所 研究所員紹介



副所長 教授
菊池 洋
Yo Kikuchi

分子生物学、生化学、進化工学による機能性高分子創製、Ribonuclease P、菌体外分泌DNAおよびRNA
Molecular biology, Biochemistry, Ribonuclease P, Extracellular DNA and RNA, Evolutionary bioengineering for functional polymer



副所長 専任教授
Adarsh SANDHU

研究テーマ:グラフェン生成及び応用、半導体量子ホール効果を利用した磁界可視化用走査型ナノホール・プローブ顕微鏡開発、ホール磁気素子と磁性粒子標識を用いた早期医療診断技術構築、水液中磁性粒子の自己組織化観察による医療診断技術開発、溶液中マイクロ流路型透過型電子顕微鏡観察
Synthesis and applications of graphene; quantum Hall effect and semiconductor Hall effect sensors; scanning Hall probe microscopy; magnetic nanoparticles for medical diagnostics; self-assembly of magnetic particles; in-situ observation with wet-transmission electron microscopy.



専任准教授
岡田 浩
Hiroshi Okada

研究テーマ:窒化物半導体などのIII-V族化合物半導体とナノ材料、シリコン集積回路との一体化による高感度紫外光センサなどセンサ開発や、微細加工、イオンビーム技術を応用した発光デバイスなど、プロセス開発及びデバイス作製に取り組んでいます。

My interest is development of semiconductor device and technologies by integration of compound semiconductors, silicon and nano materials to enhance interdisciplinary researches.



専任准教授
中鉢 淳
Atsushi Nakabayashi

研究テーマ:多細胞生物-微生物間相互作用は、農業生産や医療に密接に関わるのはもちろん、生物に劇的な進化をもたらす原動力となることがあります。私は最先端の工学技術を駆使して、その成り立つの理解を進め、幅広い応用展開の基盤づくりを進めています。

My research interests focus on the biology of symbiosis between multicellular organisms and microbes, which is important for agricultural and medical biotechnology as well as evolutionary history of life.



専任助教
赤井 大輔
Daisuke Akai

研究テーマ:人が感じることのできない超音波や赤外線は、医療診断装置、セキュリティなど様々な分野への応用が広がりつつあります。私は、Si半導体と強誘電薄膜とを融合し、これらの信号を可視化できる小型・高感度なイメージセンサの開発を進めています。
EIIRIS-2の館内設備/装置管理

I'm studying for fusion on a functional material and Si integrated circuit technology. An insulating crystal thin film (γ -Al₂O₃) was grown on Si substrates and ferroelectric thin film smart sensor with Si electronics was developed using above substrates.



専任教授
臼井 支朗
Shiro Usui

研究テーマ:脳・神経情報処理、生理工学、視科学、網膜生理、時空間多チャンネル信号計測と解析、神経システムのモデリングとシミュレーション解析

Brain and Neural Information Processing, Physiological Engineering, Vision Science, Retinal Physiology, Measurement and Analysis of Spatiotemporal Multi-channel Signal, Neural System Modeling and Simulation Analysis.



所長 教授
石田 誠
Makoto Ishida

半導体材料・デバイス・集積回路、スマート・マイクロ・センサチップ、次世代半導体デバイス
Semiconductor material·devices·integrated circuits, Smart micro sensorchips, next-generation semiconductor devices



特任准教授
櫻井 孝司
Takashi Sakurai

研究テーマ:細胞はイオンなどの生理活性物質を信号として用いています。細胞から放出された信号分子を直接検出するために、化学顕微鏡ならびに生体内視技術の開発を行っています。脳機能の生理学的解析や異常部位の病理学的診断への展開を目指しています。

Cells release ions or neurotransmitters. To examine the dynamics of the physiologically active substances without labeling, we have been developing an ion image sensor-based microscope and a fiber-coupled endoscope. The opto-chemical microscopic assessment promises usefulness of the functional analysis of cells, tissues and a body.



特任准教授
土谷 徹
Tohru Tsuchiya

研究テーマ:マイクロ流体・MEMS技術を中心に遺伝子診断システムの構築を目指しています。その研究成果で安全・安心な健康社会へ貢献できればと考えています。

URA
(University Research Administrator)
1.Research of Genetic Diagnosis System
2.Research of μ TAS(micro Total Analysis System) and micro fluidics
3.URA(University Research Administrator)



特任助教
Tran Viet THU

研究テーマ:私は、グラフェンを用いた新規ナノ材料を研究しています。グラフェンを各種の物質と組み合わせることで、化学物質を検出する能力、触媒能力、エネルギー変換能力など、様々な付加機能を持たせた磁性ナノ粒子の開発を行っています。My research interest lies in the boundary between materials chemistry and nanotechnology. Currently I focus on novel hybrid materials based on graphene and functional nanoparticles, especially noble metals and magnetic nanoparticles. I develop efficient strategies to synthesize those hybrids with tailored properties for applications in catalysis, sensing, and environmental remediation.



特任講師
大井 英生
Hideo Oi

研究テーマ:シリコン基板の上に、局所的に結晶を成長させることで、髪の毛よりも細い針を作ることができます。私どもはこれを電極として、生体の神経に流れる信号を拾うチップを製作しています。また、実際に使うための配線やパッケージの開発を行っています。

Narrow needle can be grown on Si substrate using VLS selective epitaxial method. We are making neuronal probe electrode cored by the Si needle and developing the lead cable and package for actual usage.



特任助教
広瀬 侑
Yuu Hirose

研究テーマ:生物は、光を受容するために様々な補助色素やタンパク質を進化させてきました。私は、EIIRISの次世代DNAシークエンサーを用いて、野外の光合成藻類のゲノム解析を行い、その光受容機構の解明を目指しています。

Photosynthesis organisms harbor various kinds of photoreceptor proteins.
I am exploring molecular mechanism and physiological roles of these photoreceptors using next generation DNA sequencer.



准教授(環境・生命工学系)
沼野 利佳
Rika Numano

研究テーマ:網膜視機能の究明を目指して、網膜電位図(ERG)を対象に電気生理学的アプローチによる神経活動の解析を進めています。また、本学LSI工場で製作された豊橋プローブ電極を駆使しながら、電極ならびに計測技術に関する研究に取り組んでいます。

In order to elucidate the retinal information processing, we have been developing a novel measurement method and unique microprobe array for Electroretinogram (ERG) recordings.

**エレクトロニクス先端融合領域
若手研究者育成プログラム
(テニュア・トラック・プログラム)
研究所員紹介**



テニュア・トラック准教授
南 哲人
Tetsuto Minami

研究テーマ:感性情報やひらめき・気づきなどの潜在的な情報を理解することは、ヒトにやさしい情報環境の構築には重要です。私は、顔を中心とした非言語コミュニケーションや、ひらめき・気づきなどの情報理解度に関して、脳活動計測を行っています。

My current projects focus on behavioral and neuronal correlates of higher cognitive function such as nonverbal communication and brainstorm, and its application such as brain machine interface.



テニュア・トラック助教
高村 司
Tsukasa Takamura

研究テーマ:透過型電子顕微鏡を用いて液体中にある生体物質活動や化学反応をリアルタイムに観察可能なTEMナノカプセルの開発を行っております。また磁性ナノ粒子上にマイクロ粒子が吸着する磁気的自己組織化を用いた高感度生体物質検出を行っております。

My research is on the development of the capsule for observing materials in liquid by TEM. Also bio-sensing utilizing magnetic labels and their self-assembly is carried out.



テニュア・トラック准教授
Alexander BARYSHEV

研究テーマ:Physics and application of photonic and plasmonic crystals, magneto-optical materials and composites. Researches on extremely responsive materials supporting surface waves for biosensor, environmental and proximity sensor applications, and optical switches.



テニュア・トラック准教授
鯉田 孝和
Kowa Koida

研究テーマ:視覚認知の神経基盤を理解するために、EIIRIS-3ライフサイエンスラボにて動物(主にサル)の行動と神経活動を記録する実験を行っています。ヒト心理実験との連動、神経活動を見るための電位・イオン・光センシングの応用に特徴があります。

To understand relationship between perception and neuronal activity, I am conducting physiological recordings from cerebral cortex of monkeys while performing cognitive tasks.



テニュア・トラック助教
Dzmitry TSETSERUKOU

研究テーマ:The research focuses on telexistence robotic systems and haptic technologies. My research interest also includes human-robot interaction, haptic interfaces and displays, robotic skin, exoskeletons. I proposed such original research fields and concepts as Affective Haptics, Emotional Telepresence/ Telexistence, and 4D communication.



テニュア・トラック助教
三澤 宣雄
Nobuo Misawa

研究テーマ:生体の仕組みを利用あるいは模倣した系と人工的な系を組み合わせた研究をしています。化学受容体を発現させた細胞を利用した化学センサや細胞膜をまねた脂質膜から成る微小な粒子(ベシクル/リポソーム)の簡易形成技術の創出に取り組んでいます。

My research interest is construction of bio-hybrid / mimetic system with artificial materials. I currently focus on developing a cell-based biosensor and easy formation method of liposome.



テニュア・トラック助教
手老 龍吾
Ryugo Tero

研究テーマ:脂質二重膜は細胞膜の基本構造で、物質・情報・エネルギー輸送の反応場として働きます。私はシリコンやグラフェンなどの機能性表面上に作製した人工脂質膜中で脂質やタンパク質の分子挙動その場観察とそのための計測手法の開発に取り組んでいます。

We investigate the dynamics and assembly of lipids and proteins on single molecular scale to mesoscale in artificial cell membrane models on solid substrates, e.g. silicon, graphene and solid sensing devices.



テニュア・トラック助教
真下 智昭
Tomoaki Mashimo

研究テーマ:圧電アクチュエータは、高出力密度(小さくても大きな力)という優れた特長を有しています。この特長に注目し、私は、わずか1ミリメートルの医療用モータの開発や、軽くても大きな力のロボット用モータの研究開発を行っています。

The advantage of the piezoelectric actuators is the high energy density that generates large power from a small body. Using this advantage, we are creating small actuators for medical devices and light-weight high-torque actuators for robotics.

エレクトロニクス先端融合研究所 支援スタッフ

Support Staff



エレクトロニクス先端融合
研究所 特命技術職員
足木 光昭
Mitsuaki Ashiki

EIIRIS-2(VBL)クリーンルームの半導体製造設備の維持管理、学内外からのプロセス依頼の対応、半導体集積回路(MOS-IC, LSI)・センサ・MEMS技術を活かしたデバイスプロセス開発を担当しています。

Maintenance management of a clean room and semiconductor equipment. Device process development using an integrated circuit, a sensor, and MEMS technology.



エレクトロニクス先端融合
研究所 コーディネーター
橋詰 恒雄
Tsuneo Hashizume
Coordinator



エレクトロニクス先端融合
研究所 事務スタッフ
小林 祐子
Yuko Kobayashi
Secretary

EIIRISとの研究協定大学及び共同研究実施機関

海外の研究機関とMOUを締結した。これらの研究機関への訪問や、研究者の招聘などを通じた交流を図り、これらの機関と共に論文発表を行うなどの成果を挙げている。

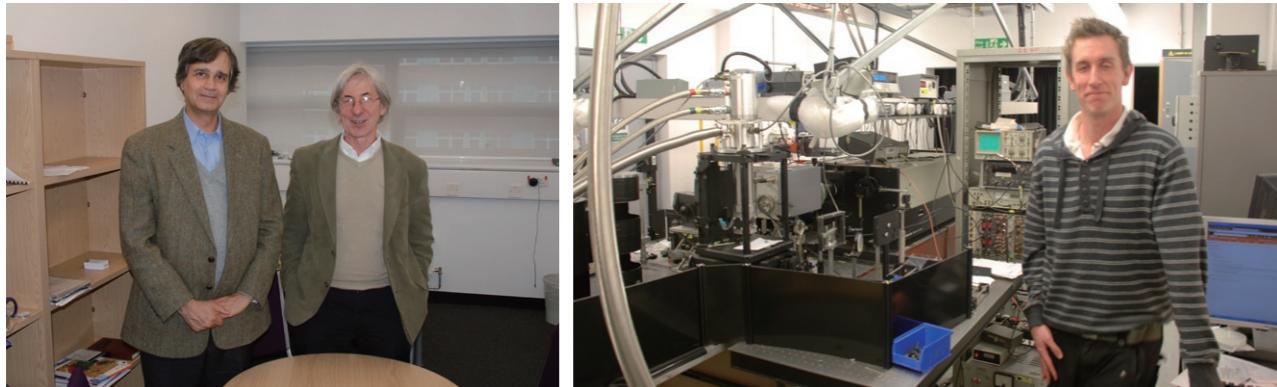
〈国際交流協定(MOU)を締結した海外の機関及び共同研究実施機関〉

University College of London/Davy -Faraday Laboratory, Royal Institute of Great Britain	Professor Quentin Pankhurst
University of Manchester	Professor Bruce Hamilton
University of California, Irvine	Professor G.P. Li
Chungnam National University, Korea	Professor CheolGi Kim
Indian Institute of Technology, Delhi	Professor Joby Joseph
Pierre & Marie Curie University (UPMC)	Professor Mohamed Bouthchich
Nanyang University, Singapore	Professor Raju V. Ramanujan
Tsinghua University, Beijing	Professor Jing-Feng Li
VAST, Vietnam	Professor Nguyen Van Hieu
Indian Institute of Science, Bangalore	Professor Arindam Ghosh
Raman Research Institute, Bangalore	Professor Ranjini Bandyopadhyay
University of Cambridge, Cavendish Laboratory	Dr Justin Llandro
Universidad Complutense de Madrid, UCM	Professor Daniel Ortega Ponce
Indian Institute of Technology, Madras	Professor Prem B. Bisht
Internet Research Institute, Inc.	Professor Hiroshi Fujiwara
Mitsubishi Chemical Corporation	Professor Hiroto Hara
Sony Computer Science Laboratories, Inc.	Professor Hiroaki Kitano
Toyo University	Professor Toru Maekawa
Okinawa Institute of Science and Technology	Professor Keshav Dani
RIKEN	Professor Tomoki Fukai
Tokyo Institute of Technology	Professor Makoto Konagai
Okayama University	Professor Yoshihiro Kubozono
Kyoto University	Professor Katsuhsia Tanaka
M.V. Lomonosov Moscow State University	Professor Granovsky Alexander Borisovich
Tohoku Institute of Technology	Professor Hironaga Uchida
National Institutes of Natural Sciences, Institute of Molecular Science	Professor Takunori Taira
Nara National College Of Technology	Professor Naoyuki Fujita
HolyMine Corporation	Professor Hideyoshi Horimai
KTH Royal Institute of Technology	Professor Grishin Alexander Michailovich
Michigan Technological University	Professor Levy Miguel

University College London/Davy-Faraday Laboratory, Royal Institute of Great Britain



University of Manchester



University of California, Irvine



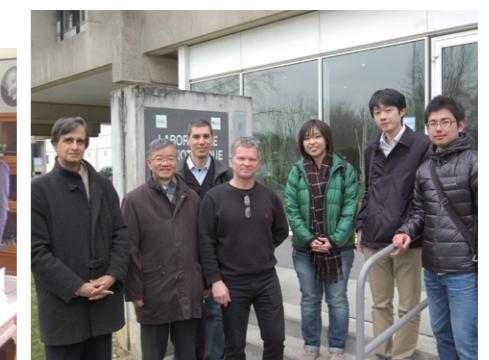
Chungnam University, Korea



Indian Institute of Technology, Delhi



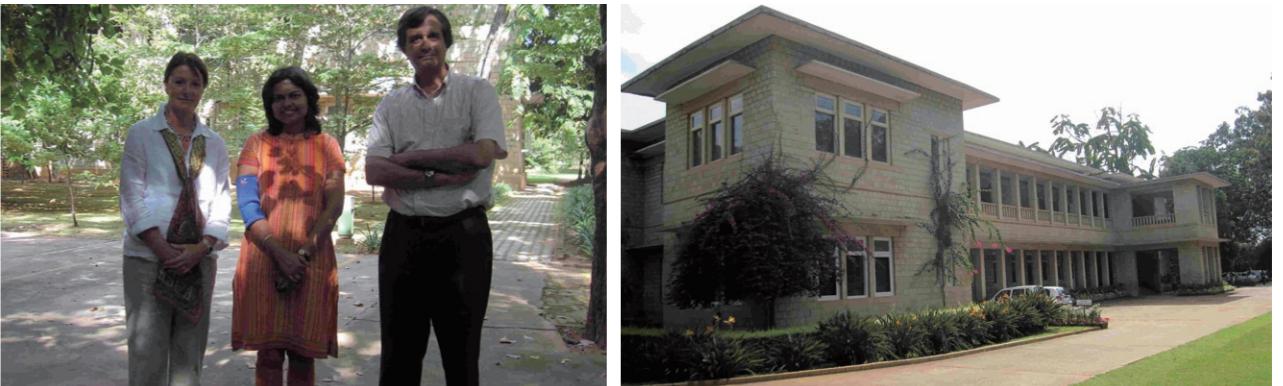
Paris University



Nanyang University, Singapore



Raman Research Institute, Bangalore



Tsinghua University, Beijing



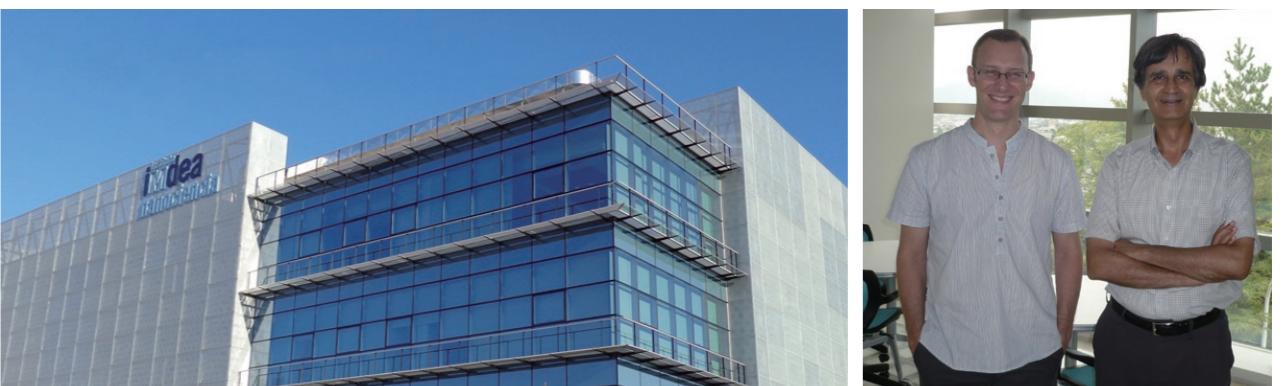
University of Cambridge, Cavendish Laboratory



VAST, Vietnam



IMDEA-Nanoscience Institute



Indian Institute of Science, Bangalore



Indian Institute of Technology, Madras



シンポジウム Symposia

名称 / 開催日 / 場所

The Irago Conference 2013

24 -25 October 2013

Irago Sea-Park & Spa Hotel, Tahara, Aichi, Japan.



平成 24 年度 EIIRIS プロジェクト研究成果報告会

—機能集積化デバイスの開発研究の現状と展開—

2013 年 6 月 24 日

豊橋技術科学大学 VBL3F プロジェクト研究交流室



EIIRIS成果報告会／産官学交流シンポジウム

2013 年 3 月 5 日

豊橋技術科学大学 VBL3F プロジェクト研究交流室



次世代シーケンス技術応用研究会キックオフミーティング

2013 年 2 月 25 日

豊橋技術科学大学 VBL3F プロジェクト研究交流室



The Irago Conference 2012 (AP-IRC 2012)

The Asia-Pacific Interdisciplinary Research Conference 2012

15 -16 November 2012

Irago Sea-Park & Spa Hotel, Tahara, Aichi, Japan.



Toyohashi University of Technology Tenure Track Symposium

23 -24 February 2012

Hotel Associa Toyohashi, Ballroom



The Asia-Pacific Interdisciplinary Research Conference 2011 (AP-IRC 2011)

17 -18 November 2011

Toyohashi University of Technology



エレクトロニクス先端融合研究所(EIIRIS)開所記念国際シンポジウム

2010 年 11 月 16 日

豊橋技術科学大学 A101 講義室



エレクトロニクス先端融合領域若手研究者育成プログラム

(テニュアトラック・プログラム) キックオフ・シンポジウム

2010 年 7 月 29 日

豊橋技術科学大学 A101 講義室



特別招待セミナー Seminars

名称 / 開催日 / 場所 / 講演者

EIIRIS 講演会：酸素を作り出す植物の仕組み

岡山大学大学院自然科学研究科 沈建仁教授

2013年10月1日

豊橋技術科学大学 VBL3F プロジェクト研究交流室



EIIRIS 講演会：ペルフルオロカーボンブロックを導入した

新規リン脂質分子集合体の開発

～膜タンパク質の構造・機能解析への応用に向けて～

群馬大学理工学研究院 園山正史教授

2013年7月12日

豊橋技術科学大学 VBL3F プロジェクト研究交流室



EIIRIS 講演会：細菌が合成するナノ磁石の形態制御機構

東京農工大学大学院 工学研究院 生命機能科学部門

新垣篤史准教授

2013年6月27日

豊橋技術科学大学 VBL3F プロジェクト研究交流室



EIIRIS特別講演会：非線形システムで制御する

化学エネルギー駆動型物質操作

山形大学理学部物質生命化学科 並河英紀准教授

2013年5月9日

豊橋技術科学大学 VBL 会議室



Ultrafast Lasers, multiphoton absorption, whispering gallery modes and applications

Professor Prem B. Bisht

Physics Department, Indian Institute of Technology Madras

25th October 2012

Seminar Room at Venture Business Lab. Bld. 3F



Carbon materials for heterojunctions and transparent electrodes

Associate Professor Mohamed Bouchich

Pierre and Marie Curie University (UPMC)

Laboratory of Electrical Engineering of Paris (LGEP)

25th October 2012

Seminar Room at Venture Business Lab. Bld. 3F



"Electronics and Superconductivity by using carbonaceous materials"

28 June 2012

Seminar Room at Venture Business Lab. Bld. 3F

Yoshihiro Kubozono, Professor at Research Laboratory for Surface Science, Okayama University



Current understanding of brain's neural networks

26 April 2012

Seminar Room at Venture Business Lab. Bld. 3F

Tomoki Fukai, Laboratory for Neural Circuit Theory, RIKEN



Graphene: New Facets in Ultra-Flat Nanoelectronics

1 March 2012

Seminar Room at Venture Business Lab. Bld. 3F

Arindam Ghosh, Associate Professor, Department of Physics, Indian Institute of Science



Special Seminar:

1. National agenda on Science and technology policy in Korea
2. Research plans on Nano-Bio-Information-Cognition (NBIC) fusion technology
3. Research on NanoBio Engineering and Spintronics

13 January 2012

Seminar Room at Venture Business Lab. Bld. 3F

CheolGi Kim, Department of Materials Science and Engineering, Chungnam National University, Center for NanoBio Engineering & Spintronics, South Korea



Special Seminar:

'Phase Engineered Interference Lithography for Complex Photonic Structure Fabrication'

20 December 2011

Seminar Room at Venture Business Lab. Bld. 3F

Joby Joseph (Professor, IIT Delhi, New Delhi, INDIA)

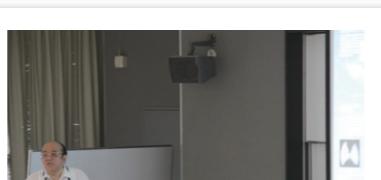


Lunch Colloquia

名称 / 開催日 / 場所 / 講演者	
Special Seminar: Magnetic trapping and sensing of protein and cell in microfluidic channels	
24 November 2011 Seminar Room at Venture Business Lab. Bld. 3F CheolGi Kim, Professor, Department of Materials Science and Engineering, Chungnam National University, South Korea	

名称 / 開催日 / 場所 / 講演者	
Experiments on aging soft colloidal glasses and rising Brazil nuts.	
20 October 2011 Seminar Room at Venture Business Lab. Bld. 3F Ranjini Bandyopadhyay, Associate Professor, Raman Research Institute, INDIA	

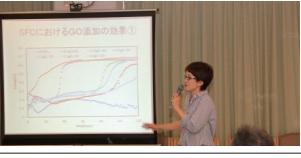
名称 / 開催日 / 場所 / 講演者	
How I supported my 50 students to be PhDs.	
5 September 2011 Lecture Hall A101 Takeo Kanade, Electrical and Computer Engineering, Carnegie Mellon University	

名称 / 開催日 / 場所 / 講演者	
Discovery of the New Element 113	
23 June 2011 Lecture Hall A2-301 Kosuke Morita, Associate Chief Scientist, RIKEN	

名称 / 開催日 / 場所 / 講演者	
Magnetic nano particles and cancer treatment (Japanese)	
21 April 2011 Seminar Room at Venture Business Lab. Bld. 3F Toru Maekawa (Professor, Toyo Univ.), Kenji Kono (Professor, Osaka Pref.Univ.)	

平成 22 年度	第1回 2010年6月24日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
ExoInterface :Novel ExoSkelton Haptic Interface for Virtual Reality,Augmented Sport and Rehabilitation		Dzmitry Tsetserukou テニュア・トラック助教
		
平成 22 年度	第2回 2010年9月30日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	錯視の不思議な世界：アートから視覚神経科学へ	
鯉田 孝和 テニュア・トラック准教授		
平成 22 年度	第3回 2010年10月21日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	生物の臭覚を利用した人工鼻開発に向けて	
三澤 宣雄 テニュア・トラック助教		
平成 22 年度	第4回 2010年11月25日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	「ホントは怖い体内リズムのはなし」	
沼野 利佳 テニュア・トラック准教授		
平成 22 年度	第5回 2010年12月16日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	「磁性ナノ粒子によるポイント・オブ・ケア診断」	
Park Sang Yoon テニュア・トラック助教		
平成 22 年度	第6回 2011年1月27日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	「両親媒分子が作る自己組織化構造：洗剤から細胞膜モデルまで」	
手老 龍吾 テニュア・トラック助教		
平成 22 年度	第7回 2011年2月24日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	「アクチュエータ開発に基づいた新しいロボットデザイン」	
真下 智昭 テニュア・トラック助教		
平成 23 年度	第8回 2011年4月21日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	「無限に広がる微生物のエネルギー獲得方法」	
吉田 奈央子 テニュア・トラック助教		
平成 23 年度	第9回 2011年5月26日 豊橋技術科学大学 ひばりラウンジ	
	タイトル	講演者
	「フォトニック結晶入門とバイオセンシングへの応用」	
Alexander Baryshev テニュア・トラック准教授		

ランチコロキアとイブニングコロキア

平成 23 年度	第 10 回	2011 年 6 月 23 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	『脳波を利用した新しいコミュニケーションの世界』		
	講演者	南 哲人 テニュア・トラック准教授		
	講演概要			
		現在、脳活動から情報を読み取ることにより、コミュニケーションを円滑にしようしたり、また、ヒトの情報処理機構から学んで、それを情報通信に生かそうしたりという試みが進んでおり、脳科学・神経科学と情報通信環境に関する研究は切り離せないものとなりつつある。本発表では、脳波を用いた研究をいくつか紹介するとともに、BMI 技術を利用したニューロコミュニケーションのデモを行いました。		
	第 11 回	2011 年 7 月 28 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	『高臨場感遠隔テレイングシステムの開発』		
	講演者	Dzmitry Tsetserukou テニュア・トラック助教		
	講演概要	テレプレゼンスロボットシステムは、人間とロボットが異なる場所に存在する場合でも、視覚・聴覚・触覚といった刺激によって、あたかも同じ場所に存在するかのように感じさせるシステムである。本研究では、新しい触覚インターフェースを用いたテレイングシステムを開発することを目標としている。本発表では開発したインターフェースを用いた実ロボットの操作デモと、VR 環境でのシミュレーションのデモを行いました。		
平成 24 年度	第 12 回	2011 年 10 月 27 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	「化学物質としての“匂い”に関する研究～匂い研究と最近の話題～」		
	講演者	三澤 宣雄 テニュア・トラック助教		
	講演概要	数十万種類あると予想されている匂い物質を我々生き物はいかにして感じるのか、その原理は未だに不明な点が多く存在する。しかしながら、かつて経験的な手法が主であった「嗅覚」の研究は、嗅覚受容体遺伝子の発見をランドマークとして、分子生物学や生化学の面から大きく進展してきた。匂いのもとを化学物質とするならば、地球上に住む生物でその影響を受けないものはありません。本講演では工学的な化学物質センシング手法と最近の匂いに関する話題に触れました。		
	第 13 回	2011 年 11 月 24 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	色盲ザルを探して		
	講演者	鯉田 孝和 テニュア・トラック准教授		
	講演概要	色に三原色があるのは、網膜に 3 種類のセンサー（錐体）が存在するからです。このうち一種類が遺伝的に欠損して二色性の色覚を示す人、いわゆる色盲がいます。二色性色覚の研究は視覚系の理解に大きな貢献をしました。そんな色盲はサルにも見つかるのでしょうか？サルは視覚と脳を調べるモデル動物として広く用いられているため、見つかれば大きな貢献が期待されます。そんなサルを探してインドネシアまで出かけた話と、ついに見つけた色盲ザルについて、後に日本で行った実験の最新データとともに話しました。		
平成 25 年度	第 14 回	2012 年 1 月 26 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	もの言わぬ細胞、組織、動物を光らせて情報を得る手法～生体イメージングについて～		
	講演者	沼野 利佳 テニュア・トラック准教授		
	講演概要	2008年のノーベル化学賞は、下村脩先生、チャルフィー先生、チェン先生3人の博士に授与されました。下村先生はオワンクラゲがなぜ緑色に光るかの研究から、発光と緑蛍光タンパク質 Green Fluorescence Protein (GFP) を発見しました。チャルフィー先生とチェン先生は GFP を用い、生物の特定のタンパク質に蛍光タンパク質を融合させて生きた細胞内で機能させ、その特定分子の挙動を観察することによって細胞内で起こる生命現象を解析する方法を開発しました。現在では GFP など色々な光を発する発光・蛍光リポーターを用いて、生物の体の中で何が起こっているかをミクロのレベルで調べる「生体イメージング」法が確立しています。本講演では、生体イメージング法はどんなものがあるかを紹介し、その長所と短所を考えました。		
	第 15 回	2012 年 4 月 26 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	グラフェン上の細胞膜モデル：単原子シートの上の二分子膜		
	講演者	手老 龍吾 テニュア・トラック助教		
	講演概要	細胞膜の基本骨格は、脂質二重膜と呼ばれる二分子で出来た 2 次元流動膜です。細胞膜は細胞内外の物質・情報・エネルギー輸送の反応場として生命活動に重要な役割を果たしており、脂質膜二重膜内の分子挙動を調べる実験システムや計測手法が望まれています。炭素の単原子シートであるグラフェンは、安定に単離することの出来る究極の 2 次元材料です。今では電気的特性だけでなく、様々なユニークな特性を持つことが分かってきており、バイオセンシングへの応用も始まっています。グラフェンの上に細胞膜モデルとしての脂質二重膜をのせた新しい実験系と計測手法を開発すること、それが私の研究テーマです。グラフェンと脂質二重膜、2 つの 2 次元材料についての解説と、この 2 つを組み合わせて EIIRIS で行っている研究トピックスを紹介しました。		
	第 16 回	2012 年 6 月 29 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	ロボティクス：機械からヒトへ		
	講演者	真下 智昭 テニュア・トラック助教		
	講演概要	誰もが待ち望む人型ロボットは？というと長年研究が続けられているものの、なかなか実現しそうにありません。今回のランチコロキアでは、ロボット研究開発における先人たちの話を踏まえながら、何がどのように難しいのか、解決するためには何をしなくてはならないのかを考えていきます。		
平成 26 年度	第 17 回	2012 年 7 月 27 日	豊橋技術科学大学 ひばりラウンジ	
	タイトル	バイオ電池の現状と課題		
	講演者	吉田 奈央子 テニュア・トラック助教		
	講演概要	少し古い映画ですが、「バック トゥー ザ フューチャー 2」で、生ごみ発電で動く車が登場した場面をご存知でしょうか？そんな未来はまだ遠いですが、バイオ電池が、すっかり聞き馴染みのある言葉になってきました。SONY の酵素電池や水田電池などが有名でしょうか。今ランチコロキアでは、これまでに開発されたさまざまなバイオ電池について、発電原理、現状と課題についてご紹介しました。また、EIIRIS で構築したバイオ電池についても紹介しました。		
	第 18 回	2012 年 10 月 26 日 (金)	豊橋技術科学大学 ひばりラウンジ	
	タイトル	Plasmonic magneto-optical structures: plasmon-triggered enhancement of polarization rotation and its peculiarities (Au 粒子を複合化させた磁性ガーネット膜の磁気光学効果の特性に関する研究)		
	講演者	Alexander BARYSHEV テニュア・トラック准教授		
	講演概要	In earlier works discussion on magnetoplasmronics revolves around plasmon-enhanced magneto-optical(MO) responses, but the question on whether the observed enhancement has a non reciprocal or reciprocal origin has not yet been enough discussed. This talk will illustrate that the plasmonic enhancement of Faraday rotation in Bi:YIG/Au structures has the reciprocal nature. To understand the mechanism responsible for the enhancement of polarization rotation, the Faraday rotation spectra of Bi:YIG/Au films were experimentally studied in the single-and multi-pass regimes for the magnetized and demagnetized films. Experiments showed that the peak of the plasmon-enhanced Faraday rotation seen in the single-pass regime vanished from the spectra measured in the two-and multi-pass regime. Cancellation of plasmon contribution to MO response of Bi:YIG/Au illustrates reciprocity of plasmonic magneto-optical structures. Calculations supporting the above conclusion and demonstrating enhancement of polarization rotation together with its full conversion will be discussed.		
平成 27 年度	第 19 回	2013 年 1 月 25 日 (金)	豊橋技術科学大学 ひばりラウンジ	
	タイトル	身近になりつつある脳波計測技術とその応用例		
	講演者	南 哲人 テニュア・トラック准教授		
	講演概要	近年、生体信号の計測・処理技術は急速な発展を遂げており、特に、これまで医療や基礎研究の現場に利用が限られてきた脳波測定は身近なものになりつつあります。今回のランチコロキアでは、さまざまな脳波計測機器やその応用例を紹介するとともに、参加者の皆様にも簡易脳波計を使ってデモをしていただきたいと思っています。		

平成 27 年度	第 19 回	2013 年 1 月 25 日 (金)	豊橋技術科学大学 ひばりラウンジ	
	タイトル	身近になりつつある脳波計測技術とその応用例		
	講演者	南 哲人 テニュア・トラック准教授		
	講演概要	近年、生体信号の計測・処理技術は急速な発展を遂げており、特に、これまで医療や基礎研究の現場に利用が限られてきた脳波測定は身近なものになりつつあります。今回のランチコロキアでは、さまざまな脳波計測機器やその応用例を紹介するとともに、参加者の皆様にも簡易脳波計を使ってデモをしていただきたいと思っています。		

第 20 回	2013 年 4 月 26 日 (金)	豊橋技術科学大学 ひばりラウンジ		
タイトル	Development of haptic technologies for health care and rehabilitation (ヘルスケア・リハビリテーション用触覚(ハaptic)技術の開発)			
講演者	Tsetserukou Dzmitry テニュアトラック助教			
講演概要 ハapticあるいはハaptic技術とは力や圧力、振動、温度あるいは動きを利用してユーザーに触覚を伝える技術です。この講演ではヘルスケア、看護あるいはリハビリにおける「LinkTouch」、「ExoPower」、「TotalTouch」や「NurseSim」といった開発したハapticデバイスやシステムについて論じます。「5節リンク機構を用いた指先への2自由度力覚提示のデバイス試作」最近開発した装着型2自由度力覚提示装置「LinkTouch」では指先へ高忠実力ベクトルを伝えることができます。「ExoPower—使用者が力を増強できる装着可能なロボットハンド」の構想にはユーザーの指先に装着可能な小型でかつ強力な力をもたらす装置を開発する事がありました。ロボットハンドは指先機能のリハビリだけでなく、バーチャルリアリティにおけるハapticインターフェースあるいは肢用インターフェース、あるいはロボティクスにおけるハapticインターフェースとしても応用が可能です。「TotalTouch」は非常に高精度の4次元触覚インターフェースで、フォースベクトルや触覚によるジェスチャーを認識します。このインターフェースに搭載しているセンサーは3次元のテクスチャー、プリズムを備えた変形可能なポリマー端末でプリズム表面からの反射イメージを取り込む光学的システムであるという特徴があります。「プロジェクトNurseSim—バーチャルシミュレーター」はバーチャルリアリティにより看護師や病院職員が意識不明の患者や負傷者を運搬するためのトレーニングに利用することを想定しています。最後にこの講演で取り上げた力覚デバイス「LinkTouch」と「ExoPower」のデモを行います。				
平成 24 年度	第 21 回	2013 年 5 月 24 日 (金)	豊橋技術科学大学 ひばりラウンジ	
	タイトル	言語が思考を決めるのか？－カテゴリー認知と神経情報デコーディング－		
	講演者	鯉田 孝和 テニュアトラック准教授		
講演概要 言葉は思考を伝える優れた手段ですが、逆に、言語があるからヒトは思考することが可能なのだ、という極端な考え方もあります。単語というカテゴリーレベルを用いることで記憶の情報量が高まること、知覚の精度が際立つことは確かなようですが、これはどうすれば実験的に確かめられるでしょうか。研究対象として広く用いられている色のカテゴリー認知を例に、言語の違い、子どもの単語習得、左右脳の差から明らかになった最近の研究動向と、神経活動から色情報をデコーディングすることで明らかになった脳情報表現のダイナミクスについてわかりやすく紹介します。				
平成 25 年度	第 22 回	2013 年 6 月 28 日 (金)	豊橋技術科学大学 ひばりラウンジ	
	タイトル	嗅覚に基づいた化学物質センシングの応用		
	講演者	三澤 宣雄 テニュアトラック助教		
講演概要 食品の異味・異臭による苦情は実際にどれくらいの規模かご存知でしょうか。例えばヒトの嗅覚による抜き打ちでの官能評価に基づいて食品メーカーは対策を講じていますが、苦情対応やそれに伴う自主回収等に大きな時間と労力が費やされているのが現状です。この解決策として特に人工的な嗅覚センサがその一助になるのではと考え、今回はその応用提案を御紹介します。近年、明らかになり始めた特に昆虫の嗅覚系の話題を含めてお話ししたいと思います。				
平成 25 年度	第 23 回	2013 年 7 月 19 日 (金)	豊橋技術科学大学 ひばりラウンジ	
	タイトル	iPS 細胞がもたらす未来～再生医療が抱える諸問題について我々のできることは？		
	講演者	沼野 利佳 テニュアトラック准教授		
講演概要 2012年のノーベル医学・生理学賞に輝いた京都大の山中伸弥教授は、「万能細胞」である人工多能性幹(iPS)細胞を作成することに成功し、再生医療の実現に道を開いた。同時に受賞した英ケンブリッジ大学名誉教授のジョン・ガードン博士が発見した、体細胞を受精卵のようにあらゆる組織に分化能を持つ細胞に戻せるリプログラミングという現象を、4つの遺伝子を働かせるだけで、分化した体細胞を、分化多能性を持った幹細胞の状態に戻せることを証明した。このiPS細胞は、適切な培養条件で神経細胞や心筋細胞などのさまざまな種類の成熟した細胞へ分化させることができる。本講演では、近年のiPS細胞を用いた新しい医療研究を紹介し、その未来、問題点、そしてそれを解決するには何をすればいいか?を考えていきたい。				
平成 25 年度	第 24 回	2013 年 9 月 13 日 (金)	豊橋技術科学大学 ひばりラウンジ	
	タイトル	ナノマテリアルの法規制動向、細胞毒性、環境影響および環境技術への利用		
	講演者	吉田 奈央子 テニュアトラック助教		
講演概要 ナノテクノロジー製品は、30カ国、587社、1,317 品目以上が登録されており、2015年には80兆円の市場規模が見込まれている。ナノテクノロジー製品とは、化学組成が同じでもサイズが小さいことで比表面積が大きくなり、異なる性質を有するいわゆるナノマテリアルの特徴を生かした製品群である。ナノマテリアルは、現在、特に工業用ナノ材料(manufactured nanomaterials, NM)として、サイズが大きい物質とは区別し、新たな法的な規制が設けられる傾向にある。本ランチコロキアでは、このようなナノマテリアルの法的規制、細胞毒性研究、環境影響研究の概要をレビューとともに、発表者が取り組んできた酸化グラフェンを用いた廃水処理の研究成果について報告する。				

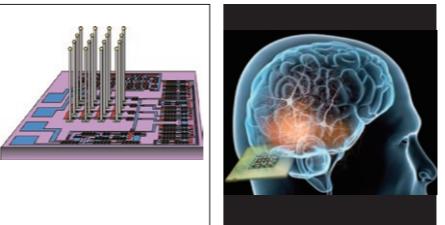
Evening Colloquia

第1回	2012 年 9 月 5 日	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	情報メディア基盤センター、情報科学関連について		
講演者	稻垣 康善 理事・副学長		
第2回	2012 年 10 月 16 日	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	装置で得られた物性値の意味と古くて新しい課題（酸塩基）		
講演者	角田 範義 環境・生命工学系教授（未来ビークルセンター長）		
第3回	2012 年 11 月 28 日 (水)	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	共生環境でのロボットテクノロジーの研究－介護・福祉ロボットでの問題点－		
講演者	寺嶋 一彦 機械工学系教授（副学長）(人間・ロボット共生 R C 長)		
第4回	2013 年 1 月 30 日 (水)	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	生命の起源から産業へ—RNA 創薬		
講演者	菊池 洋 環境・生命工学系教授（副学長）(先端農業・バイオ R C 長)		
第5回	2013 年 4 月 18 日 (水)	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	東三河地域の農業と IT 農業の展開		
講演者	三枝 正彦 先端農業・バイオリサーチセンター特任教授		
第6回	2013 年 6 月 4 日 (水)	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	細胞機能解析用 MEMS プラットフォームの開発		
講演者	柴田 隆行 機械工学系教授		
第7回	2013 年 7 月 10 日 (水)	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	Higher Education in India and some facts about IITs (Joby Joseph) Higher Education in India (Jaiyam Sharma, Vedant Saboo)		
講演者	Joby Joseph Physics Department Indian Institute of Technology Delhi IIT Delhi 学部 4 年研究留学生 (Jaiyam Sharma, Vedant Saboo)		
第8回	2012 年 8 月 7 日 (水)	豊橋技術科学大学 エレクトロニクス先端融合研究所 1階エントランスホール	
タイトル	古い静電気工学のいくつかの新しい観点 —遺伝子・細胞操作、歩行時の人体電圧、地震時の屋外電界—		
講演者	水野 彰 環境生命工学系教授		

ニューロセンシング Neuro-sensing

豊橋プローブを用いたニューロセンシング

- ・神経工学
- ・生体信号処理
- ・網膜電気生理
- ・マルチ電極アレイ
- ・筋電位
- ・初期視覚
- ・分泌生理学
- ・光量子医学
- ・生体内顕微鏡
- ・化学顕微鏡
- ・神経伝達物質
- ・細胞弁別
- ・概日リズム
- ・Periodl
- ・ペースメーカー
- ・神経
- ・VLSチップ
- ・LiGluR受容体
- ・光照射制御
- ・神経生理学
- ・電気生理実験
- ・単一細胞外記録
- ・微小電気刺激
- ・サル行動実験
- ・視覚心理物理
- ・色知覚
- ・認知神経科学
- ・脳波
- ・BCI
- ・不自然さ
- ・理解度
- ・顔認知処理



農業及びプラントサイエンス Agriculture and Plant Science

- ・太陽光利用型植物工場
- ・マルチモーダルセンサ
- ・持続的食料生産システム
- ・生物間相互作用
- ・昆虫学
- ・微生物学
- ・ゲノム進化
- ・害虫防除
- ・植物工場



先端ゲノム科学及び表面科学 Genomics and Surface Science

- ・次世代DNAシーケンサー
- ・光合成
- ・環境微生物
- ・RNA工学
- ・ゲノム機能科学
- ・界面物理化学
- ・脂質二重膜
- ・表面微細加工
- ・一分子計測pHセンシング



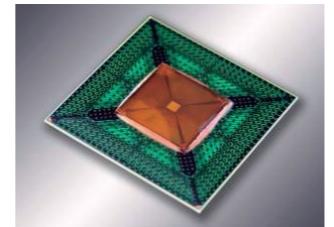
環境浄化・モニタリング技術の開発 Environmental Monitoring

- ・高度水処理技術
- ・環境微生物学
- ・バイオレメディエーション
- ・微生物生態学
- ・生物工学
- ・農業
- ・食料生産における環境負荷軽減
- ・温室効果ガス(メタン、亜酸化窒素)の発生抑制



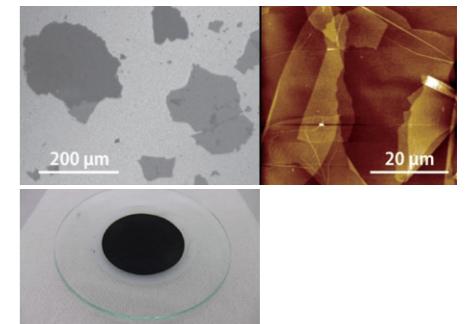
フォトニックメディカルデータストレージ・情報ディスプレイ・情報処理 Photonics Medical Data Storage · Information Processing

- ・ホログラムメモリ
- ・超高速空間光変調器
- ・全医療画像データ保存
- ・生涯メディカルデータカード
- ・3次元ディスプレイ
- ・リアルタイム生体活動表示
- ・フォトニック画像処理(医療画像データ処理)
- ・光コンピューティングに基づく超高速高信頼医療
- ・生体情報処理のための集積化超高感度室温磁界センサ



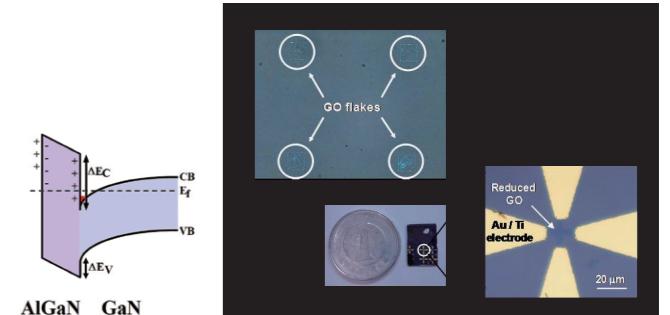
グラフェン系物質生成及びナノ・バイオ・磁気エレクトロニクス応用 Graphene / Bio-magnetics

- ・化学気相蒸着または化学蒸着(CVD: Chemical Vapor Deposition)による大面積グラフェン膜生成と応用
- ・化学反応に基づくナノ・グラフェン微粒子生成
- ・微生物採用によるグラフェン生成及び応用
- ・絶縁体基板上電気化学法による大面積グラフェン生成及び電気的な応用
- ・ワンポット合成により磁気グラフェン生成及びナノ・バイオエレクトロニクス応用
- ・グラフェン系高性能磁気センサ作製
- ・グラフェン系走査型磁気センサプローブ顕微鏡の開発



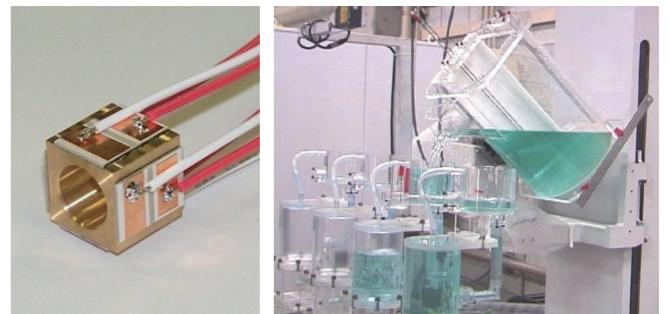
基礎物理学・ヘテロ接合半導体素子 Basic physics and Semiconductor heterojunctions

- ・グラフェン系物質における超伝導現象解明
- ・放射線下における化合物半導体ヘテロ接合2次元
- ・電子ガスの量子ホール効果



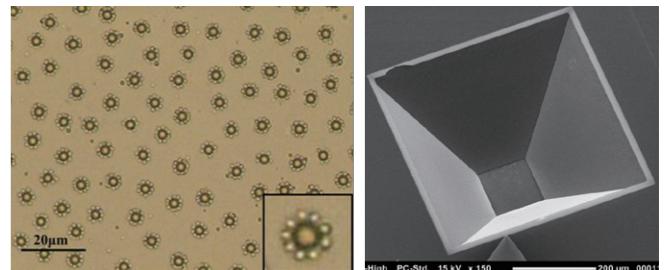
Robotics, actuators and systems control

- ・高速搬送と振動抑制を同時に達成する制御技術
- ・生活支援と医療福祉支援のためのロボット技術
- ・ロボティクス
- ・機械設計
- ・圧電アクチュエータ
- ・知能ロボティクス及びコミュニケーション
- ・遠隔操作ロボット
- ・触覚力覚ディスプレイ
- ・着用型力覚提示装置
- ・感情触感



NEMS・MEMS 物理センサ MEMS・MEMS Physical sensor

- ・MEMS 加速度センサ
- ・貼り付き
- ・BioMEMS
- ・匂いセンサ
- ・卵母細胞
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[報道記事]

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新技術 新商品

豊橋技術科学大、1mm角の超小型モーター開発—脳梗塞治療に「デカラ」

2014年1月14日 14:00

Facebook Twitter Print Email

豊橋技術科学大は、約2.5cm角の超小型モーターを開発。立派な1台の電子顕微鏡よりも小さく、直径約1.5mm、大きさ約1.2mmのモーターで、通常の電子顕微鏡に比べて約10倍の速さで、細胞内構造を観察できる。開発したモーターは、脳梗塞治療用の「デカラ」(左)に搭載され、脳梗塞治療の手術時間を見直す。脳梗塞の内因性原因である血栓がどうでて、3D的に動かせる。

豊橋技術科学大は、脳梗塞治療用の内因性血栓を手術的に取り除く手術で、これまで手で取り除いていたが、手筋が細い、止血まで手でスムーズに操作する手筋を手離す手筋がかかるため、血栓を手離す手筋がかかる。そこで、豊橋技術科学大は、脳梗塞治療用の内因性血栓を手離す手筋を、電気電子工学科の久保田義典准教授(右)と共同で開発した。電気電子工学科の久保田准教授によると、従来のモーターは、電動機の回転運動を直接手筋に伝える方式だったが、開発したモーターは、回転運動を手筋に伝える方式ではなく、モーターの回転運動を手筋に伝える方式だ。

■ 必要な動きを手筋に記入し、手筋を起動してDCM(ドクターチーム)

日本電子顕微鏡電子顕微鏡ver.2.0 では、手筋の機能に適応しています

ページを更新されました。

The screenshot shows the Smartplanet homepage. At the top, there's a navigation bar with links like Home, Business, Technology, Innovation, Energy, and Voices. Below the header, there's a search bar and social media links for LinkedIn, Facebook, and Twitter. The main content area features a large image of a car's engine compartment with a grid overlay. The headline reads "Electric roadways would allow plug-in cars to charge on the go". Below the headline is a byline: "By Eric Choperen | Published: April 20, 2011, 10:50 AM PDT". To the right of the main image, there's a sidebar with a blue box containing a stylized map of the United States and the text "Introducing synergies with built-in infrastructure". Below that is another box with the text "Meet IBM PureSystems" and the IBM logo. Further down the sidebar are sections for "Keep Up with Smartplanet", "Your Email", "Smartplanet Newsletter", "A weekly review of the best stories, one from each category, delivered to your inbox every Friday", and "Interactive Tools". At the bottom of the sidebar, there are three sections: "IBM Sponsored Resources", "IBM Research News", and "Facebook Activities".

The image is a screenshot of a web page from WIRED.co.uk. At the top, there's a navigation bar with links for Home, News, Reviews, Videos, Magazine, Podcast, Topics, Events, and a search bar. Below the navigation is a breadcrumb trail: Home > News > Technology > Japanese EVs. The main headline reads "Japanese researchers send electricity through concrete to car wheels". Below the headline is a photo of six people in lab coats standing behind a table with a glowing lightbulb. A caption below the photo states: "Japanese researchers have come up with a solution to one of the biggest problems facing electric cars: their usefulness limited battery life. A team from the Tohoku University of Technology has managed to create a wheel which has a network of concrete".

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Goodby petrol stations? Cars could receive charge through their tyres as team manages to send electricity through 12 inches of CONCRETE

By SCOTT MCKEE

PUBLISHED: 09:00 EST, Aug 13, 2012 | UPDATED: 02:38 GMT, 8 July 2012

Electric cars could one day be charged at the wheel, as the fueling process begins in earnest and we begin to reduce our dependence on petrol, one key researcher claims.

While many electric vehicle stops are being built along roads across the country, a Japanese team of researchers has come up with another method, after demonstrating a way of sending electricity through concrete.

The technological achievement could see cars being recharged through special tyres that could such charge up through the same wire on the move.

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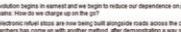
Curiously, when asked for her opinion, she said she was not sure if she had any close relationships with family members who are a day, three days or even a week away from her

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Electric cars may soon be charged on the road with technology developed by Japanese scientists

(WEDNESDAY, SEPTEMBER 21, 2011, 4:58 PM)

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The diagram shows a black sedan with a red lightning bolt symbol on its front grille. A dashed red circle surrounds the front left wheel area, labeled "Leakage electromagnetic field is small". Below the car, two metal plates are shown, with arrows pointing to them labeled "Metal plate" and "Metal plate". A dashed line extends from the front left corner of the car to a circular inset labeled "Magnification". The inset shows a cross-section of the car's body and a steel belt, with the tire labeled "Tire(rubber)".

Advantage of proposed method

- ✓ Leakage electromagnetic field is small
- ✓ Infrastructure can be set up at a low cost compared with a coils
- ✓ Influence of a shake of a car is not received easily

An illustration shows how technology developed by Toyohashi University inventors would work.

Japanese researchers may have created a new way to give electric vehicles an unlimited range using wireless power transmission.

The team from Toyohashi University of Technology believes that the technology they are testing could potentially power electric vehicles

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HOME ニュース エレクトロニクス

豊橋技科大、路面から車へ送電—EV電池小型化へ

掲載日 2012年06月28日

Tweet 14 | 14,151 | 23 |

【名古屋】豊橋技術科学大学電子・電子情報工学科の平孝教授らは、路面のアルミニウム製導電板から自動車に送電する技術を開発した。

高周波電磁の電気を用いることで、タイヤのゴムを通してタイヤホイールまで送電する。路面からタイヤホイールへの送電技術は世界で初めて、大量電池が不要で低燃費なインホイールモーター式電気自動車(EV)の開発につながる。

道沿いの電柱からアスファルト路面の下に設けたアルミ導電板に送電する。道沿いに設置したインバータで周波数50~60ヘルツの電気を10ガヘルツ程度に変換し、ホイール内の駆動モーターに供給する。平孝教授らは導電板とタイヤ内のスチールベルト、タイヤホイールと共にタイヤに回路を構成し、2本のタイヤ間に設けた電力50ワットの電池が光ることを確認した。

Graphene Times

The Dimension News and Commentary

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Synthesis of Graphene from Graphene Oxide Using Bacteria

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Detailed Science

Biochar Science

PAC Research at Yonsei University in Asan, Korea have managed to use bacteria to create graphene – a substance with great promise in manufacturing. Using bacteria to reduce graphene's oxide creates a "porous" ... and more >

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A screenshot of the MAKE website's homepage. At the top, there's a navigation bar with links for 'Project Director', 'ARTICLES', 'PHOTOS', 'CALENDAR', 'BOOKS', 'DESIGN SCHOOLS', 'DISCUSSIONS', and 'AWARDS'. Below this is a large banner for the 'WORLD Maker Faire NEW YORK' event, which is taking place on 'September 29 & 30, 2012' at the 'Flushing Corona Park'. The banner features the 'CALL FOR MAKER FAIRE' text in large blue letters. The main content area below the banner shows a photograph of a car tire mounted on a wooden frame, with a plasma cutter being used to cut through it. There are other tires and equipment visible in the background.

Modern material made by microbes

A research team in Japan has synthesized the "water-like" graphene produced by reducing pristine graphite oxide sheets using bacteria. The researchers believe this is the first time that living organisms have been used to synthesize a new material.

The researchers used *Bacillus licheniformis* to reduce graphite oxide. The *Bacillus* strain was chosen because it can reduce graphite oxide to graphene oxide at a low temperature. The researchers also chose this strain because it can produce a large amount of biomass, which is important for the mass production of graphene.

Graphene oxide is a form of graphene that contains oxygen atoms. These oxygen atoms are attached to the carbon atoms of the graphene sheet. This causes the graphene sheet to become more stable and less reactive. It can also be used as a precursor for the synthesis of other materials, such as carbon nanotubes and fullerenes.

The researchers used a two-step process to synthesize graphene oxide. In the first step, they used *Bacillus* to reduce graphite oxide to graphene oxide. In the second step, they used a chemical reduction method to remove the oxygen atoms from the graphene oxide sheet. This results in a high-quality graphene sheet that is suitable for use in various applications.

The synthesized graphene sheet has a thickness of approximately 1 nm and a diameter of approximately 100 nm. It has a high surface area and a high electrical conductivity. It can also be used as a catalyst for various chemical reactions. The researchers believe that this synthesized graphene sheet has great potential for use in various applications, such as in the field of energy storage, electronics, and sensors.

Tales of the riverbank

Another research had demonstrated that graphene oxide could act as a terminal electron acceptor for the oxidation of certain bacteria. The article is published in the journal *bioRxiv*. The researchers found that the bacteria were able to use the graphene oxide as a terminal electron acceptor, which allowed them to grow and multiply. They also found that the bacteria were able to use the graphene oxide as a source of energy, which allowed them to survive in environments where there was no oxygen.

The researchers believe that this discovery could lead to new applications for graphene oxide, such as in the field of biotechnology and environmental science. They hope that their findings will help to advance the understanding of the interaction between living organisms and synthetic materials.

Image of reduced graphene oxide sheets on a 900x900 substrate.

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Science & Technology

Scientists Produce Graphene Using Microorganisms

Friday, March 23, 2012 | Techspex Report of Technology

The Graphene Research Group at Toyohashi Tech report on the synthesis of graphene by reducing graphene oxide using microorganisms extracted from a river.

The Toyohashi Tech Graphene Research Group at the Electronics Inspired Interdisciplinary Research Institute (ERII) report on an innovative method for producing high quality graphene by reducing graphene oxide flakes using microorganisms.

Currently, the chemical reduction of graphite oxide (GO) flakes is the preferred choice for the mass production of graphene. Notably, the critical reduction step in this process, which is often referred to as the "reduction reaction," involves exposure of the graphitic carbon to strong hydrides. This reduction processes have fundamental limitations for large scale production due to the toxicity of the reagents used and the potential toxicity.

The method developed by the Toyohashi Tech team was inspired by a recent report that graphene oxide behaves as a terminal electron acceptor in biological systems. Specifically, the researchers found that processes of breathing or electron transport. Notably, the Toyohashi Graphene Research Group method is a hybrid approach, where chemically derived GO flakes are reduced using microorganisms that were isolated and extracted from a river bank near the Tempaku Campus of Toyohashi University of Technology. The results of the resulting measurement showed that the GO flakes had indeed been reduced.

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Tuesday - May 10, 2005 - 10:45 AM (IST)

Soon, electric cars to be powered through tyres

Wednesday - May 11, 2005 - 09:00 AM (IST)

Electric Motor Production

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London - A team of researchers from Japan has come up with a method of sending electricity directly via inductance to a vehicle's wheels, which could one day power an electric car while it is on the move.

The Doshisha University of Technology has said that there are technological hurdles to bringing this technology to market, but the team believes that the concept is feasible.

The country's transportation and the environment ministry has said that for road vehicles in Japan, and abroad electricity as an energy source is the future.

In the future, electricity for 30 to 40 years will have been sent to actual tyres, with a light bulb lighting up to indicate that the vehicle is charged.

And then we will have automobile tyres, the Daily Mail reported.

Last year former Toyota Chairman章男 said that the company had to relate to us without a problem, although he made no mention of the Japanese firm's own EVs.

However, this is not the case as a recent report by the BBC said that the car giant had been working on this research for some time.

He added that the efficiency of the power transmission through the tyres was to be passed on higher.

Other companies that are looking at similar technologies are Toyota, which suggests a range of model plane

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A screenshot of the MyNavi News website. The header features the MyNavi logo and the word "キャリア" (Career). Below the header is a navigation bar with links for "総合", "バッテリー", "機器", "電気", "タイプ", "エンジン", "モーター", "車両", "スクール", "クリエイ", and "技術". A search bar is also present. The main content area displays a news article titled "バッテリーなしで走行可能な電気自動車を実現する技術「EVER」" (Technology to realize electric vehicles that can run without batteries). The article includes a photo of a Formula E race car on a track. The footer contains a copyright notice for "2012/07/10" and a link to "PR TIMES".

NewScientist

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Microbes from nearby river help produce graphene

By **Tom Banks** on **26 March 2012**

Technology

COMMENTARY BY **John P. McGovern**, consultant

Atom-scale structure of a single layer of carbon atoms, or graphene.

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A molecular model of graphene, showing a hexagonal lattice of carbon atoms arranged in a single layer. The carbon atoms are represented by grey spheres, and the bonds between them are represented by blue rods. The model is set against a dark blue background.

Scientists produce graphene using microorganisms

The Toyama Research Group at Tohoku University of Technology (Japan) has reported on the synthesis of graphene by reducing graphene oxide using microorganisms extracted from a river bed.

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by Google

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The chemical reduction of graphene oxide (GO) flakes is widely used for the synthesis of graphene. In this process, the critical stage of reducing GO flakes into graphene requires the exposure of the GO to hydrazine. This reduction process has fundamental importance for large scale production, in particular because of the hydrazine vapor it yields.

The method developed by the Toyohashi Tech team was inspired by a recent report showing that graphene oxide behaves as a terminal electron acceptor for bacteria, which is to say it can be reduced by bacteria in the presence of oxygen [1]. The technique, known as the Toyohashi Graphene Research Group method is a hybrid approach, where chemically derived graphene oxide flakes are reduced by readily available *microorganisms* extracted from a river bank near the Tempaku Campus of Tohoku University. The researchers used Raman scattering measurements to show that the GO flakes had indeed been reduced.

The approach offers a low-cost, highly efficient, and environmentally friendly method for the mass production of high quality graphene for the electronics industry.

For more information: Y. Tanizawa et al. Microorganism mediated synthesis of reduced graphene oxide films, IOP Journal of Physics: Conference Series (in press), <http://iopscience.iop.org/1742-6596>

Provided by Toyohashi University of Technology
by Google

The screenshot shows the Softpedia website. At the top, there's a search bar with the word 'Keywords' and a magnifying glass icon. Below the search bar, there are links for 'TOP DOWNLOADS', 'TOP GAMES', 'TOP APPS', and 'TOP WEBSITES'. The main navigation menu includes 'HOME', 'TOP DOWNLOADS', 'TOP GAMES', 'TOP APPS', 'TOP WEBSITES', 'TOP NEWS', 'TOP REVIEWS', 'TOP VIDEOS', 'TOP BLOGS', and 'TOP PODCASTS'. A sidebar on the left lists 'NEWS CATEGORIES' such as Games, Drivers, Mac, Linux, Software, Mobile, Handheld, News, and more. A large banner at the top right features a truck and the text 'Autodesk AutoCAD 2012 - 3D CAD Software'. Below the banner, there's a news summary: 'Bacteria Can Produce Graphene' with a link to 'www.digkey.jp'. The main content area has a heading 'Components at Digic-Key' and a sub-section 'Distributor of Quality Electronic Components. Order from Digic-Key® - www.digkey.jp'. There are also sections for 'ADVERTISING', 'PRIVACY POLICY', 'TERMS OF USE', 'CONTACT US', and 'HELP & SUPPORT'. The footer contains links for 'About Us', 'Feedback', 'Help', 'Privacy Policy', 'Terms of Use', and 'Contact Us'. It also includes social media icons for Facebook, Twitter, and YouTube, and a link to 'Advertise on Softpedia'.

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Graphene News

Graphene Produced Using Microorganisms from an Ordinary River

ScienceDaily (Mar. 21, 2012) — The Graphene Research Group at Tohoku University in Japan have synthesized graphene by reducing graphite oxide using microorganisms extracted from a local river.

Chemical reduction of graphite oxide (GO) is widely used for the synthesis of graphene at this point, the synthetic stage of which reduces GO flakes into grapheme nanosheets using strong reducing hydrazine. This reduction process has fundamental problems for large scale production, in particular because of the high cost of the hydrazine vapor required for the reduction.

The method developed by the Tohoku Tech team was inspired by a recent discovery showing that terminal electron acceptor for the reduction of GO can be provided by microbial action in the process of breathing or electron transport.

The Graphene Research Group method is a hybrid technique in which graphite oxide and graphene oxide flakes are reduced by readily available microorganisms. The researchers at the Tempaku Campus of Tohoku University in Aoba-ku, Sendai, Japan scattered measurements showed that the GO flakes had indeed been reduced

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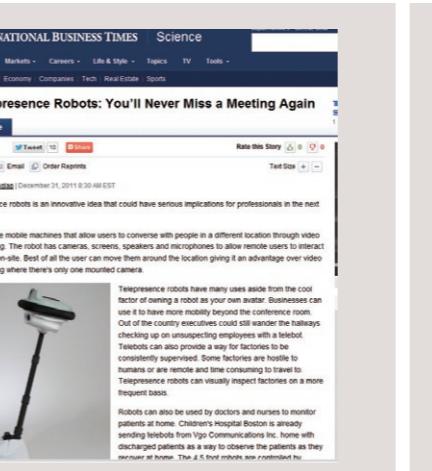
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Faster, Cheaper Way Found to Cool Electronic Devices (July 10, 2012) — Researchers have developed a more efficient, less expensive way to cool electronic components than existing methods that generate a lot of heat, such as lasers and power

■ ■ ■ Seeing an Atomic Thickness (May 25, 2011) — Scientists in the UK and Sweden have shown that regions of graphene of different thicknesses exhibit different physical properties under conditions using electrostatic force > read more

■ ■ ■ New Antibacterial Material for Bandages, Food Packaging, Shoes (July 10, 2011) —

The screenshot shows the homepage of R&D Magazine. At the top, there's a banner with a woman in a lab coat and the text "There's still time to get the ins... on the latest laboratory design". Below the banner is a navigation bar with links for Publications, Sections, News, Community, Multimedia, Awards, Industry Guide, and Subscribe. A search bar is also present. The main content area features a large image of a scanning electron micrograph (SEM) of a surface. To the left of the image is the text "Graphene: Potential for modelling cell membrane systems(2)". Below the image, there's a section titled "Graphene: New applications and innovations - Page 1 of 2" with a "Read more" link. On the right side of the image, there's a sidebar with social media sharing options (Facebook, Twitter, LinkedIn, Email, Print, Share, Diggi), a "Print" button, and a "PDF" button.

The header features the "INTERNATIONAL BUSINESS TIMES" logo in blue and red, followed by the word "Science" in black. A navigation bar below includes links for Markets, Careers, Life & Style, Topics, TV, Tools, and a dropdown menu for Economy, Companies, Tech, Real Estate, and Sports. Below the header is a large, bold headline: "Telepresence Robots: You'll Never Miss a Meeting Again". To the right of the headline are three small icons: a blue square with a white arrow, a red square with a white plus sign, and a yellow square with a white minus sign. The main article text discusses the concept of telepresence robots, their uses in business meetings, and how they can be used for monitoring patients at home. It also mentions the potential for remote surveillance. The footer contains a "Rate this Story" section with a green thumbs-up icon, a red thumbs-down icon, and a red "0" rating. It also includes a "Text Size" button with a plus and minus sign.

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every News - Tech News > Human Gets Immersed In Remote Robot's Actions

MAN GETS IMMERSED IN REMOTE ROBOT'S ACTIONS

What kinds of robots could represent us in faraway places, letting us interact with friends, family and coworkers as if we were there.

By Alyssa DiGiorgio | All Dec 26, 2014 at 7:00 AM ET | [Leave a Comment](#)

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THE GIST

- The NAO/gold system lets a human guide a robot remotely using body movements.
- The human receives physical feedback from the robot's movements.
- A virtual reality component lets the human controller get immersed in the robot's location.

What if you could be in two places at once? Or four? A group of Japanese researchers have found a way where we can interact with friends and family and respond as in distant work sites. They are developing a telepresence robot that they think will give humans more physical immersion in remote locations.

"Vision is not enough," said Ozminny Tastekinoku, an

Innovations report

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14.12.2011

Piezoelectric actuators: Why cubic?

The paper discusses the design of a cubic actuator as a relatively new type of piezoelectric actuator. It highlights the technically challenging, theoretically, the vibrational behaviour of cubic actuators remains unclear when modelled using the finite element method (FEM).

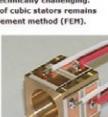
Here, Tomohiko Hashimoto and Shigeki Ueda analyzed the vibrational behavior of cubic actuators based on an energy method, which distinguishes components of mechanical energy.

By changing the design of actuators—especially their height—in the direction of the tetragonal shape, the researchers classified how the vibrational modes at one equal frequency in cubic shape.

The energy method described in this paper showed that the mechanical energy of two specific vibrational modes is in equilibrium. The shape for which the actuator achieves equilibrium energy was found to be a cube.

This approach should be useful for not only studies on vibration, but also for design the actuators with an easy-to-use modal analysis method.

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An actual cubic actuator
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Graphene: Potential for Modelling Cell Membrane Systems

ScienceDaily (Mar. 21, 2013) — At Toyohashi University of Technology the intriguing properties of graphene are being exploited — such as high electron mobility and fluorescence quenching are being exploited for biosensing and analysis of nanoscale biological systems.

Graphene could also play an important role in the modelling of cell membranes. For example, the unique fundamental structure of cell membranes, which are highly dynamic, of laser membranes governs the interaction of molecules with membranes in and out of cells.

Ryoko Terai and her colleagues in the Department of Physics at Toyohashi University of Technology have developed a technique to fabricate artificial paper-like (GO) membranes on a substrate (SiO₂) and reduced graphene oxide (rGO) as a model of biological membranes, such as tails and proteins on and inside of cells.

An aqueous solution of GO was prepared by sonication and dropped onto a thermally oxidized silicon substrate (SiO₂). The resulting GO/SiO₂ was washed with deionized water and dried (diluted GO/SiO₂). Subsequent observation with an atomic force microscope (AFM) (Fig. 1B) and measured the presence of two planar GO bilayer membranes in the absence of calcium on rGO, and that the GO bilayers on rGO were stable for a long time.

Two types of GO bilayer structures were obtained on hydrophobic rGO, which was produced by reducing GO with hydrazine vapor. Artificial spicules on graphene and its

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Fig. 1. (A) Scanning electron micrograph image of GO bilayers dropped onto a SiO₂ substrate and (B) atomic force microscopy topography and (C) structural model of the GO bilayer on rGO.

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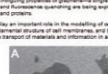
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STM-based microscopy and fluorescence quenching are being explored for biosensing of graphene-based materials.

Graphene could also play an important role in the modeling of cell membranes. For example, the transport of materials across the cell membrane and the dynamics of bilayer membranes govern the transport of materials and information in and out of cells.

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TECHNOLOGY NEWS

Tohoku University of Technology develops pH image sensor

22 March 2012

Scientists led by Katsuaki Saito at the Tohoku University of Technology have developed a pH image sensor based on the selective resolution of the pH and optical imaging of chemical activity of solutions and solutes. Saito and his group have chosen as their industrial partners the CHOSO device company.

The CHOSO device consists of an array of CCDs covered with a functionalized membrane. Changes in the concentration and the two-dimensional distribution of ions and molecules can be monitored by monitoring the pH and monitoring the pH distribution, the device also yields optical images of the test solution.

The sensitivity of the pH imaging sensor is 100 times greater than ISE's devices and enables the detection of an pH difference of 0.005 pH. "High resolution pH images can be obtained in a few seconds, and the number of frames per second is high," says Saito. "The charge transfer is repeated many times, which gives huge improvements in signal-to-noise ratio."

The new sensor can measure the pH of aqueous solutions, such as with a sensing area of 1 x 15 mm. The pH and its gradients are displayed on pH maps and contour plots, with each pixel being 0.1x0.1 mm. Saito has also applied the sensor to the measurement of the pH gradient on image sensing. "In the future, plans include pH imaging devices for measuring the movement and distribution of other ions including calcium and sodium."

Saito's group has recently reported the use of the sensor for real-time imaging of the distribution of adenosine triphosphate (ATP) and the distribution of ACh when nerve cells are stimulated with KCl; and Saito's "image" is the variation of the concentration of ACh may lead to new applications for the development of Alzheimer's disease.

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The feedback loop of transcriptional factor with 24 h period in the suprachiasmatic nuclei (SCN) was proposed to work as a circadian central oscillator, as well as in peripheral tissues including cartilage and bone.

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On the other hand, the circadian clock of bone formation is controlled by circadian oscillators that undergo cycles more than once even 24 hours in embryonic development. In 1997, the earliest circadian gene identified in bone, *clock-controlled gene 1*, was identified in chick embryos and monitored the period of somite formation (every 30 min in a chick), called the segmentation clock.

Somitogenesis is one of the most evident events in an ultradian manner, which endows basic regionalization of the body axis and its associated tissues during embryonic development. Long bone growth and bone formation are also controlled by circadian genes in a circadian fashion. Core loops of circadian clock genes are also at work in bone and cartilage. Here, collaborators at Toyohashi University of Technology and Central University propose bio-imaging methodology to observe both clocks. Bio-imaging detecting of temporal changes in circadian signals enables observation of more comprehensive sets of genes and activities/regulatory proteins of these clockwork mechanisms during development.

In this review paper, the authors also describe the potential of three dimensional imaging for bone research, and the bone fluorescence imaging would contribute to widening our knowledge of biomedical science.

Tadahiro Iimura¹, Ayako Hanami¹, Hayu Sugiyama¹, Hiroki Satoh², Yuki Makino², Takeshi Watanabe¹, Yuji Takagi¹, Riku Nameki¹, Akira Yamaguchi¹*¹Toho University, ²Central University, ^{*}Toyohashi University of Technology, ¹Developmental Clockwork development and metabolism of bone/mineral of bone and Mineral Metabolism; On-line July 2011 DOI: 10.1007/s00392-011-3119-1 International Journal of Molecular Sciences in Tooth and Bone Diseases, Tokyo Medical and Dental University, Sections of Oral Pathology/Website: <http://www.tmd.ac.jp/en/copal/copal1.htm#2> The Electronics-Inspired Interdisciplinary Research Institute (EIIRIS), Toyohashi University of Technology

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Carbon Nanotube Composites for Enzymes and Cosmetics

Yoshitomo Tsuchiya et al., Japan Advanced Institute of Technology, Toyohashi University of Technology

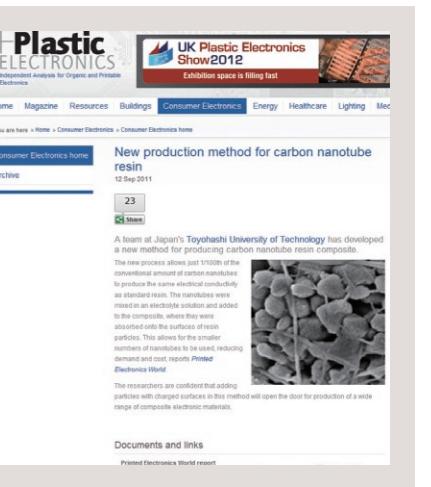
Yoshitomo Tsuchiya researchers develop a low cost and efficient method for producing electrically conducting composites based on electrostatic adsorption of CNTs onto resin and ceramic particles for applications including enzyme immobilization and cosmetics.

Image: Cross-section of PLLA/CNT resin composite material showing the existence of CNTs on the surface of the resin particles. The CNTs add to reduce electrical conductivity.

Image: Ceramics particles with electrostatically adsorbed CNTs.

Hiroaki Miyazaki and colleagues at Japan's Toyohashi University of Technology (Toyohashi Tech) have developed an innovative method for producing electrically conductive composites based on CNTs that only requires 1/100 of the conventional amount of CNT additive to produce equivalent electrical conductivity.

In this method, CNTs were mixed in an electrolyte solution and added to

The header features the "Plastic Electronics" logo in large, bold, black letters at the top left. To its right is a banner for the "UK Plastic Electronics Show 2012" with the tagline "Exhibition space is filling fast". Below the banner is a photograph of a printed circuit board with organic materials. The main navigation menu includes links for Home, Magazine, Resources, Buildings, Consumer Electronics, Energy, Healthcare, Lighting, and Media. A breadcrumb trail indicates the current page is "Consumer Electronics home".

A screenshot of the PHYS.ORG website. The header includes links for 'Home', 'Nanotechnology', 'Physics', 'Space & Earth', 'Electronics', 'Technology', 'Chemistry', and 'Biology'. Below the header is a navigation bar with 'General Physics', 'Condensed Matter', 'Optics / Photonics', 'Superconductivity', and 'Plasma Physics'. The main content features a large image of a Hall effect sensor chip. To its left are five smaller images showing EPRHIM (Electron Paramagnetic Resonance Heteroimaging) images of the sensor at different temperatures: 27°C, 70°C, 100°C, 130°C, and 160°C. The text above the images reads: 'EPRHIM images of a bismuth substituted iron garnet perovskite in 25-100 °C under an external perpendicular magnetic field. Heat: 150 Gc. Credit: Toyohashi University of Technology'. Below the images, the text says: 'Topohysik Tech researchers have fabricated Hall effect magnetic field sensors operating at least 400 °C and in extreme radiation conditions using gallium nitride-based heterostructures a with two-dimensional electron gas.' At the bottom of the page, there is a section titled 'Components at Digi-Key - Distributor Quality Electronic Components. Order from Digi-Key' with a link to www.digkey.com.



Innanotube composites for enzymes and

tic

By Atman Sandhu

Cross-section of PMMA resin composite material showing the networks of CNTs on the surfaces of the resin particles. The CNTs are produced by pyrolyzing CNT (carbon nanotubes) powder. Credit: Graphene Tech

researchers have developed a low cost and efficient method for electrically conducting composites based on electrostatic adsorption of CNTs onto resin and carbon particles for applications including and cosmetics.

al

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ato and colleagues at Japan's Toyohashi University of Technology (Graphene Tech) have developed an innovative method for producing CNT (carbon nanotubes) composites that can reduce energy consumption by 1100 t of the CNT additive to produce electrical conductivity in the composite material. In addition, CNTs were mixed in an electrolyte solution and added to the resin, where the CNTs were adsorbed onto the surfaces of the resin particles and subsequently anchored onto the resin matrix, thereby enhancing the production of conductive composites by the addition of a small quantity of CNTs.

the electrical conductivity of the composite material was easily controlled by the amount of electrolyte added to the composite, namely, the amount of CNTs adsorption onto the resin particles.

approach enables significant reductions in both the production costs and time compared with conventional methods for manufacturing resins.

A screenshot of the Electronics News website. The top navigation bar includes links for Home, News, Features, Columns, and Resources. A search bar is located at the top right. The main content area features a large image of a carbon nanotube resin composite material. To the left of the image is a headline: "Approach to carbon nanotube resin composite manufacture". Below the headline is a detailed article about the research at the University of Technology Delft. To the right of the image is a sidebar titled "Buy It. In Tubes." with a small image of a tube. Below the image is a section titled "Find It. Contact Us. Buy It." with a red "RS" button. At the bottom of the page is a "Related Articles" section with several thumbnail images and titles.

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Hard electronics: Hall effect magnetic field sensors for h temperatures and harmful radiation environments

Period of validity: March 21st, 2013 and is valid under [Science and development](#). You can follow [this article](#) in the following ways:

ScienceDaily (Mar. 21, 2013) Researchers at Toyohashi University of Technology have invented Hall effect magnetic field sensors that are operable at high temperatures and harmful radiation conditions. The sensors will find applications in space craft and nuclear power stations.

Toyohashi Tech researchers have fabricated Hall effect magnetic field sensors operate at up to 400°C and can evaluate dimensional changes using gallium nitride semiconductors with two-dimensional electron gases.

Silicon and III-V compound semiconductor Hall effect magnetic field sensors are widely used in the electronics industry for monitoring rotation in equipment such as optical memory disks and for barcode authentication in mobile phones. However, the Hall effect magnetic field sensor's performance in harsh environments such as high temperatures and harmful radiation environments in outer space and nuclear power stations is more challenging because of the large fluctuations in temperature and harmful radiation in these environments.

To resolve these issues, the Toyohashi Tech researchers used AlGaN/GaN two-dimensional electron gas heterostructures to fabricate high sensitive magnetic field sensors.

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Smart robots designed for hospitals

LIFESTYLE SEP. 04, 2011 - 04:06JST JET (C+)

TOKYO—Kenjiro Terasawa, head of Tohoku University of Technology's new Center for Synthetic Human Robotics Research, proposes new assist robots for hospitals.

Japan has many aged individuals who need assistance with daily routines that can walk, run, climb, and even ride bicycles. But Terasawa says, "There are no practical applications from all this research." Since robotics researchers focus on taking care of humans have little to show for their efforts, says Terasawa. The reason, he suggests, is because so much of the research is carried out in laboratories—not in real-world environments like a hospital, care center or the home.

"What's more, researchers usually set robots a single task to perform," he adds. "But as in a hospital or care center, a robot must be able to perform a variety of tasks if it is to be useful. It needs to assist a patient or aged person to sit in a chair, lie down on a bed, eat a bath, walk, practice therapy, and so on."

This requires a new thinking in design where robots are considered part of an overall system of care, controlled centrally through such as memory storage, which will be necessary in order to perform multiple tasks. The difference will be led and directed by a human in a more intuitive manner using concepts taken from factory automation. Key technologies for such a scheme under development at the Robotics Center are methods for vibration damping, one-dimensional movement, and sensor-based power-assisted movement.

"Instead of spending our funds on building complicated robots of limited use, we're developing much simpler power-assisted systems that can help the infirm move about comfortably and safely," explains Terasawa.

Heavy tasks such as lifting and moving a bed-bound person, for instance, would be done by a

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The screenshot shows the AFM World website with a header featuring the 'ano werk' logo, 'FastScan AFM', and 'World's Ultimate AFM'. The main content area includes a search bar, a sidebar with navigation links like 'Home', 'Products', 'Applications', 'Case Studies', 'Videos', 'Events', 'Support', and 'Contact', as well as a central column with news articles and a sidebar for 'NT-MDT'.

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エレクトロニクス先端融合研究所 (EIIRIS) フロアマップ

EIIRIS Floor Map



Toyohashi-Tech Campus



Map



Access 豊橋駅まで 東京駅から新幹線ひかりで約 90 分。名古屋駅から新幹線ひかりで約 20 分、もしくは JR 東海道線か名鉄本線で約 50 分
中部国際空港より名鉄、神宮前駅で豊橋行きに乗り換え、約 90 分

豊橋駅よりバス 豊鉄バス 2 番のりばから、豊橋技科大線に乗車「技科大前」で下車：約 30 分

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