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TOYOHASHI UNIVERSITY of TECHNOLOGY
e-Newsletter
News and views from one of Japan's most innovative and dynamic science and technology-based academic institutes

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President Takashi Onishi outlines his plans to create a multi-cultural and intellectually active campus at Toyohashi Tech

Takashi Onishi was appointed the president of Toyohashi University of Technology on 1st April 2014. "My expertise is in urban engineering and planning," says Onishi. "I am looking forward to working with my colleagues at Toyohashi Tech to ensure the success of programs in progress as well as launching new projects and initiatives in broad subjects of technology."

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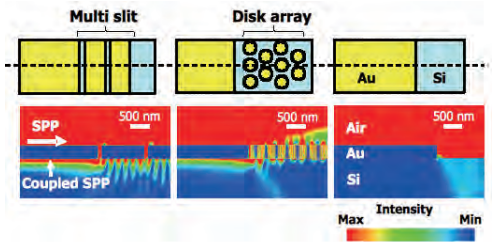

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President Takashi Onishi outlines his plans to create a multicultural and intellectually active campus at Toyohashi Tech

Takashi Onishi was appointed the president of Toyohashi University of Technology on 1st April 2014. "My expertise is in urban engineering and planning," says Onishi. "I am looking forward to working with my colleagues at Toyohashi Tech to ensure the success of programs in progress as well as launching new projects and initiatives in broad subjects of technology."

President Takashi Onishi

Toyohashi Tech currently has three major programs in progress: The National University Reform Enhancement Project being run with Nagaoka University of Technology and Institute of National College of Technology to nurture globally-minded human resources. This program led to the establishment of the TUT-USM Campus in Penang, Malaysia. The second project is the Leading Graduate School Program to "strengthen brain information educational research capabilities". And the third initiative is the Program for Promoting the Enhancement of Research Universities. All three programs are funded by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT).

In addition to supporting these programs, President Onishi has set new innovative goals for his tenureship.

"Enhancing the level of globalization of the entire university is a high priority," says Onishi. "I want to promote greater international collaboration in both education and research." President Onishi also wants to encourage greater interaction with the local community. "I think that Toyohashi Tech researchers can contribute to regional disaster management and mitigation." In particular, President Onishi wants to build on the excellence in research at the Electronics-Inspired Interdisciplinary Research Institute (EIIRIS) by enhancing international collaboration over a wide range of multidisciplinary research areas.

In education, President Onishi plans to improve the communication skills of students by collaborating with Nagaoka University of Technology and Institute of National Colleges of Technology (KOSEN). "I want to establish a bilingual and multicultural curriculum and campus life to encourage more students from overseas to study at Toyohashi Tech."

Reforming the university administration is another goal for President Onishi. "I want to streamline our administrative system and improve our research environment to attract even more world class researchers to Toyohashi," says Onishi. "My goal is to create a multicultural and intellectually active campus."

President Takashi Onishi delivers inauguration address

President Takashi Onishi delivered his inauguration address on 1st April 2014 to an audience of the university's faculty and students.

His address included his philosophy for university management, education and research. President Onishi stated the following five objectives:

1. Further promotion of globalization of the entire university.
2. Deepening cooperation between the university and the local community.
3. Strengthening the university's research activities.
4. Promotion of global human resources development in education.
5. Reform of the university's management system.

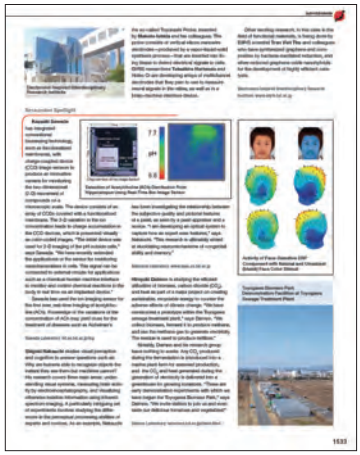
President Onishi giving his inauguration address

Global visibility advertisement on new research program published in *Science Magazine*

Toyohashi Tech was one of 22 institutions chosen for the MEXT Program for Promoting the Enhancement of Research Universities in autumn 2013. The background, goals, and challenges of the Program are described in a special advertisement-article published on 28 March 2014 in AAAS Science Magazine.

A PDF of the lead Editorial summary and the Toyohashi Tech pages of the advertisement-article can be found here:
http://www.tut.ac.jp/english/news/201404/3951.html


Toyohashi University of Technology
"Value Creation Engineering" for New Industries



International Student Workshop: Towards Success as Global Engineers

What is a successful international student? And what kind of efforts should they make? An international student workshop was held at Toyohashi Tech 18th April 2014 to answer these and other related questions about international students. The workshop attracted more than 60 international and Japanese students, and academic staff.

The Indonesian Student Association of Toyohashi invited Khoirul Anwar, an assistant professor at the Japan Advanced Institute of Science and Technology, to give a talk at the workshop. Dr Anwar is an expert in telecommunications. His talk was entitled,"Learn the Signs: How to Be a Great Scientist". During his powerful presentation, he described his life and his unique theory on how to be successful.

There was a panel discussion after the talk moderated by associate professor Nobumasa Sekishita from the Department of Mechanical Engineering. The panelists were Khoirul Anwar, Roy Reyna, a doctoral student at Toyohashi Tech from Peru, and project assistant professor Hirotsugu Kamahara from the Toyohashi Tech Center for International Relations. The panelists and audience shared their dreams and experiences of carrying out research in their own countries and Japan. It was a truly fruitful workshop for everyone.

Commemorative photograph of the participants at the workshop

Development of the world's strongest magnesium alloy

There is strong demand for the improvement of the mechanical properties (particularly the strength) of magnesium (Mg) alloys to meet the growing industrial applications of structural materials.

Hiromi Miura and colleagues* applied severe plastic deformation, that is, multi-directional forging (MDF), to commercial brittle Mg alloys by controlling pass strains and severe plastic deformation was realized without any cracking up to cumulative strain of 2.0. The coarse initial grains were gradually subdivided into ultrafine grains by mechanical twinning. The initial coarse twins were further subdivided by higher order mechanical twins. The average grain size achieved at a cumulative strain of 2.0 was as fine as 0.3 ㎛. The Mg alloy produced by MDF showed an excellent balance of mechanical properties of 530 MPa yield stress, 650 MPa ultimate tensile strength, and 9% plastic strain to fracture (Fig. 1). This was the world strongest Mg alloy ever produced.

Hiromi Miura

The ultrafine grain structure and suppression of texture resulted in the extraordinarily high strength without spoiling ductility.

The researchers are now conducting experiment to produce large sizes samples of the MDFed Mg alloys.

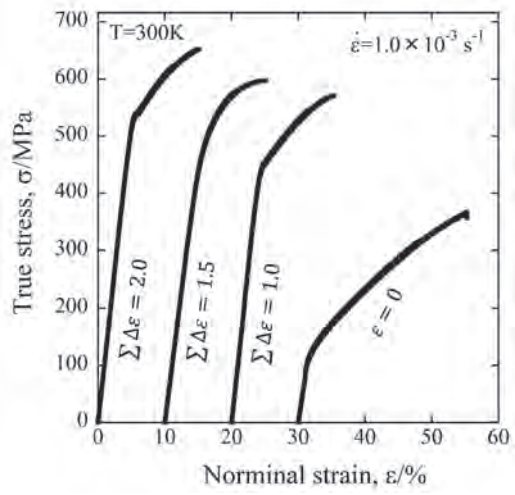


Fig.1: True stress vs. true strain curves obtained by tensile

Reference:

- Authors: H. Miura and W. Nakamura
- Title: Microstructure and Mechanical Properties of Mg-8Al Alloy Fabricated by Room-Temperature Multi-Directional Forging
- Journal: Philosophical Magazine Letters. Vol.93, pp.601-607, 2013.
- Digital Object Identifier (DOI): 10.1080/09500839.2013.827800
- Affiliation: Department of Mechanical Engineering, Toyohashi University of Technology.

*This research was conducted at the University of Electro-Communications, Tokyo.

Waveguiding and detecting structure for surface plasmon polaritons on silicon

Surface plasmon polaritons (SPPs) are waves that propagate along the surface of a conductor and collective oscillation of electrons coupled with the optical field at the nano-scale beyond the diffraction limit of propagating light waves. Recently, there is increasing interest in SPPs as signal carriers in nanoscale integrated circuits to increase the degree of accumulation and reduce power consumption.

However, low-loss SPP waveguides with detectors have not been developed for applying to nanoscale integrated circuits.

Now, Mitsuo Fukuda and his group at Toyohashi Tech have developed a simple, low-loss waveguide for SPPs that is applicable to nanoscale integrated circuits.

A thin metal film deposited on a silicon substrate was terminated with a diffraction structure (a multi-slit or a metal disk array) at the end to guide the SPPs transmitted on the surface (air-metal interface) to the opposite side of the metal (metal-silicon interface). A Schottky barrier is formed at the metal-silicon interface, and the free electrons in the metal are excited by the guided SPPs and then cross over the barrier. The overflowing electrons result in observable photocurrents.

Mitsuo Fukuda

The waveguide developed in this research enabled the efficient propagation of SSPs in 1550-nm-wavelength bands (transparent to silicon) along the Au film surface, and the photocurrents were much larger than for waveguides without the diffraction structure (26 times for the grating structure and 10 times for the disk array).

This waveguide device is expected to contribute to nanoscale photonic integrated circuits on silicon.

Reference:

- Authors: M. Fukuhara, M. Ota, H. Sakai, T. Aihara, Y. Ishii, and M. Fukuda.
- Title of original paper: Low-loss waveguiding and detecting structure for surface plasmon polaritons.
- Journal, volume, pages and year: *Applied Physics Letters*, 104, 081111 (2014).
- Digital Object Identifier (DOI): 10.1063/1.4866792
- Affiliations: Department of Electrical & Electronic information Engineering.
- Website: http://www.photon.ee.tut.ac.jp

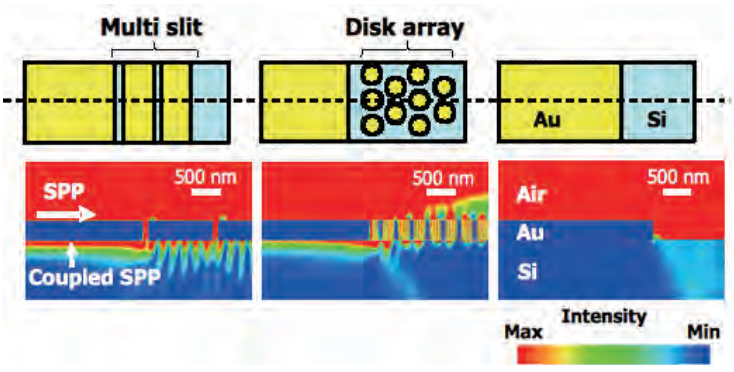


Fig.1: Schematic diagrams and electric field intensity distributions for (a) a multi-slit structure, (b) a disk array, and (c) no diffraction structure at the waveguide end.

Insights into physiological mechanisms underlying symptoms of aging

Sarcopenia refers to age-related loss of skeletal muscle mass characterized by a deterioration of muscle quantity and quality, which leads to a gradual slowing of movement, a decline in strength and power, increased risk of fall-related injury, and often, frailty.

Several possible candidates for modulating sarcopenia have been proposed, however, the precise contribution of each is unknown.

Now, Kunihiro Sakuma and colleagues at Toyohashi Tech have published a review article Pflügers Archiv on the age-related adaptation of positive and negative factors regulating sarcopenia.

This review describes the positive regulators such as mTOR- and SRF-dependent signaling, which modulate protein syntesis and mRNA transcripiton to enhance muscle hypertrophy. In addition, the authors discuss major negative signaling (UPS, autophagy, myostatin-Smad, NF-kappaB) to elicit protein breakdown resulting in muscle atrophy.

Kunihiro Sakuma

The report highlights the fact that autophagy-dependent signaling, and not the UPS system, is destroyed in sarcopenic muscle. Although the UPS system, an activator of protein degradation in various catabolic conditions (i.e., immobilization), is believed to elicit the atrophy of muscle fiber during aging, this review concludes there to be no contribution to this.

Advances in our understanding of sarcopenia have led to new approaches, such as supplements, and pharmatheuticals, to attenuate the symptoms.

Reference:

- Authors: Kunihiro Sakuma, Wataru Aoi, and Akihiko Yamaguchi.
- Title of review article: Current understanding of sarcopenia: possible candidates modulating muscle mass.
- Journal, volume, pages and year: *Pflügers Archiv, in press* (2014).
- Digital Object Identifier (DOI): 10.1007/s00424-014-1527-x
- Affiliations: Department of Research Center for Physical Fitness, Sports and Health, Toyohashi Tech.
- Website: http://www.health.tut.ac.jp/sakuma/index.html

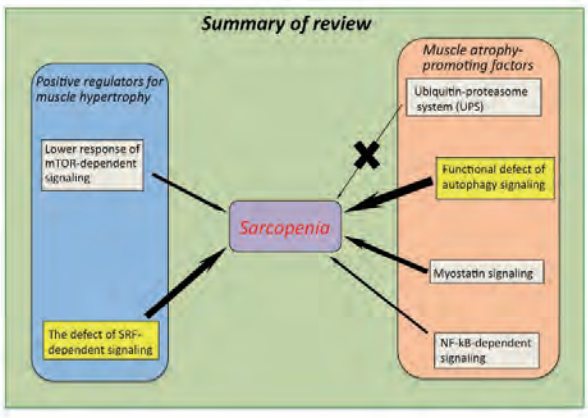


Fig.1: Functional defect of autophagy- and SRF-dependent signaling regulate sarcopenia.

Brain regions sensitive to facial color processing

Facial color provides important clues to recognize a person's emotion and health, and is therefore facial color contains important information for social communication.

Previous research published by Tetsuto Minami and colleagues at the Electronics-Inspired Interdisciplinary Research Institute (EIIRIS) at Toyohashi Tech based on electroencephalography (EEG) has shown that the face-sensitive event related potential (ERP) component (N170) is modulated by facial color, which suggests that face color is important for face detection (Minami et al. Neuroscience, 176, 265-73, (2011)). Moreover, the sensitivity of N170 was found at the left occipito-temporal site (Nakajima et al., Neuropsychologia, 50, 2499-505, (2012)).

However, it is not clear which region of the brain is involved in facial color processing because spatial resolution of EEG is not sufficient.

Here, Tetsuto Minami and colleagues at Electronics-Inspired Interdisciplinary Research Institute (EIIRIS) at Toyohashi Tech, report on the brain regions sensitive to color information for face processing.

The present study aimed to identify the brain regions related to facial color processing by using functional magnetic resonance imaging (fMRI). The researchers measured the brain activity from 25 participants during the presentation of natural- and bluish-colored faces and other scrambled images. Face-selective regions of interest (ROIs) were identified separately for each subject and hemisphere of the brain.

As a result, the bilateral fusiform face

Tetsuto Minami

(FFA) area and occipital face area (OFA) were identified as brain areas that were activated more to natural-colored faces than to natural-colored scrambled images. The ROI analysis showed that the left FFA was sensitive to facial color, whereas the right FFA was not. Furthermore, the right and left OFA were insensitive to facial color.

In combination with previous EEG studies by this group, the present study showed that the left FFA is related to facial color processing.

Reference:

- Authors: Kae Nakajima[1], Tetsuto Minami[2,*], Hiroki C. Tanabe[3,4], Norihiro Sadato[3,5] and Shigeki Nakauchi[1]
- Title of original paper: Facial color processing in the face-selective regions: An fMRI study
- Journal, volume, pages and year: *Human Brain Mapping Early View (Online Version of Record published before inclusion in an issue)*
- Digital Object Identifier (DOI): 10.1002/hbm.22535
- Affiliation(s): [1]Department of Computer Science and Engineering, Toyohashi University of Technology, Toyohashi, Aichi, Japan, [2]Electronics-Inspired Interdisciplinary Research Institute, Toyohashi University of Technology, Toyohashi, Aichi, Japan, [3]Department of Cerebral Research, National Institute for Physiological Sciences, Okazaki, Aichi, Japan, [4]Department of Social and Human Environment, Graduate School of Environmental Studies, Nagoya University, Nagoya, Japan, [5]Department of Physiological Sciences, the Graduate University for Advanced Studies, Okazaki, Aichi, Japan
- Website: http://www.eiiris.tut.ac.jp/

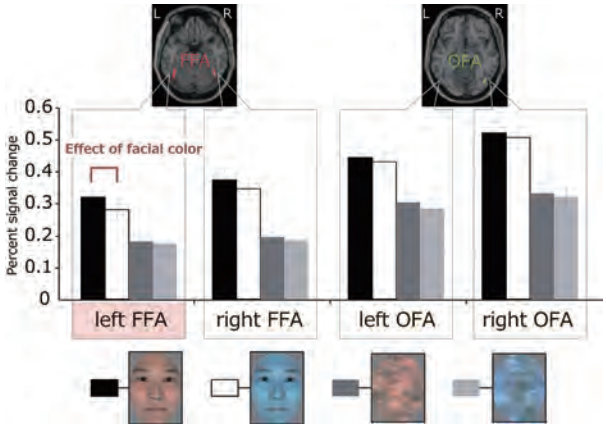


Fig.1: Results of the ROI analyses, which suggests that the left FFA was sensitive to facial color.

Toyohashi Tech Badminton Club

Group photograph

Competition play

After a few months of becoming an enthusiastic member of Toyohashi Tech's Badminton Club, Hayato Ishida, a third year student majoring in electrical and electronic engineering, was asked to take over leadership of the club. His acceptance of the responsibility is a reflection of his enthusiasm for the sport.

Explaining his love for the game, he says, "In badminton you have to use your body and your mind. It's an active team sport and you are always thinking where to hit the shuttlecock. And it's a great feeling when you smash it and score points."

The club has 20 members, and over half of them meet two times weekly in the university's gym. They practice together and hold discussions for around three hours a session. Prior to competitions more members attend and an extra meeting is often arranged to better prepare. "Meeting and practicing regularly is also a good way to create strong relationships, so it's not just about the sport and exercising," says Ishida.

The club is particularly eager to compete in tournaments and may enter as many as seven or eight competitions a year. Last year, the club won the Toyohashi Citizens' Sports Festival Competition and came second in the prestigious Tokai Regional National University Badminton Tournament.

Taking part in competitions helps increase members' confidence and test their abilities, as well as fostering a strong team ethic, Ishida points out. He caught the badminton bug playing the game for the first time in technical college. "I really enjoyed it. It's such a fast, flowing game. So I was delighted to join the club when I entered Toyohashi Tech."

He adds that all comers are welcome to join and they don't need to have played the game before. "Our experienced players are happy to teach new members. So please join. It's fun."

Daniel Ortega, visiting researcher at EIIRIS, September to October 2013

Daniel Ortega giving a lecture at EIIRIS.

Daniel Ortega at the IMDEA Nanociencia, Madrid, Spain.

Japanese people are Japan's main asset—Period.

This may sound like a cliché quoted in travelling guides like Lonely Planet or Time Out about any country in the world, but nothing describes the land of the sake better. To a foreigner coming from the other side of the world, inadvertently exposed to the inaccurate picture of this country offered by some global media after the March 11 earthquake in Tohoku, living in Japan could be a bit of a gamble. Sure? Sorry, but that must be somewhere else. As soon as you step out of the plane, you realise that beyond the traditional food and architecture, it is the Japanese people who make the difference before and after your stay. When you are here, you really learn the actual meaning of ganbaru: it is not just about one self, it also concerns the treatment you get as a visitor. Whatever you need and whenever you need it, they will always try their best in giving you a lift up despite the sometimes insurmountable language barriers between nationals of different countries. Of course, this does not prevent you to get equally amazed by those little details you do not usually see in Europe: the refreshing wet towels in every restaurant; the con sense of safety even in the most highly populated cities like Tokyo and Osaka.

No wonder that living and working in Japan, particularly at EIIRIS in Toyohashi, is one of the big stories I will tell my grandsons. Their unique character, along with their determined technology bid, makes of the EIIRIS not just a good place to work in but a place to really enjoy working in science.

Although in rōmaji , arigatōgozaimashita my friends.

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Internship in Penang, Malaysia

Yosuke Sakashita, Department of Electrical and Electronic Information Engineering

I was one of 21 students who travelled to Penang in Malaysia, for an internship from January to the end of February 2014 as part of our final year undergraduate program. We can choose to do internships at companies in Japan as well as overseas in countries including France, United States, and Malaysia.

The 21 students in this group decided to go to Malaysia because the people there are one of the best English speakers in Asia and recently the country has made remarkable economic progress.

I did my internship at Mini-Circuits technologies Malaysia Sdn Bhd—a company that has expertise in manufacturing RF (radio frequency), IF (intermediate frequency), and microwave signal processing products.

I worked four days a week for the two months on soldering and designing circuits. My boss and all of the other people at Mini-Circuits were very kind to me, so it was easy to ask them for advice.

But there were some things there were difficult for me to understand. For example, I was surprised that Malaysian workers prayed during working time. It doesn't happen in Japan. Approximately 60% of Malaysians are Muslim and they have to pray a few times each day. That's why it is common sense there. So you can see this everywhere in Malaysia.

The other members of the group from Toyohashi Tech worked at companies including Toray, Panasonic. Everyone seemed to have similar experiences as me.

On holidays, we attended lectures held by local workers at TUT-USM Penang, an overseas education base in Penang, and sometimes went sightseeing. I learnt a lot about foreign culture from this internship. It will be useful experience for my life.

Members of the workers and me in Mini-Circuit Technologies

Group photograph of the participants