World Premier International Research Center Initiative (WPI)
Activities Report of the WPI Academy Center
(FY 2017 – FY 2019)

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Research Center	International Center for Materials Nanoarchitectonics (WPI-MANA)		
Center Director	Takayoshi Sasaki	Administrative Director	Tomonobu Nakayama

Common Instructions:
* Unless otherwise specified, prepare this report based on the current (31 March 2020) situation of your Center.
* Use yen (¥) when writing monetary amounts in the report. If an exchange rate is used to calculate the yen amount, give the rate.
* Prepare this report within 10 pages (excluding the appendices, and including "Summary of State of WPI Academy Center Progress" (within 2 pages)).

Summary of WPI Academy Center's Activities (write within **2 pages**)

* Describe clearly and concisely the progress being made by the Center from the viewpoints below.
- In addressing the below-listed 1-8 viewpoints, place emphasis on the following:
  (1) Whether research standards and operation of the Center is maintaining a "world premier" status.
  (2) Whether the Center participate and cooperate to the activities to advance the overall development of the WPI Program and to promulgate its achievements.

After three years as a WPI Academy center, MANA keeps yielding research output that lives up to its name as a world-class research center. As an international hub for nanotechnology research, MANA has also drawn on its worldwide research network to promote international "brain circulation," and has worked to expand that network. The following will provide a summary of MANA's activities.

[Research center overview and world-class research / interdisciplinary research]

Working under the concept of "nanoarchitectonics" to establish a new paradigm of nanotechnology, MANA strives as a part of the WPI Academy to promote top-level research and act as a hub for international "brain circulation" in the field of nanotechnology. In FY 2017, MANA clarified its role as an organization within NIMS (its host organization) to explore fundamental research. Consequently, it established three basic research fields—Nano-Materials, Nano-System, and Nano-Theory—and assigned young independent researchers to work across the fields. As a result, MANA has produced 1,411 papers in 2017-2019 (an average impact factor of 6.95 in 2019). The elements of MANA that underlie its world-class original research are the nanoarchitectonics concept, the mind of Grand Challenges, the promotion of challenging and interdisciplinary research, and the "brain circulation" network. MANA is also making efforts to explore new research such as the realization of photonic topological materials and their application to planar-emmision lasers, conformational control of molecules by local excitation, data-driven olfactory sensing techniques, and decision-making devices based on ionics.

[International research environment / International "brain circulation"]

To promote world-top-class research under the leadership of the MANA Director, a fully bilingual administrative office and a number of measures to stimulate research are implemented. This has become possible largely owing to the support, both financial and human, provided by NIMS and by the acceleration and expansion of international "brain circulation" supported by the WPI Academy. For example, MANA has appointed world-renowned researchers as PIs and established overseas satellites to further boost the level of research performed at MANA and to help promote "brain circulation." In 2018, MANA welcomed Prof. Gero Decher from University of Strasbourg in France and Prof. Thomas E. Mallouk from Penn State University in the USA as new satellite PIs. By this addition, MANA is now running seven overseas MANA satellites. MANA has also invited researchers from overseas and sending MANA researchers to overseas institutions including MANA satellites. Beginning in 2018, we enacted special policies to support MoU-based invitations and overseas dispatches for sustainable international collaboration, especially with partners with whom we have strong ties. In addition, MANA's hosting (and co-hosting) of international conferences and workshops also plays an important role in expanding international brain circulation. MANA has been organizing the MANA International Symposium every year (300-400 participants). However, the outbreak of COVID-19 has had an enormous impact on the international brain circulation, MANA was forced to cancel the actual meeting of participants for the 13th MANA International Symposium.

[Spillover effects for the host institution in the form of systemic and organizational reforms]

MANA's current "troika" management system, consisting of the Center Director and two Deputy Directors (one of whom also serves as the Administrative Director), makes decisions. The Administrative office is in charge of implementation and operation of those decisions. This structure enables the Center Director to take the lead and demonstrate leadership. The Center Director and Deputy Directors are holding MANA executive meetings online as needed to share information and reflect the latest data in center operations.

MANA has made a number of system reforms that had not been achieved in NIMS before. Some of the spillover effects at NIMS include: establishment of each Research Center Management Office (corresponding to MANA's Administrative Department); transfer of the technical support system and ICYS-MANA to NIMS; NIMS's independent researcher system; and the "NIMS Global Collaboration Fellowship Program" that is a rendering of the MANA Short-term Invitation Program for Young Researcher.

[Maintaining and improving the WPI brand and outreach efforts]

WPI branding is accomplished through research and outreach activities, such as "demonstrating world-class research capabilities and achievements," "disseminating and collecting information through networks of alumni and other relevant parties," "raising awareness among the next generation of leaders," and "clarifying the relationship between these activities and the WPI." Specifically, these correspond to issuing the MANA e-bulletin, sponsoring international symposia and workshops, organizing the MANA Alumni, promoting science education activities for primary school through university students, and uses of the WPI designation in all of these activities.

MANA has issued its e-bulletin since FY 2017 to showcase its achievements, resulting in a large number of news sites and expansion of the reach of MANA's outputs. This has improved visibility of the WPI brand. The annual MANA International Symposium is recognized as a conference that attracts the world's top researchers. However, due to the global spread of COVID-19, the 13th MANA International Symposium held in March 2020 took the special measure of distributing a book of abstracts of all the presentations among registered attendees in lieu of the on-site meeting activity.

There is a MANA/ICYS Alumni Association that has been established for researchers enrolled in MANA and ICYS (International Center for Young Scientists). The MANA/ICYS Alumni channels are strengthened via social networking sites (Twitter, Facebook, and Instagram). This network is such that it will become even more valuable as alumni move up to more senior positions, which will also promote the WPI brand.

Since 2017, MANA has been stepping up its efforts to properly show the outcomes to public and to build interest in science among young people, who are the future of science. This effort has contributed tremendously to the rapid growth visitors to NIMS open-facility days in recent years (it has ranked first in the Tsukuba area for recent three years, surpassing JAXA in attendance), also increased visibility of the WPI brand. Also, MANA is making efforts to include "WPI-MANA" in the affiliation of MANA papers and other publications that are encountered by researchers around the world.

[Ensuring the medium- to long-term development of the center]

NIMS has positioned MANA as a research center devoted to basic and fundamental research, and research at the application phase will be transferred to other centers in NIMS to continue that work. This policy also serves to promote the metabolism of MANA in terms of research and personnel, and to incorporate the mid- to long-term development of MANA into the mid- to long-term development of NIMS. In addition, MANA has been allocated additional grants for operational expenses (President's Special Support Budget), which are important for its mid- to long-term development as a world-class research center, and both tenure-track research staff and young independent researchers are assigned to MANA with priority. All of these measures are extremely important to the activity of MANA.

[Other: Three years of initiatives to accelerate and expand international "brain circulation"]

MANA has maintained the world's highest level of research quality with minimal decline in activity despite organizational reforms and changes in budget size and after WPI Grants ended. Moreover, MANA is creating new partnerships. These two factors are both intrinsically important to the acceleration and expansion of international "brain circulation," and to that end the following initiatives were undertaken.

---Establishment of the MANA Postdoctoral Fellowship Program.
---Securing ICYS-WPI-MANA researchers to merge ICYS's and MANA's brain circulation networks.
---Strengthening MANA's overseas satellites and hosting PI meetings to activate researchers' network.
---Invitations and dispatches of researchers and strengthen cooperative activities initiated by MoU.
---International symposia and workshops to promote research cooperation and personnel exchange.

Details of each will be explained later.

1. Overall Image of Your Center

・Describe the Center's current identity and overall image.
・List the Principal Investigators in Appendix 2, diagram the Center's management system in Appendix 3-1, enter the number of center personnel in Appendix 3-1a, and enter center funding in Appendix 3-2.

In the nine and a half years since its inception (October 2007 - March 2017), MANA has grown into a world-class research center in relevant research fields. Since April 2017, as one of the WPI Academy centers, MANA has been drawing on its prior experience with center formation to revamp our management structure and enhance our function as a center for international brain circulation, in order to further improve the level of quality of our research and achieve more development.

NIMS, MANA's host institution, is one of Japan's leading research institutes in the field of materials science. MANA was established on a center design focused on materials research and development, emphasizing the importance of effective use of nanotechnology (and nanoscience) to strongly promote research and development of new materials. In this design, MANA advocated that nanotechnology must be correctly recognized as being qualitatively different from microtechnology, and that a new concept of "nanoarchitectonics" (nanoscale architecture) is needed to succinctly express this fact.

This concept of nanoarchitectonics itself is what sets MANA's research unique, and what makes MANA unparalleled among the world's nanotechnology research institutions.

MANA's vision is to "open up new paradigms of nanotechnology and lead the world in development of new materials for a better tomorrow." To that end, MANA operated under the following four missions:

1. World-top-level research on new materials on the basis of "nanoarchitectonics"
2. Open up new fields of research by interdisciplinary research
3. Foster and secure the next generation of young researchers
4. Form an international network for research cooperation

Since its establishment through to FY 2015, the MANA research organization promoted research in four fields: two basic fields (Nano-Materials, Nano-System) covering basics through potential applications, and two practical application-oriented fields (Nano-Power, Nano-Life). In FY 2016, a theoretical field was launched to establish a five-field system in which research was promoted. Beginning in FY 2017, at the reorganization of NIMS in the fourth medium-and long-term plan, MANA was positioned as the center of NIMS specializing in basic and fundamental bottom-up research, and therefore, research fields were consolidated into three fundamental fields (Nano-Materials, Nano-System, and Nano-Theory), with the practical application-oriented research fields transferred from MANA to another center of NIMS. In each of these fields, tenured researchers, fixed-term researchers, and doctoral students from different backgrounds perform group research under the leadership of group leaders such as principal investigators (PIs) who determine the specific direction of the research. However, MANA encourages and supports researchers in each field to propose and promote fusion research with other groups and fields, rather than staying within their own group in their own field. Additionally, around 7 to 10 young independent researchers, who are not part of a research group, are assigned to work directly under the director of the center to promote creative and challenging research by young researchers, with the aim of enabling excellent young researchers to become the core of interdisciplinary research. In these ways, MANA has been steadily advancing group research based on the new concept of "nanoarchitectonics," while at the same time putting the entire center behind encouraging and supporting interdisciplinary research to create new types of research.

2. Advancing Research of the Highest Global Level

・Describe what's been accomplished in the Center's research objectives and plans.
・In Appendix 1, list the papers underscoring those research achievement and list the Center's research papers published in 2017-2019 in a manner prescribed in Appendix A.

At MANA, our PIs who are active throughout the world are largely contributing to world-class research outcomes. At the same time, MANA emphasizes the importance of new and unique research, especially the proposal and execution of such research by young researchers. It goes without saying that it is of vital importance to nurture the seeds of new research into the world's highest level of research in the future. The two pillars underlying this are the presentation of research concepts and the financial support for challenging/interdisciplinary research. We explain recent research outcomes below.

[Presentation of research concepts]

MANA has proposed the new concept of "nanoarchitectonics," and has amassed a diverse group of researchers who are on board this concept. However, because of the wide range of research fields and directions suggested by the concept, MANA has presented four particularly interesting and challenging research topics as the four Grand Challenges as follows.

1. Development of nano perceptive systems

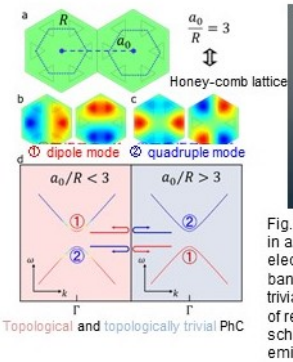
2 . Creation of the nanoarchitectonic artificial brain
3 . Realization of room-temperature superconductivity
4 . Realization of practical photosynthesis

However, there is no obligation for MANA researchers to engage in research aimed at one of the above four topics. The fact that we are all cognizant of these Grand Challenges leads to important realizations and the achievement of world-class research outcomes. For example, 10 out of 20 representative papers and 5 out of 10 major invitational lectures and keynote addresses were derived from research mindful of the Grand Challenges. MANA authored 3,840 papers in 2007-16 and 1,411 papers in 2017-19 (a total of 5,251 papers throughout the period). Our average impact factor for 2019 reached 6.95, with 180 of all the papers are the top 1% papers.

In particular, "Research on photonic topological materials" by Xiao Hu, MANA-PI, is a creative achievement from original research into room-temperature superconductivity. Principal Investigator Hu launched the JST-CREST project "Creating Topological States and Innovative Functionality Based on Artificial Graphenes" in 2018. Below is one of Principal Investigator Hu's most representative papers.

Z.-K. Shao, X. Hu, et al., A high-performance topological bulk laser based on band-inversion-induced reflection, Nature Nanotechnology 15, 67-72 (2020), published:16 Dec. 2019.

Extending the findings from studies on honeycomb-type materials such as graphene and graphene-like materials which exhibit Dirac-type dispersion relation, Hu et al. succeeded in creating novel photonic topological states by band engineering based on nanostructure formation. Specifically, two-dimensional photonic crystals were fabricated by periodically arranging fine triangular pores in a honeycomb pattern on InGaAs substrates. Structural periodicity was controlled to distinguish between trivial and non-trivial topological regimes, and they created a topological optical resonator. A planar-emission laser was created using this topological optical resonator and its excellent properties were confirmed.



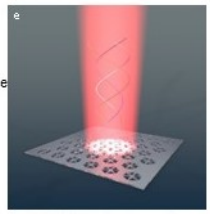


Fig. 1. (a) PhC with triangular pores in a semiconductor film, (b, c) electro-magnetic eigen modes, (d) band structures of non-trivial and trivial topological PhC with illustration of reflection of eigen modes, and (e) schematic figure of a planar-emission topological laser.

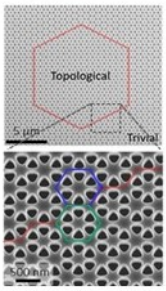


Fig. 2. SEM images of topological PhC resonator fabricated using a thin film of InGaAsP.

[Support for challenging and interdisciplinary research]

MANA researchers should challenge themselves to highly original and risky research. MANA invites proposals for the Challenging Research Program (CRP) every year and selects about six proposals per year to receive research funding. The CRP covers a variety of topics ranging from the testing of novel ideas to the exploration of potential applications, and is recognized for its effectiveness in producing highly original research. This has subsequently led to the acquisition of external funding. Another important measure is the Theorist-Experimentalist Pairing Program (TEPP) for promoting links between existing fields and MANA's newest research field launched in FY 2016, the field of nano-theory. These two programs, play a role in the generation of seeds and are not intended to lead directly to world-class research in the short term, but some of the research output of these programs has attracted international attention.

In particular, Ayako Nakata (theorist) and Waka Nakanishi (experimentalist) carried out theoretical-experimental interdisciplinary research on molecular conformation manipulation as a TEPP research project, and this developed into an international collaboration with collaborators of Christian Joachim (MANA Satellite PI; CNRS-CEMES, France), as well as collaboration with the world's first molecular car race.

W.-H. Soe, K. Ariga, C. Joachim, W. Nakanishi, et al., Conformation Manipulation and Motion of a Double Paddle Molecule on an Au(111) surface, ACS Nano 11, 10357-10365 (2017).

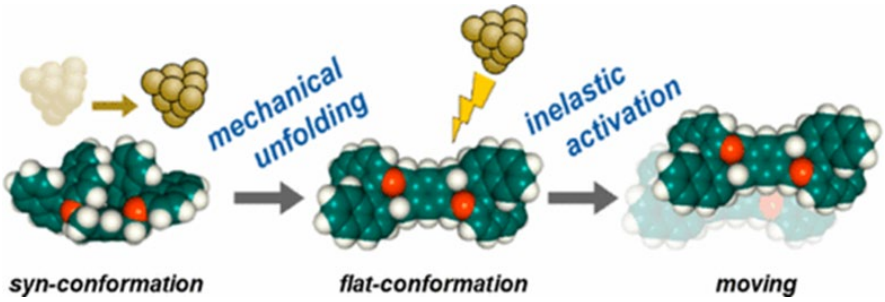


Fig. 3: The syn-shaped BBD molecule that is stable in solution takes a flat morphology when adsorbed on Au(111). The flat molecule can be deformed and moved by local inelastic tunneling excitation through STM manipulation.

The authors synthesized bisbinaphtyldurene (BBD) molecules, the conformation of which can be modified around the C-C bonds present in the molecule. The paper demonstrates both theoretically and experimentally that the shape of the synthesized molecule is altered by local inelastic tunneling excitation when the tip of the scanning tunneling microscope is precisely positioned on the appropriate site within the molecule, after it has been adsorbed on an Au(111) surface. The position of the BBD molecule on the Au(111) surface was successfully controlled because the size of the interaction with the Au(111) surface changed with the change in the molecular shape.

3. Facilitating Interdisciplinary Research Activities

- Describe the content of measures taken by the Center to facilitate interdisciplinary research activities. For example, measures that create an environment that will facilitate doing joint research by researchers in differing fields.
- Describe the contents and results of interdisciplinary research activities yielded by the measures described above.

The promotion of interdisciplinary research is important at various stages of research, from the conceptual stage to the deepening and further developing research that is already at a high level. Based on researcher proposals, MANA is working on the following three initiatives so that decisions on providing assistance with funding, human resources, and the research environment can be made smoothly.

[Matching theorists and experimentalists through TEPP (see above)]

The aforementioned pairing of Nakata (theory) and Nakanishi (experiment) is a good example of how such collaborations progress to international interdisciplinary research. The development of a data-driven nanomechanical sensing method proposed by MANA researchers Ryo Tamura (theory) and Kota Shiba (experiment) is another example that is an emerging but excellent achievement because it shows the potential to significantly expand the range of applications of the Membrane-type Surface stress Sensors (MSS) we have developed. So the MSS-related research was transferred to other centers in NIMS in FY 2018 to putting it into practical use. The following is a summary of MANA's results.

K. Shiba, R. Tamura, G. Imamura, G. Yoshikawa, Data-driven nanomechanical sensing: specific information extraction from a complex system, Scientific Reports 7, 3661 (2017).

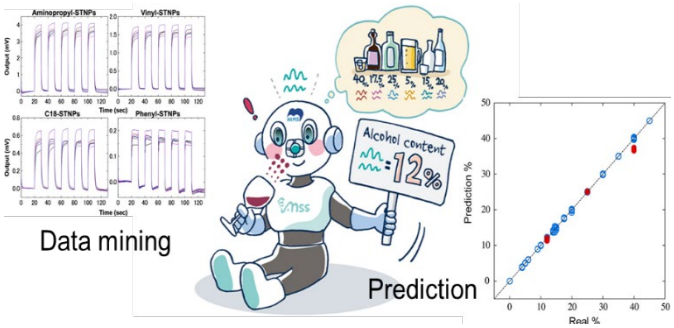


Fig. 4: Conceptual diagram of data-driven nanomechanical sensing

The difficulty in reproducing the five senses with sensor technology stems from the difficulty in selecting and detecting from the thousands of chemical species that are said to be involved in odors, as well as the difficulty in clarifying the relationship between the changes in ratios of heterogeneous molecules and the odors that people perceive. MANA has developed a method for "inferring" individual molecular species without "identifying" them, taking advantage of the fact that many molecules are adsorbed on and desorbed from a receptor film of the sensor with different sensitivities and time constants. Estimation of the alcohol concentration of an unknown liquid with high accuracy was demonstrated by recording and compiling a database of a response of a nanomechanical sensor for beverages with different alcohol concentrations.

[Challenging interdisciplinary research via CRP (see above)]

As already mentioned, the CRP research conducted by MANA targets truly challenging research, which includes both individual and fusion research, and much interdisciplinary research also blends concepts from different fields. As a typical example of the blending of concepts from different fields, we introduce the "development of a decision-making device using ionics." In this study, the findings of atomic switch research were combined with research on hydrogen ion transfer phenomena in Nafion (polymer), which have been build up through work on fuel cells and other applications. Theoretical research that had already been completed was used as a framework for this experimental study.

T. Tsuchiya, T. Tsuruoka, K. Terabe, et al., Ionic decision-maker created as novel, solid-state devices, Science Advances 4, eaau2057 (2018).

An atomic switch displaces the metal ions in an ion conductor to the edge of a material with an electric field. The metal atoms precipitated therein bridge between the opposing electrodes, and the precipitated metal atoms are returned to the ion conductor to cut the bridge. In this study, electric-field control is used

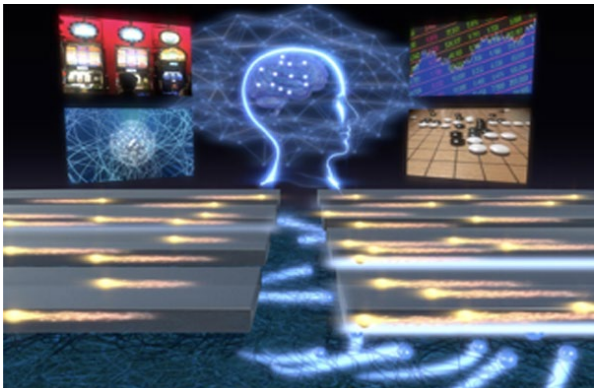


Fig. 5: In an ionics-based decision-maker, the selection of the optimal solution, which is calculated by an AI using a

to control the protons in Nafion, and the ion concentration around a metal electrode in contact with Nafion provides a local variation of resistance in Nafion. In other words, two metal electrodes were placed in Nafion and potentials were repeatedly applied to each electrode with different probabilities. Through this, the probability of a voltage being applied to each electrode is learned as a proton distribution, and the probability of a voltage application is represented by the proton distribution and provide an output as the ratio of electrochemical potential between two electrodes. This can be used as a device to make "safer" decisions based on experience. A computer program can record the history and make decision, but the efficiency of decision-maker developed here was found to be comparable with the computer programs.

[Other: Regular research meetings]
Twice a month (two speakers per session), MANA researchers (without distinguishing between PIs, young researchers, independent researchers, etc.) will speak at a seminar for the entirety of MANA to share and discuss their research within the center. The meetings have been held since 2017, and in general are closed to those outside the center. It is recommended that speakers include an explanation of issues faced and cooperation / support needed on the topics of greatest interest to them. In a center with a total of nearly 200 researchers, because it is very difficult to continually have everyone sharing in each other's research content and interests, this opportunity has given birth to new ways of thinking, new collaborations, and new interdisciplinary ideas, and the center has a system in place to provide consultation and support regarding funding, research environments, and information on research collaborators

4. Maintaining an International Research Environment

- Describe what's been accomplished in the efforts to raise the Center's recognition as a genuine globally visible research institute, along with innovative efforts proactively being taken, including the following points, for example:
  - Efforts being developed to maintain an international research environment based on the analysis of number and state of world-leading, frontline researchers; exchanges with overseas entities
  - Proactive efforts to raise the level of the Center's international recognition
  - Efforts to make the Center into one that attracts excellent researchers from around the world (such as creating of an environment in which researchers can concentrate on their research, providing startup research funding, supporting efforts that will foster young researchers and contribute to advancing their career paths, and arranging support system for the research activities of overseas researchers.)
  - Consolidation of the administrative structures to support implementing the efforts described above
- In Appendix 3-1, describe the state of cooperation with overseas satellites, and list the main international research meetings held by the Center.

MANA maintains a bilingual environment in which all tenured and fixed-term staff are at least proficient in English and Japanese. In addition, the International Center for Young Scientists (ICYS), where ICYS-MANA was transferred to in FY2017, is placing several staff who have worked in MANA's Administrative Office to ensure that there is no difference between MANA and ICYS in terms of the international research environment. The percentage of non-Japanese researchers at MANA fell to 45.0% at the end of FY2016 due to the release of non-Japanese postdocs as the WPI project wrapped up. Since 2017, MANA has used external funding to secure talented non-Japanese postdocs, pushing the percentage back up to 50% by the end of 2018-2019. It is noticed that 23 permanent MANA researchers are also assigned as Professors and Associate Professors through NIMS graduate school system in cooperation with Hokkaido University, University of Tsukuba, Waseda University and Kyushu University. Through this channel, MANA is accepting Ph.D. students in Doctoral Program from all over the world and the students are greatly contributing MANA's research. Therefore, in the above non-Japanese ratio is taking both the numbers of postdocs and Ph.D. students. In terms of postdoctoral researchers and Ph.D. students at MANA alone, the percentage of non-Japanese staff remains high as 82% at the end of FY2019.

Overseas satellites play an important role in raising the overall level of international research and the international character of MANA's activities in general. MANA had five overseas satellites in FY2017 (1 in Finland, 2 in the US, 1 in the UK, and 1 in France). In FY 2018, two more satellites were added in the nanomaterials field: University of Strasbourg and Penn State University (changed to University of Pennsylvania in 2019), further strengthening the international research environment. Outstanding young researchers from these overseas satellites are invited to the annual MANA international symposium to promote bilateral exchange of personnel. Especially Prof. David R. Bowler (MANA satellite PI) at UCL in the UK regularly sending and accepting personnel, Dr. Christian Joachim (MANA satellite PI, CNRS-CEMES,

France) is stationed at MANA 4 times per year (around 2 weeks per visit), and Prof. Francoise Winnik (MANA satellite PI, Finland) is stationed at MANA twice a year (around 3 weeks per visit). Other satellite PIs and affiliated researchers, in addition to visiting MANA when possible, engage in online discussions to regularly exchange research information, personnel information, and specific joint research meetings. All of these activities tremendously contribute to improving the overall level of research at MANA.

In addition to the above, MANA operates a program for inviting overseas researchers to Japan and sending MANA researchers abroad for a period of one week to about one month. This is a flexible program that mainly supports young researchers and takes into account the budget of each individual researcher, adapt to the circumstances of each project. With the support of MANA, the project conducted 9 invitations and 3 dispatches in FY 2017; 6 invitations and 6 dispatches in FY 2018; and 10 invitations and 5 dispatches in FY 2019. It is also important to invite overseas doctoral students to Japan in order to promote mobility among future research personnel. MANA is extensively using NIMS's internship system to achieve an international research environment even at the student level.

5. Making Organizational Reforms and their Ripple Effects

- Describe distinctive effort in managing research operation and administrative organization, such as the strong leadership that the director is giving on the Center's operation, strong performance by the administrative director who provides the center director with strong administrative and managerial support, and division of roles and authority between the Center and its host institution.
- Describe the ripple effects that activities to disseminate experience and know-how accumulated by the Center, such as the followings, have/had on the host institution (or other research institutes, if any):
  - System reforms made through the Center's leading activities to its research operation and administrative organization
  - Experience and know-how accumulated by the Center as it has worked to establish itself as top world-level research institutes.
- Other than the above, give examples, if any, of cooperative activities by the Center and the whole WPI Program or other WPI centers, to disseminate experience and know-how accumulated by the WPI program and/or the WPI centers.

[Decision-making structure]

Dr. Masakazu Aono and Dr. Yoshio Bando, who were Center Director and Chief Operating Officer respectively from MANA's establishment until FY 2016, retired from the Center. In FY 2017, a new structure was launched in which Dr. Takayoshi Sasaki became the Center Director and Dr. Tomonobu Nakayama became the Administrative and Deputy Director. Dr. Aono and Dr. Bando continue to advise MANA as executive advisors to the center. In addition, ICYS-MANA and the MANA's Technical Support Team have been completely brought under NIMS management. In FY 2018, Dr. Yutaka Wakayama was appointed Deputy Director of the center, and a new "TROIKA" structure was established that consisted of the center's Director and two Deputy Directors (one of whom also serves as the Administrative Director).

In consultation with one another, the center's Director and Deputy Directors determine MANA's operational policies, research support programs, the selection of MANA postdoctoral fellows, and other matters. These decisions (with deliberation, if necessary) are communicated directly from the center Director to the PIs, group leaders, and independent researchers through MANA center meetings. This ensures the leadership of Director. Through the center meetings, information and requests from the host institution, NIMS, are also passed down. When implementing various measures and responding to requests from NIMS, the Administrative Director is responsible for coordinating the necessary administrative procedures and implementation and the Center Director checks and approves them. All MANA members can freely discuss their opinions and requests with the Center Director and Deputy Directors, which are further discussed in MANA executive meetings online as needed to reflect in management of the center.

In order to maintain and further develop MANA's world-class level of research activities without hindrance, it is particularly important to develop research-related policies and to provide proper guidance and advice to researchers. MANA began holding Group Hearings in FY 2017 under the leadership of the Center Director with the aim of ensuring proper and smooth implementation of these policies and operations. In the first quarter of each fiscal year, each PI/group leader (or independent researcher) meets individually, in an interview with MANA management for a frank exchange of ideas. These meetings have been very useful in helping the Center Director to understand the actual circumstances of the environment in which research work is done (budget, experimental space, personnel, etc.) and the problems and concerns facing research, as well as in helping the Center Director demonstrate real leadership in response to these issues.

[Spillover effects for the host institution]

---MANA Recognized as a NIMS Research Center---

NIMS made MANA one of the seven permanent research centers that it operates. At that time, the role of MANA was clarified to be to perform basic fundamental research and bottom-up research, and system reforms put in place at MANA (which is also a WPI center) were ready to be easily spread over to NIMS generally.

---Establishment of Administrative Offices at the NIMS Research Centers---

In NIMS's 4th Medium-Long Term Plan that began in April 2016, Administrative Offices were established at each of the seven research centers established by NIMS. After the MANA Administrative Department was proven to not only to the support researchers but also to contribute to the administrative efficiency

of the host institution itself, this initiative was launched with aim of extending the same benefits to other centers. The work performed by the Administrative Office at other centers (MANA continues to have an Administrative Department) varies depending on the center, and although smaller than MANA, the importance of supporting researchers is certainly sinking in.

---Partial Transfer of Administrative Functions and Spillover Effects: Technical Support and ICYS-MANA---

The bilingual Technical Support Team in the Administrative Department and the ICYS-MANA system, which were operated by MANA until FY2016, were completely transferred to the management of NIMS in FY2017. Their functions and characteristics were fully passed along, they serve as a good example of how MANA initiatives have had spillover effects throughout NIMS as a whole. In particular with respect to ICYS, MANA Administrative Director Nakayama is concurrently serving as ICYS Deputy Director, and MANA continues to contribute to ICYS operations. Part of the ICYS administrative office is located in the same room as the MANA administrative office which facilitates the exchange of information.

---Independent Scientist System---

The independent scientist system, which was unique to MANA, also spread throughout NIMS as a whole. NIMS recruits young researchers with a mandatory retirement age, as well as existing young researchers. In particular, a system was established to select talented researchers and making them independent scientists. Through this, the authority that MANA had to independently select independent researchers was transferred to NIMS, but many of the independent researchers certified by NIMS are ultimately assigned to MANA.

-- MANA Short-term Invitation Program for Researchers --

MANA has operated a “Fellowship Program for Young Researchers”, in which up-and-coming young researchers are invited to take up faculty positions overseas to promote collaborative research. Such a program has now been established at NIMS as the “NIMS Global Collaboration Fellowship Program.” This transformed program changed the focus to "groups of researchers" with the aim of the program being a focus on promoting future hubs of collaborative research. NIMS also allows for the invitation of doctoral students to work with the researchers overseas. Using its Fellowship Program for Young Researchers together with this new NIMS system, MANA is implementing a flexible international “brain circulation” framework that allows for freedom in issuing invitations.

-- Crowd funding --

As MANA started crowdfunding, NIMS had no rules for soliciting donations from an unspecified number of members of the public. Centered around the MANA outreach team, the regulations for crowdfunding were developed to allow now all researchers in NIMS to carry out crowdfunding.

[Assistance from the host institution]

While the MANA system is incorporated into the NIMS management system as appropriate, NIMS contributes 100 million yen annually to MANA from its grants for operational expenses (President’s Special Support Budget) as a discretionary expense for the Center Director. In addition, the "Support System for Curiosity-driven Research,” which is unique to NIMS, has been established to support primarily basic fundamental research. Although this is not a system specifically for MANA, it is considered to be effectively a research support measure for MANA, as MANA's mission is to conduct basic fundamental research within NIMS. NIMS has also confirmed that it has been and will continue to provide maximum support for MANA management, even in the form of the continued assignment of 90 permanent staff to MANA to bolster research.

6. Effort to Enhance and Amplify the Visibility and Brand of the Overall WPI Program

- Describe how the Center's outreach activities have contributed to enhancing and amplifying the visibility and brand of the WPI program. Describe the successful cases of the Center's outreach activities in Appendix 4, and enter the number of activities in Appendix 4a.
- Other than the above, describe, if any, the activities and their concrete contents that have contributed to the enhancement and amplification of the visibility and brand of the WPI program (such as holding a large international research meeting, collaborative activities with multiple WPI centers). If you have already provided this information, please indicate where in the report.

Considerable work on cultivating the name recognition and brand power of WPI has been achieved through the efforts of the bodies that implement the WPI Program--the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Japan Society for the Promotion of Science (JSPS)--as well as the 13 WPI Centers that have been selected to date. Moving forward, we must aim to achieve still further improvement. In this respect, MANA is built around "demonstrating world-class research capabilities and achievements," "disseminating and collecting information through of alumni and other relevant parties," “raising awareness among the next generation of leaders," and "clarifying the relationship between these activities and the WPI.”

[Publication of the MANA e-bulletin]

In FY 2017, MANA established a special website to distribute information online in e-bulletin format using

a “press wire distribution service”. This replaced its email newsletter (“Research Highlights”) that had previously been used to showcase particularly noteworthy MANA results. From an outreach perspective, the disadvantages of the email newsletter format were that it was limited to domestic and international subscribers selected by MANA and that it was not possible to track who viewed what content. By contrast, using a press wire distribution service meant that information was posted to a large number of news sites, significantly expanding the reach of MANA's output. Using this method, viewers accessed information specifically for the purpose of reading it, and thus the service's role as a promulgator of MANA's output was that it accurately conveyed information to the most interested parties. This has also been highly beneficial to the brand penetration of the WPI brand.

[Hosting international symposia and workshops]

Since FY 2013, the MANA International Symposium has been recognized as a top international conference attended by many of the world’s best researchers, seeing over 300 participants each time. Since FY 2017, the conference has been shortened to just two days in length but it remains successful with over 300 participants. Due to the global spread of COVID-19, the 13th MANA International Symposium held in March 2020 canceled the symposium's on-site meeting and took the special measure of distributing summaries of the abstract book of all the presentations among registered attendees in lieu of the actual conference. This was a true shame because MANA had planned to try some new things for the first time, such as awarding the best poster awards offered by companies and academic associations. In addition to the above, MANA also strives, as a WPI Center, to enhance its presence in the research community by holding topical workshops and giving support for academic association-sponsored lectures with the aim of disseminating, propagating, and further developing MANA's research output.

[MANA Alumni]

The MANA/ICYS Alumni network is prepared as for researchers enrolled in MANA and ICYS (International Center for Young Scientists). The aim is to develop a MANA/ICYS Alumni network around the world to promote exchange among alumni and between alumni and MANA researchers. In FY2017-2019, we established channels by which people can exchange information on social networking sites (Twitter, Facebook, and Instagram). Twelve and a half years after its launch, some alumni are in science- and technology-related leadership positions at research institutions overseas. Utilizing the Alumni Network, which can be considered a major asset of a WPI Center, is the key to increasing WPI's name recognition, enhancing the brand, and revitalizing international “brain circulation”.

[Science education activities]

MANA recognizes that activities aimed at gaining the support of the general public for the promotion of science and technology in Japan, and at raising interest in science among young people who will be the leaders of the future, is one of the key responsibilities of the WPI, which is engaged in promoting world-class research. To that end, MANA has been stepping up our efforts to properly “visualize” the MANA’s outcomes 2017. Specifically, MANA searches centers for research results of the sort that can be experienced by participants at science events and school visits. These results are utilized at venues open to the public, such as through crowdfunding. For example, “visualization" of original MANA achievements such as the Smart Polymer Rangers activity and water boiling at room temperature (using the photothermal conversion by nanoparticles) have contributed tremendously to the rapid growth visitors to NIMS open-facility days in recent years (it has ranked first in the Tsukuba area for three years in a row, surpassing JAXA in attendance), and have also helped raise the profile of WPI Centers.

[Use of WPI designation]

MANA has made every effort to include WPI-MANA in the affiliation information of MANA researchers in research papers and other publications that are encountered by researchers around the world. In addition, every effort is made to ensure that the WPI abbreviation and logo are visible to the public as much as possible in the course of the following various activities.

7. Effort to Secure the Center’s Future Development over the Mid- to Long-term

・Address each of the following items that have been done to secure mid- to long-term center development:
- Contents of the measures taken by the host institution to support maintaining the activities of the Center (such as securing financial and personnel resources, coordination among host institution to bring together in-house researchers, in-kind provision and/or facilities afforded in terms of usage of building, lab space and other equipment, new management reform carried out after the funding period ends).
- Actions and measures taken to sustain the Center as a world premier international research center.

NIMS has clearly positioned MANA as a research center devoted to basic and fundamental research, and research predicted to have promising applications has been transferred from MANA to other centers in NIMS to continue that work. This will necessarily serve to rejuvenate MANA such that it will function as an important seed-generating platform for other research centers in NIMS. In other words, policies have been adopted that incorporate the mid- to long-term development of MANA into the mid- to long-term development of NIMS. The various resources necessary for this are being provided in the same manner as NIMS is providing resources to other centers. In NIMS, there are only two buildings in which the name of the research center is used as the same of the building: the WPI-MANA Building and the MANA Building.

The above are measures to clarify the significance of MANA's presence in NIMS and to support its maintenance and development within NIMS. In addition to this, special measures have been provided by NIMS to help MANA develops as a world-class research center in the medium to long term. Specifically, the following measures are extremely important as support for the world's top-level research center: a ¥100 million/year grant for operational expenses (President's Special Support) that can be used at the discretion of the Center Director, preferential assignment of new tenured researchers and young independent researchers to MANA, and the assignment of about 100 tenured staff to MANA, which is nearly a quarter of the approximately 400 NIMS tenured researchers.

8. Others

・Describe the Center's efforts over the past 3 years in making it a place that expands and accelerates the international circulation of the world's best brains. Give about 5 example of their success cases and describe their concrete contents and effect in narrative.
・In addition to the above1-7, note any of the Center's notable efforts and activities.

[Establishment of the MANA Postdoctoral Fellowship Program]

The numerous postdoctoral researchers employed using grant money during the WPI program were an important element supporting MANA's research activities in terms of both quality and quantity, in addition to this being one of the ways that international "brain circulation" was promoted. After joining the WPI Academy, the MANA Postdoctoral Fellowship Program was created to recruit around five outstanding postdoctoral fellows each year for a term that is a maximum of two years in length. These MANA postdoctoral fellows have been a major force in MANA research and sending them out on a regular basis, both nationally and internationally, has furthermore helped to promote international "brain circulation".

[Acquiring ICYS-WPI-MANA researchers]

Within the ICYS project, which transferred ISCY-MANA operations to NIMS, WPI-sponsored ICYS-WPI-MANA researchers were acquired to pave the way for the ICYS network to become part of the MANA network, which continues to expand its alumni around the world just as MANA does. The personnel and research costs of ICYS-WPI-MANA researchers are covered by MANA. However, to maintain fairness, the selection process and criteria are exactly the same as for ICYS researchers in general. To date, two ICYS-WPI-MANA researchers have been hired, and the plan is to continue using this system on into the future.

[Strengthening MANA's overseas satellites and hosting PI meetings]

In 2018, MANA welcomed Prof. Gero Decher from the Strasbourg University in France and Prof. Thomas E. Mallouk from Penn State University in the USA as new satellite PIs. In 2019, Prof. E. Mallouk moved to University of Pennsylvania. The research departments at which both professors work were made MANA satellites. Both individuals are prominent scientists who are world leaders in their fields and are a major force of not only raising the quality level of research at MANA, but also of promoting international "brain circulation". Specifically, exchanges of ideas and joint research meetings have begun between MANA researchers and young researchers in the Prof. Decher group, and we hope we are able to increase mobility among research personnel. (Currently suspended due to the COVID-19 pandemic.) In the past, MANA has encouraged information-sharing among PIs and other MANA researchers through center meetings and research meetings, and a PI meeting was held in conjunction with the FY 2018 MANA International Symposium. It was unfortunately necessary to cancel the FY 2019 symposium, but satellite PIs do attend PI meetings to share information on research trends and research collaboration. MANA will take the lead in promoting "brain circulation" among overseas satellite PIs. Through this, MANA aims to make more effective use of its research personnel network and overseas satellites.

[Invitations and dispatches]

Personnel invitations and dispatches were carried out to provide support for collaborative work between MANA researchers and researchers with high levels of overseas activity. Almost the exact same type of initiatives was introduced in the WPI program era, but the Grant-in-Aid for MoU-based Collaboration program was launched as a new type of personnel dispatch/invitation framework beginning in FY 2018. Its aim is to develop the international collaboration framework based on MoUs, which may result in mere temporary cooperation, into a more continual and genuine joint research framework. These initiatives first bore fruit when the University of Sydney and MANA, which have a history of information and personnel exchange based on an MoU, agreed to sign a joint research agreement (the signing of the agreement has been delayed to FY 2020 due to the COVID-19 pandemic).

[Hosting international symposia and workshops]

As already explained in "6. Activities to improve name recognition and maintain / improve the WPI brand," it is intrinsically important that MANA continue to boost international "brain circulation" in respective topical fields. Beginning with exchanges between participants in symposia and workshops, such interchanges between researchers became an essential part of business, and MANA promote the acceleration and expansion of international "brain circulation" through the signing of MoUs, invitations, dispatches, and other such support.

Appendix 1 List of Center's Major Research Achievements

1. List of Major Refereed Papers

*List **up to 20 papers** representative of the Center's research activities during the period between FY 2017 and FY 2019, and give brief descriptions (within 5 to 10 lines) of them.
*For each, write the author name(s); year of publication; journal name, volume, page(s), and article title. Any listing order may be used as long as format is the same. If a paper has many authors, underline those affiliated with the Center.
*If a paper has many authors (say, more than 10), all of their names do not need to be listed.

Note: Authors with MANA affiliation are underlined.

1. (Highly Cited Paper; 316 Times Cited, Web of Science)
R.R. Salunkhe, Y.V. Kaneti, Y. Yamauchi, *Metal-Organic Framework-Derived Nanoporous Metal Oxides toward Supercapacitor Applications: Progress and Prospects*, ACS Nano **11**(6), 5293 (2017). doi: 10.1021/acsnano.7b02796
Brief Description: Transition metal oxides (TMOs) have attracted significant attention for energy storage applications such as supercapacitors due to their good electrical conductivity, high electrochemical response (by providing Faradaic reactions), low manufacturing costs, and easy processability. Despite exhibiting these attractive characteristics, the practical applications of TMOs for super capacitors are still relatively limited. In this review, we will summarize the recent developments in the field of MOF-derived porous metal oxide nanostructures and nanocomposites for supercapacitor applications. Furthermore, the current challenges along with the future trends and prospects in the application of these materials for supercapacitors will also be discussed.

2. (Highly Cited Paper; 313 Times Cited, Web of Science)
Y.V. Kaneti, J. Tang, R.R. Salunkhe, X.C. Jiang, A.B. Yu, K.C.W. Wu, Y. Yamauchi, *Nanoarchitectured Design of Porous Materials and Nanocomposites from Metal-Organic Frameworks*, Advanced Materials **29**(12), 1604898 (2017). doi: 10.1002/adma.201604898
Brief Description: Metal-organic framework (MOF)-derived nanostructures have attracted significant attention for a wide range of applications due to their tunable composition, structure and pore size. The recent developments, challenges and future directions in the fabrication of MOF-derived nanomaterials such as porous carbons, metal oxides, metal chalcogenides, metal carbides, metal phosphides and their composites are comprehensively reviewed.

3. (Highly Cited Paper; 256 Times Cited, Web of Science)
A.H. Khan, S. Ghosh, B. Pradhan, A. Dalui, L.K. Shrestha, S. Acharya, K. Ariga, *Two-Dimensional (2D) Nanomaterials towards Electrochemical Nanoarchitectonics in Energy-Related Applications*, Bulletin of the Chemical Society of Japan **90**(6), 627 (2017).
doi: 10.1246/bcsj.20170043
Brief Description: Designing nanoscale components and units into functional defined systems and materials has recently received attention as a nanoarchitectonics approach. In particular, exploration of nanoarchitectonics in two-dimensions (2D) has made great progress these days. Basically, 2D nanomaterials are a center of interest owing to the large surface areas suitable for a variety of surface active applications. Because of the unique structures and multifunctionalities, 2D nanomaterials have stimulated great interest in the field of energy conversion and storage. This review highlights recent progress in the synthesis of a variety of 2D nanomaterials and their applications in energy conversion and storage.

4. (Highly Cited Paper; 200 Times Cited, Web of Science)
M. Komiyama, K. Yoshimoto, M. Sisido, K. Ariga, *Chemistry Can Make Strict and Fuzzy Controls for Bio-Systems: DNA Nanoarchitectonics and Cell-Macromolecular Nanoarchitectonics*, Bulletin of the Chemical Society of Japan 90(9), 967 (2017). doi: 10.1246/bcsj.20170156
Brief Description: In this review, we introduce two kinds of bio-related nanoarchitectonics, DNA nanoarchitectonics and cell-macromolecular nanoarchitectonics, both of which are basically

controlled by chemical strategies. The former DNA-based approach would represent the precise nature of the nanoarchitectonics based on the strict or "digital" molecular recognition between nucleic bases. This part includes functionalization of single DNAs by chemical means, modification of the main-chain or side-chain bases to achieve stronger DNA binding, DNA aptamers and DNAzymes.In contrast to the digital molecular recognition between nucleic bases, cell membrane assemblies and their interaction with macromolecules are achieved through rather generic and "analog" interactions such as hydrophobic effects and electrostatic forces.

5. (Highly Cited Paper; 165 Times Cited, Web of Science)
M. Khazaei, A. Ranjbar, M. Arai, T. Sasaki, S. Yunoki, *Electronic properties and applications of MXenes: a theoretical review*, Journal of Materials Chemistry C **5**(10), 2488 (2017).
doi: 10.1039/c7tc00140a
Brief Description: The recent chemical exfoliation of layered MAX phase compounds to novel two-dimensional transition metal carbides and nitrides, the so-called MXenes, has brought a new opportunity to materials science and technology. This review highlights the computational attempts that have been made to understand the physics and chemistry of this very promising family of advanced two-dimensional materials, and to exploit their novel and exceptional properties for electronic and energy harvesting applications.

6. (Highly Cited Paper; 111 Times Cited, Web of Science)
L.Q. Yang, J.F. Huang, L. Shi, L.Y. Cao, Q. Yu, Y.N. Jie, J. Frei, H.B. Ouyang, J.H. Ye, *A surface modification resultant thermally oxidized porous g-C3N4 with enhanced photocatalytic hydrogen production*, Applied Catalysis B **204**, 335 (2017). doi: 10.1016/j.apcatb.2016.11.047
Brief Description: Thermally oxidized porous g-C3N4 was obtained by a facile oxidation approach and 1430.1 mu mol g(-1) h(-1) average photocatalytic hydrogen evolution is achieved in 8 h under visible-light irradiation, which was 4.3 times as high as that of the pristine sample (334.3 mu mol g(-1) h(-1)). It is found that this modified g-C3N4 presented both porous structure and intrinsic electronic/band structure modulation, resulting in larger specific surface area with more surface reaction sites, extended light absorption range for more effective visible-light utilization, up-shifted conduction band for stronger reducibility and more effective separation of photogenerated charge carriers, which are beneficial for improving photocatalytic hydrogen evolution activity.

7. (Paper with high Journal Impact Factor; IF2017: 51.941, Web of Science)
G. Rapenne, C. Joachim, *The first nanocar race*, Nature Reviews Materials **2**, 17040 (2017). doi: 10.1038/natrevmats.2017.40
Brief Description: The first race involving molecular 'cars' stimulated technical advances in scanning tunnelling microscopy and provided insights in surface science and synthetic chemistry it also attracted wide interest from the public. Four years ago, we proposed a nanocar race; that is, a race involving several molecular ‘vehicles’ individually driven at the same time and on the same surface by different 'pilots' using scanning tunnelling microscopes (STMs). A lesson that can be learned from the race is that the efficient design of nanocars cannot rely only on the intuition of synthetic chemists trying to design their nanocar like an ultimate miniature version of a macroscopic car. Another important take-away message is that small molecules are easier to pilot on the surface than large ones.

8. (Highly Cited Paper; 234 Times Cited, Web of Science; Hot Paper)
H.B. Zhang, G.G. Liu, L. Shi, J.H. Ye, *Single-Atom Catalysts: Emerging Multifunctional Materials in Heterogeneous Catalysis*, Advanced Energy Materials **8**(1), 1701343 (2018).
doi: 10.1002/aenm.201701343
Brief Description: Supported metal nanoparticles are the most widely investigated heterogeneous catalysts in catalysis community. The size of metal nanostructures is an important parameter in influencing the activity of constructed catalysts. Single-atom catalysts (SACs), containing single

metal atoms anchored on supports, represent the utmost utilization of metallic catalysts and thus maximize the usage efficiency of metal atom. With uniform single-atom dispersion and well-defined configuration, SACs afford great space for optimizing high selectivity and activity. In this review, a detailed discussion of preparing, characterizing, and catalytically testing within this family is provided, including the theoretical understanding of key aspects of SACs materials. The main advantages of SACs as catalysts and the challenges faced for further improving catalytic performance are also highlighted.

9. (Highly Cited Paper; 141 Times Cited, Web of Science)
C. Young, J. Wang, J. Kim, Y. Sugahara, J. Henzie, Y. Yamauchi, *Controlled Chemical Vapor Deposition for Synthesis of Nanowire Arrays of Metal-Organic Frameworks and Their Thermal Conversion to Carbon/Metal Oxide Hybrid Materials*, Chemistry of Materials **30**(10), 3379 (2018). doi: 10.1021/acs.chemmater.8b00836
Brief Description: Metal-organic frameworks (MOFs) can serve as high-surface-area templates to generate hierarchically ordered nanoporous carbon electrodes for high-performance supercapacitor devices. Here we describe a simple chemical approach to synthesize dense three-dimensional (3D) arrays of core-shell ZnO@ZIF-8 and Co(CO3)(0.5)(OH)center dot 0.11H(2)O@ZIF-67 nanowires on a conductive carbon cloth. The Co3O4/NC hybrid electrodes had good performance and exhibited a high areal capacitance of 1.22 F.cm(-2) at 0.5 mA.cm(-2). Conformal deposition of MOFs via the chemical vapor method offers a promising new platform to design conductive, ultrahigh surface area electrodes that preserve the 3D morphology for applications in supercapacitors and electrocatalysis.

10. (Highly Cited Paper; 97 Times Cited, Web of Science)
M. Komiyama, T. Mori, K. Ariga, *Molecular Imprinting: Materials Nanoarchitectonics with Molecular Information*, Bulletin of the Chemical Society of Japan **91**(7), 1075 (2018).
doi: 10.1246/bcsj.20180084
Brief Description: Combining nanotechnology with other science disciplines is necessary to produce various materials with nanoscale structural and functional information, which is nanoarchitectonics, a novel paradigm to create useful materials. One of the basic ideas in nanoarchitectonics is use of molecular-level information to structurally design functional materials. This strategy is indeed used in some existing science fields and technical realms. For example, molecular imprinting techniques provide functional materials possessing molecular information inside fabricated materials. Revisiting this idea with the nanoarchitectonics concept would have great meaning toward unification of individual research disciplines into one key approach. In this review, we survey fundamentals and recent trends in molecular imprinting in consideration of nanoarchitectonics.

11. (Highly Cited Paper; 86 Times Cited, Web of Science)
L. Shi, L.Q. Yang, W. Zhou, Y.Y. Liu, L.S. Yin, X. Hai, H. Song, J.H. Ye, *Photoassisted Construction of Holey Defective g-C3N4 Photocatalysts for Efficient Visible-Light-Driven H2O2 Production*, Small **14**(9), 1703142 (2018). doi: 10.1002/smll.201703142
Brief Description: Holey defective g-C3N4 photocatalysts, which are easily prepared via a novel photoassisted heating process, are reported. The photoassisted treatment introduces nitrogen vacancies in the tri-s-triazine repeating units of g-C3N4, inducing the narrowing of intrinsic bandgap and the formation of defect states within bandgap to extend the visible-light absorption range and suppress the radiative electron-hole recombination. As a result, the holey defective g-C3N4 photocatalysts show much higher photocatalytic activity for H2O2 production with optimized enhancement up to ten times higher than pristine bulk g-C3N4. The newly developed synthetic strategy adopted here enables the sufficient utilization of solar energy and shows rather promising for the modification of other materials for efficient energy-related applications.

12. (Highly Cited Paper; 47 Times Cited, Web of Science)

S. Kawai, S. Nakatsuka, T. Hatakeyama, R. Pawlak, T. Meier, J. Tracey, E. Meyer, A.S. Foster, *Multiple heteroatom substitution to graphene nanoribbon*, Science Advances **4**(4), eaar7181 (2018). doi: 10.1126/sciadv.aar7181
Brief Description: Substituting heteroatoms into nanostructured graphene elements, such as graphene nanoribbons, offers the possibility for atomic engineering of electronic properties. To characterize these substitutions, functionalized atomic force microscopy (AFM)-a tool to directly resolve chemical structures-is one of the most promising tools, yet the chemical analysis of heteroatoms has been rarely performed. We synthesized multiple heteroatom-substituted graphene nanoribbons and showed that AFM can directly resolve elemental differences and can be correlated to the van der Waals radii, as well as the modulated local electron density caused by the substitution. This elemental-sensitive measurement takes an important step in the analysis of functionalized two-dimensional carbon materials.

13. (Paper with high Journal Impact Factor; IF2018: 38.887, Web of Science)
S.S. Li, Y.C. Lin, W. Zhao, J. Wu, Z. Wang, Z.H. Hu, Y.D. Shen, D.M. Tang, J.Y. Wang, Q. Zhang, H. Zhu, L.Q. Chum W.J. Zhao, C. Liu, Z.P. Sun, T. Taniguchi, M. Osada, W. Chen, Q.H. Xu, A.T.S. Wee, K. Suenaga, F. Ding, G. Eda, *Vapour-liquid-solid growth of monolayer MoS2 nanoribbons*, Nature Materials **17**(6), 535 (2018). doi: 10.1038/s41563-018-0055-z
Brief Description: Chemical vapour deposition of two-dimensional materials typically involves the conversion of vapour precursors to solid products in a vapour-solid-solid mode. Here, we report the vapour-liquid-solid growth of monolayer MoS2, yielding highly crystalline ribbons with a width of few tens to thousands of nanometres. This vapour-liquid-solid growth is triggered by the reaction between MoO3 and NaCl, which results in the formation of molten Na-Mo-O droplets. These droplets mediate the growth of MoS2 ribbons in the 'crawling mode' when saturated with sulfur. Our findings highlight the prospects for the controlled growth of atomically thin nano-structure arrays for nanoelectronic devices and the development of unique mixed-dimensional structures.

14. (Highly Cited Paper; 74 Times Cited, Web of Science; Hot Paper)
Y.N. Guo, T. Park, J.W. Yi, J. Henzie, J. Kim, Z.L. Wang, B. Jiang, Y. Bando, Y. Sugahara, J. Tang, Y. Yamauchi, *Nanoarchitectonics for Transition-Metal-Sulfide-Based Electrocatalysts for Water Splitting*, Advanced Materials **31**(17), 1807134 (2019). doi: 10.1002/adma.201807134
Brief Description: Heterogenous electrocatalysts based on transition metal sulfides (TMS) are being actively explored in renewable energy research because nanostructured forms support high intrinsic activities for both the hydrogen evolution reaction (HER) and oxygen evolution reaction (OER). Herein, it is described how researchers are working to improve the performance of TMS-based materials by manipulating their internal and external nanoarchitectures. The current challenges and future opportunities of TMS materials in the context of water splitting are summarized. The aim herein is to provide insights gathered in the process of studying TMS, and describe valuable guidelines for engineering other kinds of nanomaterial catalysts for energy conversion and storage technologies.

15. (Highly Cited Paper; 53 Times Cited, Web of Science)
Z.X. Cai, Z.L. Wang, J. Kim, Y. Yamauchi, *Hollow Functional Materials Derived from Metal–Organic Frameworks: Synthetic Strategies, Conversion Mechanisms, and Electrochemical Applications*, Advanced Materials **31**(11), 1804903 (2019). doi: 10.1002/adma.201804903
Brief Description: Hollow materials derived from metal-organic frameworks (MOFs), by virtue of their controllable configuration, composition, porosity, and specific surface area, have shown fascinating physicochemical properties and widespread applications, especially in electrochemical energy storage and conversion. Here, the recent advances in the controllable synthesis are discussed, mainly focusing on the conversion mechanisms from MOFs to hollow-structured materials. By analyzing and discussing 14 types of reaction processes in detail, a systematic mechanism of conversion from MOFs to hollow-structured materials is exhibited. The applications

of these hollow structures as electrode materials for lithium-ion batteries, hybrid supercapacitors, and electrocatalysis are presented.

16. (Highly Cited Paper; 52 Times Cited, Web of Science)
K. Ariga, M. Nishikawa, T. Mori, J. Takeya, L.K. Shrestha, J.P. Hill, *Self-assembly as a key player for materials nanoarchitectonics*, Science and Technology of Advanced Materials **20**(1), 51 (2019). doi: 10.1080/14686996.2018.1553108
Brief Description: The development of science and technology of advanced materials using nanoscale units can be conducted by a novel concept involving combination of nanotechnology methodology with various research disciplines, especially supramolecular chemistry. The novel concept is called 'nanoarchitectonics' where self-assembly processes are crucial in many cases involving a wide range of component materials. This review of self-assembly processes re-examines recent progress in materials nanoarchitectonics.

17. (Highly Cited Paper; 34 Times Cited, Web of Science)
N. Tsujii, A. Nishide, J. Hayakawa, T. Mori, *Observation of enhanced thermopower due to spin fluctuation in weak itinerant ferromagnet*, Science Advances **5**(2), eaat5935 (2019).
doi: 10.1126/sciadv.aat5935
Brief Description: Increasing demand for higher energy efficiency calls for waste heat recovery technology. Thus, facilitating practical thermoelectric generation systems is strongly desired. One option is enhancing the thermoelectric power factor, S-2/r, where S is the Seebeck coefficient and r is the electrical resistivity, although it is still challenging because of the trade-off between S and r. We demonstrate that enhanced S-2/r can be achieved by incorporating magnetic interaction in ferromagnetic metals via the spin fluctuation arising from itinerant electrons. A pronounced enhancement around T-C was observed in electron-doped Heusler alloys, with a 20% improvement in the power factor from the case where spin fluctuation is suppressed by applying magnetic field. This result supports the merit of using spin fluctuation to further enhance thermoelectric properties.

18. (Paper with high Journal Impact Factor; IF2018: 43.070, Web of Science)
B. Hinterleitner, I. Knapp, M. Poneder, Y. Shi, H. Müller, G. Eguchi, C. Eisenmenger-Sittner, M. Stöger-Pollach, Y. Kakefuda, N. Kawamoto, Q. Guo, T. Baba, T. Mori, S. Ullah, X.Q. Chen, E. Bauer, *Thermoelectric performance of a metastable thin-film Heusler alloy*, Nature **576**, 85 (2019). doi: 10.1038/s41586-019-1751-9
Brief Description: Thermoelectric materials transform a thermal gradient into electricity. The efficiency of this process relies on three material-dependent parameters:the Seebeck coefficient, the electrical resistivity and the thermal conductivity, summarized in the thermoelectric figure of merit. A large figure of merit is beneficial for potential applications such as thermoelectric generators. Here we report the thermal and electronic properties of thin-film Heusler alloys based on Fe2V0.8W0.2Al prepared by magnetron sputtering. Density functional theory calculations suggest that the thin films are metastable states, and measurements of the power factor-the ratio of the Seebeck coefficient squared divided by the electrical resistivity-suggest a high intrinsic figure of merit for these thin films.

19. (Paper with high Journal Impact Factor; IF2018: 41.037, Web of Science; Highly Cited Paper)
Y.B. Yang, X.D. Yang, L. Liang, Y.Y. Gao, H.Y. Cheng, X.M. Li, M.C. Zou, A.Y. Cao, R.Z. Ma, Q. Yuan, X.F. Duan, *Large-area graphene-nanomesh/carbon-nanotube hybrid membranes for ionic and molecular nanofiltration*, Science **364**(6445), 1057 (2019).
doi: 10.1126/science.aau5321
Brief Description: Nanoporous two-dimensional materials are attractive for ionic and molecular nanofiltration but limited by insufficient mechanical strength over large areas. We report a large-area graphene-nanomesh/single-walled carbon nanotube (GNM/SWNT) hybrid membrane with excellent mechanical strength while fully capturing the merit of atomically thin membranes. The

monolayer GNM features high-density, subnanometer pores for efficient transport of water molecules while blocking solute ions or molecules to enable size-selective separation. The SWNT network physically separates the GNM into microsized islands and acts as the microscopic framework to support the GNM, thus ensuring the structural integrity of the atomically thin GNM. The resulting GNM/SWNT membranes show high water permeance and a high rejection ratio for salt ions or organic molecules.

20. (Paper with high Journal Impact Factor; IF2018: 38.887, Web of Science; Highly Cited Paper)
Y.Q. Li, M. Buerkle, G.F. Li, A. Rostamian, H. Wang, Z.X. Wang, D.R. Bowler, T. Miyazaki, L.M. Xiang, Y. Asai, G. Zhou, N.J. Tao, Gate controlling of quantum interference and direct observation of anti-resonances in single molecule charge transport, Nature Materials **18**(4), 357 (2019). doi: 10.1038/s41563-018-0280-5
Brief Description: Quantum interference can profoundly affect charge transport in single molecules, but experiments can usually measure only the conductance at the Fermi energy. Because, in general, the most pronounced features of the quantum interference are not located at the Fermi energy, it is highly desirable to probe charge transport in a broader energy range. Here, by means of electrochemical gating, we measure the conductance and map the transmission functions of single molecules at and around the Fermi energy, and study signatures associated with constructive and destructive interference. By tuning the molecule in and out of anti-resonance, we achieve continuous control of the conductance over two orders of magnitude with a subthreshold swing of similar to 17 mV dec(-1), features relevant to high-speed and low-power electronics.

2. Major Invited Lectures, Plenary Addresses (etc.)

*List up to 10 main presentations made between FY 2017 and FY 2019 in order from most recent.
*For each, write the date(s), lecturer/presenter's name, presentation title and conference name.

Date(s)	Lecturer/Presenter's name	Presentation title	Conference name
2019 October 8-11	Christian Joachim (MANA Satellite PI)	Nanocar Race I & II: Single Molecule Mechanics	NanoNet International Conference 2019 (IHRS NanoNet), Dresden, Germany
2019 August 25-27	Katsuhiko Ariga (MANA PI)	Langmuir science teaches everything: molecular machine operation, nanocarbon synthesis & life regulation at liquid interfaces	2019 Fall ACS Meeting, San Diego, USA
2019 July 11-17	Tsuyoshi Miyazaki (MANA PI)	Linear-scaling DFT simulations of complex nano-structured materials using the CONQUEST code	10th Triennial Congress of the International Society for Theoretical Chemical Physics (ISTCP 2019), Tromsø, Norway
2019 July 8-11	Kazuya Terabe (MANA PI)	Ionic Nanoarchitectonics for Creating Innovative Devices	International Conference on Memristive Materials, Devices & Systems (MEMRISYS 2019), Dresden, Germany
2019 May 24-25	Tomonobu Nakayama (MANA Deputy Director)	Keynote Lecture: Emergent dynamics of neuromorphic nanowire networks: Materials that think	2019 International Symposium of Taiwan Consortium of Emergent Crystalline Materials, RSL Cold and Hot Springs Resort Suao, Taiwan
2018 September 9-14	Dmitri Golberg (MANA PI)	Keynote Lecture: In situ TEM for inorganic nanomaterial property analysis	19th International Microscopy Congress (IMC19), Sydney, Australia

2018 July 1-5	Takao Mori (MANA PI)	Plenary Lecture: Utilization of Magnetism and Other Novel Principles for Thermoelectric Enhancement and Recent Activities in Asia	37th Annual International Conference on Thermoelectrics (ICT2018) & 16th European Conference on Thermoelectrics (ECT2018), Caen, France
2017 October 23-26	Francoise M. Winnik (MANA Satellite PI)	Keynote Lecture: Colloids and Interface Science: Tradition and Prospectives	67th Canadian Chemical Engineering Society Conference, Edmonton, Alberta, Canada
2017 August 6-10	Xiao Hu (MANA PI)	Keynote Lecture: Topology Emerging from Photonic Graphene	Symposium on Active Photonic Materials IX, organized by The international society for optics and photonics (SPIE), San Diego, USA
2017 May 22-26	Takayoshi Sasaki (MANA Director)	Lattice Engineering with Molecularly Thin 2D Oxide Nanosheets	European Material Research Symposium (E-MRS) Strasbourg, France

3. Major Awards

*List main awards received between FY 2017 and FY 2019 in order from the most recent.
*For each, write the date issued, recipient's name and the name of award. In case of multiple recipients, underline those affiliated with the Center.

Date	Recipient's name	Name of award
2020 March	Masakazu Aono (MANA Executive Advisor, Former MANA Director)	JSAP Outstanding Achievement Award 2019 (issued by The Japan Society of Applied Physics)
2019 October	Zhong Lin Wang (MANA Satellite PI)	Albert Einstein World Award of Science 2019 (issued by the World Cultural Council)
2019 September	Tomonobu Nakayama (MANA Deputy Director)	JSAP Fellow 2019 (issued by the Japan Society for Applied Physics)
2019 August	Katsuhiko Ariga (MANA PI)	40th Langmuir Lectureship Award 2019 (issued by Langmuir, ACS Publications)
2019 January	Genki Yoshikawa (MANA Group Leader)	Seiyama Prize 2019 (issued by the Japan Association of Chemical Sensors)
2018 April	Mitsuhiro Ebara (MANA Group Leader), Genki Yoshikawa (MANA Group Leader), Kota Shiba (Senior Researcher, MANA), Gaku Imamura (MANA Independent Scientist)	Prize for Science and Technology (issued by MEXT)
2017 September	Kazuya Terabe (MANA PI), Masakazu Aono (MANA Executive Advisor)	Tsukuba Prize 2017 (issued by the Science and Technology Promotion Foundation of Ibaraki)
2017 September	Yutaka Wakayama (MANA Group Leader)	The 39th JSAP Outstanding Paper Award 2017 (issued by the Japan Society for Applied Physics)
2017 September	Toyohiro Chikyow (MANA PI)	JSAP Fellow 2017 (issued by the Japan Society for Applied Physics)
2017 August	Liwen Sang (MANA Independent Scientist)	Corbett Prize 2017 (issued at the 29th International Conference on Defects in Semiconductors)

Appendix 2 FY 2019 List of Principal Investigators

NOTE:

*Underline names of principal investigators who belong to an overseas research institution.

*Indicate newly added researchers in FY 2019 (2019.4.1-2020.3.31) in the “Notes” column.

<Principal Investigators at the end of FY 2019> **Principal Investigators Total: 23**

Name	Age	Affiliation (Position title, department, organization)	Academic degree, Specialty	Effort (%)*	Starting date of participation	Status of participation (Describe in concrete terms)	Note
Director Takayoshi Sasaki	64	Director, International Center for Materials Nanoarchitectonics (MANA), National Institute for Materials Science (NIMS)	Ph.D. in Science, The University of Tokyo, 1985, Nanosheet and Soft Chemistry	100	10/1/2007	usually stays at the center	
Deputy Director/ Administrative Director Tomonobu Nakayama	58	Deputy Director/Administrative Director, International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D. in Physics, The University of Tokyo, 1999, Scanning Probe Microscopy	100	10/1/2008	usually stays at the center	
Yusuke Yamauchi	39	Professor, Australian Institute for Bioengineering and Nanotechnology (AIBN), The University of Queensland	Ph.D. in Engineering, Waseda University, 2007, Inorganic Synthetic Chemistry, Inorganic Materials Chemistry	20	Independent Scientist: 10/1/2007 PI: 4/1/2016	stays at the center several times a year, usually stays at UQ (Cross-appointed with UQ / MANA)	
Dmitri Golberg	59	Professor, Science and Engineering Faculty, School of Chemistry & Physics, Queensland University of Technology	Ph.D. Moscow Institute for Ferrous Metallurgy, 1990, Nanotubes and nanowires	20	10/1/2007	stays at the center several times a year, usually stays at QUT (Cross-appointed with QUT / MANA)	
Katsuhiko Ariga	57	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D., Tokyo Inst. Tech., 1990, Supramolecular Chemistry and Surface Science	80	10/1/2007	stays at the center (Cross-appointed with The University of Tokyo / MANA)	
Junichi Takeya	53	Professor, Department of Advanced Materials Science, Graduate School of Frontier Sciences, The University of Tokyo	Ph.D. in Physics, The University of Tokyo, 2001, Organic semiconductors	20	4/1/2017	usually stays at The University of Tokyo, stays at the center several days a month (Cross-appointed with MANA / The University of Tokyo)	
Takao Mori	53	Research Center for Functional Materials, National Institute for Materials Science (NIMS)	Ph.D. in Science, The University of Tokyo, 1996, Materials Science, Solid State Chemistry & Physics	40	MANA Scientist: 10/1/2008 PI: 4/1/2016	stays at the center	
Naoki Fukata	49	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D. in Engineering, University of Tsukuba, 1998, Semiconductor physics and engineering	100	Independent Scientist: 10/1/2007 PI: 4/1/2018	usually stays at the center	
Jinhua Ye	57	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D., The University of Tokyo, 1990, Photocatalyst, Eco-materials	100	10/1/2007	usually stays at the center	
Kazuya Terabe	57	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D. in Materials Science, Nagoya Institute of Technology, 1992, Nanoionics, Solid State Electrochemistry and Nanoferroelectronics	100	MANA Scientist: 10/1/2008 PI: 4/1/2016	usually stays at the center	
Kazuhito Tsukagoshi	52	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D., Osaka University, 1995, Nano Electronics	100	1/1/2009	usually stays at the center	
Xiao Hu	58	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D. in Physics, The University of Tokyo, 1990, Condensed Matter Physics	100	10/1/2007	usually stays at the center	
Yoshihiko Takano	54	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D., Yokohama City University, 1995, Superconducting Materials, Nanomaterials, Physics	100	4/1/2016	usually stays at the center	
Tadaaki Nagao	53	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D., Waseda University, 1995, Surface and Interface Nanoscale Physics, Plasmonics, Nanoscale Materials Optics	100	Independent Scientist: 10/1/2007 PI: 4/1/2017	usually stays at the center	

Name	Age	Affiliation (Position title, department, organization)	Academic degree, Specialty	Effort (%)*	Starting date of participation	Status of participation (Describe in concrete terms)	Note
Tsuyoshi Miyazaki	53	International Center for Materials Nanoarchitectonics (MANA) , National Institute for Materials Science (NIMS)	Ph.D., The University of Tokyo, 1995 first-principles calculation	100	4/1/2016	usually stays at the center	
Yoshitaka Tateyama	49	Center for Green Research on Energy and Environmental Materials, National Institute for Materials Science (NIMS)	Ph.D., The University of Tokyo, 1998, Condensed-matter Theory, Computational Physical Chemistry	5	Independent Scientist: 10/1/2007 PI: 7/19/2016	stays at the center	
Zhong Lin Wang	58	Professor, School of Materials Science and Engineering, Georgia Institute of Technology	Ph.D. in Physics, Arizona State University, 1987, Emerging Devices for Energy Generation	10	10/1/2007	stays at the center several times a year, usually at GT satellite	
James K. Gimzewski	68	Professor, Chemistry and Biochemistry, University of California, Los Angeles	Ph.D. in Physical Chemistry, University of Strathclyde, 1977, Neuromorphic Network	20	10/1/2007	stays at the center several times a year, usually at UCLA satellite	
Christian Joachim	62	Professor, CEMES, Centre National de la Recherche Scientifique (CNRS)	Ph.D. in Applied Mathematics, Ph.D. in Quantum Physics, Molecular Device Engineering	20	10/1/2007	stays at the center several times a year, usually at CNRS satellite	
Françoise M. Winnik	68	Professor, Faculty of Science, Department of Chemistry, University of Helsinki	Ph.D. in Chemistry, University of Toronto, 1979, Functional Nanoparticles and Nanointerface	20	4/1/2011	stays at the center several times a year, usually at University of Helsinki satellite	
David R. Bowler	49	Professor, Department of Physics & Astronomy, University College London	Ph.D., University of Oxford, 1997, Large-scale Order-N DFT Calculations	20	API: 4/1/2013 PI: 4/1/2016	stays at the center several times a year, usually at UCL satellite	
Thomas E. Mallouk	65	Professor, Department of Chemistry, University of Pennsylvania	Ph.D. in Chemistry, University of California, Berkeley, 1983, Nanoscale Chemistry	10	10/5/2018	stays at the center several times a year, usually at University of Pennsylvania satellite	
Gero Decher	63	Professor, the Faculty of Chemistry, University of Strasbourg	Ph.D., Johannes Gutenberg University Mainz, 1986, Fazzy Assembly	10	2/1/2019	stays at the center several times a year, usually at University of Strasbourg satellite	

*Percentage of time that the principal investigator devotes to his/her work for the Academy center vis-à-vis his/her total working hours.

Principal Investigators resigned since FY 2017

Name	Next Affiliation (Position title, department, organization)	Period of participation
Taizo Sasaki	Chief Researcher, Center for Green Research on Energy and Environmental Materials, National Institute for Materials Science (NIMS)	4/1/2016 (Until 6/1/2017)
Minoru Osada	Professor, Institute of Materials and Systems for Sustainability (IMaSS), Nagoya University	MANA Scientist: 10/1/2007 PI: 4/1/2016 (Until 12/31/2017)
Toyohiro Chikyow	Deputy Director, Research and Services Division of Materials Data and Integrated System, National Institute for Materials Science (NIMS)	MANA Scientist: 10/1/2007 PI: 4/1/2011 (Until 4/1/2018)

Appendix 3-1 Record of Center Activities (FY 2017-FY 2019)

1. Researchers and Center Staffs, Satellites, Partner Institutions

1-1. Researchers and Center Staffs Participated in the Center's Activities

- Enter the number of researchers and center staffs affiliated with the Center in the table in Appendix 3-1a.

Special mention

- Describe the Center's concrete plans for the future and already-established schedules for employing researchers, particularly principal investigators.
- As background to how the Center is working on the global circulation of world's best brains, give good examples, if any, of how career paths are being established for the Center's researchers; that is, from which top-world research institutions do researchers come to the Center and to which research institutions do the Center's researchers go, and how long are their stays at those institutions.
- In Appendix 3-1b, describe the positions that postdoctoral researchers acquire upon leaving the Center.

Since MANA became a WPI Academy member in FY2017, the Cross Appointment system was institutionalized for the circulation of the supply of human resources.

Within Cross Appointment, MANA welcomed Professor Junichi Takeya from the University of Tokyo as a Principal Investigator (PI). Other PIs originally from MANA moved on to other universities, while continuing to lead a research group at MANA as a Cross Appointment PI: (1) Professor Yusuke Yamauchi from the University of Wollongong, Australia (now the University of Queensland). (2) Professor Dmitri Golberg from the Queensland University of Technology, Australia. (3) Professor Minoru Osada from Nagoya University, Japan. An article about such Cross Appointment has been published in the journal Nature Communications. This system promotes international brain circulation by collaboration with students and young researchers led by professors at universities who participate in MANA's research.

Examples of successful career paths of researchers from MANA

(1) Dr. Yusuke Yamauchi（2007-2015 : MANA Independent Scientist, 2016-Present: PI)
Previous Position: Professor at University of Wollongong, Australia (2016).
Current Positions: Professor at Queensland University, Brisbane, Australia (since 2017).
Cross Appointment PI at MANA.
https://aibn.uq.edu.au/profile/4422/yusuke-yamauchi
（750 papers, > 35,000 citations (h-index > 100).
Highly-Cited Researchers in Chemistry in 2016, 2017, 2018 and 2019.

(2) Dr. Dmitri Golberg（2007-Present: Satellite PI）
Current Positions: Professor, Queensland University of Technology, Brisbane, Australia (since 2017). Australian Laureate Fellow.
https://staff.qut.edu.au/staff/dmitry.golberg
(617 papers, >42,500 citations, H-index> 110)

Examples of successful career advancements of young postdoc researchers from MANA

(1) Dr. Lionel Vayssieres (2008-2011 : MANA Independent Scientist)
Current Positions: Director of the International Research Center for Renewable Energy (IRCRE), Professor of Xi'an Jiaotong University.
https://ircre.org/
(550 papers, >18500 citations, h-index=66), Most Cited Researcher in China in the field of Materials Science in 2014, 2015, 2016, 2017, and 2018 (Scopus/Elsevier),

(2) Dr. Martin Pumera（2008-2009 : MANA Scientist）
Previous Position: Associate Professor at Nanyang Technological University.
Current Positions: Professor of University of Chemistry and Technology, Prague, and Center President of Advanced Functional Nanorobots.
https://www.nanorobots.cz/about-martin/
(>600 papers, > 20,000 citations, H-index 82).
Highly-Cited Researchers in Chemistry in 2017 & 2018.

(3) Dr. Ajayan Vinu（2007-2011 MANA Independent Scientist）

Previous positions: University of Queensland, Brisbane, Australia and other places.
Current position: Director of Global Innovative Center for Advanced Nanomaterials, University of Newcastle, UK.
https://www.newcastle.edu.au/profile/ajayan-vinu
(ca. 400 papers in high impact factor journals >19,200 citations, H-index> 72)

Working places of MANA postdoc alumni

Among 388 postdoctoral graduates from MANA, there were 78 Japanese who found jobs in Japan (54 in universities and research institutes, 24 in companies) and 53 foreigners who received work in Japan (40 in universities and research institutes, 13 in companies). 99 MANA alumni found employment in China (98 in universities and research institutes, 1 at another place) and 37 are working in India (34 in universities and research institutes, 3 at other places). Overall, there are 297 MANA postdoctoral graduates working in universities and research institutes (76.5 %), 69 working in companies (17.8 %) and 22 with unknown working places (5.7 %). For individual employment, please refer to the table in Appendix 3-1B.

1-2. Satellites and Partner Institutions

- List the satellite and partner institutions, both domestic and overseas, in the table below.
- Indicate newly added and deleted institutions in the "Notes" column.

<Satellite institutions>

Institution name	Principal Investigator(s), if any	Notes
University of California Los Angeles (USA)	James K. Gimzewski (MANA Satellite PI)	
The National Center for Scientific Research, Toulouse (France)	Christian Joachim (MANA Satellite PI)	
Georgia Institute of Technology (USA)	Zhong Lin Wang (MANA Satellite PI)	
University College London (UK)	David R. Bowler (MANA Satellite PI)	
University of Helsinki (Finland)	Francoise M. Winnik (MANA Satellite PI)	New (since May 2018)
University of Montreal (Canada)	Francoise M. Winnik (MANA Satellite PI)	Finished (until April 2018)
Strasbourg University (France)	Gero Decher (MANA Satellite PI)	New (since April 2018)
University of Pennsylvania (USA)	Thomas E. Mallouk (MANA Satellite PI)	New (since May 2019)
Penn State University (USA)	Thomas E. Mallouk (MANA Satellite PI)	Finished (until April 2019) (since April 2018)

< Partner institutions>

Connected to MANA with a valid Memorandum of Understanding (MOU). All MOUs signed by the current MANA Director Takayoshi Sasaki (since 2017) or by the previous MANA Director Masakazu Aono (2015-2016).

Institution name	Principal Investigator(s), if any	Notes
Faculty of Mathematics and Physics, Charles University, Czech Republic	Participating Researchers from MANA: ・Jonathan Hill (Chief Researcher) ・Jan Labuta (Independent Scientist)	MOU: ・signed on Feb 3, 2020 ・valid until Feb 3, 2025
Department of Applied Physics and School of Pharmacy, University of Eastern Finland, Finland	Participating Researchers from MANA: ・Kohsaku Kawakami (GL)	MOU: ・signed on Jan 13, 2020 ・valid until Jan 13, 2025
Faculty of Chemical Technology, Pardubice University, Czech Republic	Participating Researchers from MANA: ・Jonathan Hill (Chief Researcher) ・Jan Labuta (Independent Scientist)	MOU: ・signed on Dec 18, 2019 ・valid until Dec 18, 2024
Nepal Academy of Science and Technology (NAST), Nepal	Participating Researchers from MANA: ・Katsuhiko Ariga (PI) ・Lok Kumar Shrestha (Principal Researcher)	MOU: ・signed on Dec 16, 2019 ・valid until Dec 16, 2024
Sydney Nano Institute, University of Sydney, Australia	Participating Researchers from MANA: ・Tomonobu Nakayama (PI, Deputy Director) ・Jun Nakanishi (GL)	MOU: ・signed on Nov 12, 2019 ・valid until Nov 12, 2024
Hierarchical Green-Energy Materials Research Center (HiGEM), National Cheng Kung University, Taiwan	Participating Researchers from MANA: ・Tomonobu Nakayama (PI, Deputy Director) ・Jun Nakanishi (GL)	MOU: ・signed on Oct 30, 2019 ・valid until Oct 30, 2024
Catalan Institute of Nanoscience and Nanotechnology (ICN2), Spain	Participating Researchers from MANA: ・Tomonobu Nakayama (PI, Deputy Director)	MOU: ・signed on Oct 16, 2019 ・valid until Oct 16, 2024
College of Science, National Chiao Tung University, Taiwan	Participating Researchers from MANA: ・Tomonobu Nakayama (PI, Deputy Director) ・Kazuhito Tsukagoshi (PI) ・Ryuichi Arafune (Senior Researcher)	MOU: ・signed on Jul 2, 2019 ・valid until Jul 2, 2024
The University of Naples Federico II, Italy	Participating Researchers from MANA: ・Yutaka Wakayama (GL, Deputy Director)	MOU: ・signed on Jun 13, 2019 ・valid until Jun 13, 2024
Qatar Environmental & Energy Research Institute (QEERI), Qatar	Participating Researchers from MANA: ・Yutaka Wakayama (GL, Deputy Director) ・Ryoma Hayakawa (Senior Researcher)	MOU: ・signed on May 8, 2019 ・valid until May 8, 2024
The Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia	Participating Researchers from MANA: ・Chiaki Yoshikawa (Senior Researcher)	MOU: ・signed on Mar 19, 2019 ・valid until Mar 19, 2024

University of Strasbourg, CNRS, France (MANA Satellite)	Participating Researchers from MANA: ・Gero Decher (Satellite PI) ・Takayoshi Sasaki (MANA Director) ・Katsuhiko Ariga (PI) ・Tadaaki Nagao (PI) ・Renzhi Ma (GL)	MOU: ・signed on Jan 21, 2019 ・valid until Jan 21, 2024
Research Center for Sustainable Energy and Nanotechnology (RCSEN), National Chung Hsing University, Taiwan	Participating Researchers from MANA: ・Katsuhiko Ariga (PI) ・Naoki Fukata (PI) ・Genki Yoshikawa (GL)	MOU: ・signed on Dec 26, 2018 ・valid until Dec 26, 2023
CEMES-CNRS, Toulouse, France (MANA Satellite)	Participating Researchers from MANA: ・Christian Joachim (Satellite PI) ・Tomonobu Nakayama (PI, Deputy Director) ・Makoto Sakurai (Principal Researcher) ・Ayako Nakata (Senior Researcher)	MOU: ・signed on Dec 21, 2018 ・valid until Dec 21, 2023
Australian Institute for Bioengineering and Nanotechnology, The University of Queensland, Australia	Participating Researchers from MANA: ・Yusuke Yamauchi (PI)	MOU: ・signed on Oct 9, 2018 ・valid until Oct 9, 2023
Eberly College of Science, The Pennsylvania State University, USA (MANA Satellite)	Participating Researchers from MANA: ・Thomas Mallouk (Satellite PI) ・Takayoshi Sasaki (Director) ・Tomonobu Nakayama (Deputy Director)	MOU: ・signed on Oct 5, 2018 ・valid until Oct 5, 2023
Department of Civil and Environmental Engineering, Stanford University, USA	Participating Researchers from MANA: ・Akihiro Okamoto (Independent Scientist)	MOU: ・signed on Jul 9, 2018 ・valid until Jul 9, 2023
Department of Chemistry, University of Helsinki, Finland (MANA Satellite)	Participating Researchers from MANA: ・Francoise M. Winnik (Satellite PI) ・Jun Nakanishi (PI) ・Naoto Shirahata (Associate PI)	MOU: ・signed on Jun 23, 2018 ・valid until Jun 23, 2023
Federal University of Rio de Janeiro (UFRJ), Brazil	Participating Researchers from MANA: ・Yoshihiko Takano (PI) ・Hiroyuki Takeya (Chief Researcher)	MOU: ・signed on Apr 27, 2018 ・valid until Apr 27, 2023
SASTRA Deemed University, India	Participating Researchers from MANA: ・Takashi Nakanishi (GL) ・Kentaro Tashiro (Principal Researcher)	MOU: ・signed on Mar 28, 2018 ・valid until Mar 28, 2023
Korea Basic Science Institute (KBSI), Busan Center, Korea	Participating Researchers from MANA: ・Yutaka Wakayama (GL, Deputy Director)	MOU: ・signed on Feb 22, 2018 ・valid until Feb 22, 2023

	· Shu Nakaharai (Principal Researcher) · Shinsuke Ishihara (Senior Researcher)	
Institute of Electronics (IE) at the Bulgarian Academy of Sciences (BAS), Bulgaria	Participating Researchers from MANA: · Naoki Fukata (PI) · Wipakorn Jevasuwan (Senior Researcher) · Ryo Matsumura (Researcher)	MOU: · signed on Jan 31, 2018 · valid until Jan 31, 2023
Institute of Science and Institute of Engineering, Suranaree University of Technology (SUT), Thailand	Participating Researchers from MANA: · Naoki Fukata (PI) · Wipakorn Jevasuwan (Senior Researcher)	MOU: · signed on Jan 30, 2018 · valid until Jan 30, 2023
London Centre for Nano-technology, University College London (UCL), UK (MANA Satellite)	Participating Researchers from MANA: · Tsuyoshi Miyazaki (PI)	MOU: · signed on Nov 13, 2017 · valid until Nov 13, 2022
Queensland University of Technology (QUT), Australia	Participating Researchers from MANA: · Yoshio Bando (PI) · Dmitri Golberg (PI)	MOU: · signed on Nov 25, 2016 · valid until Nov 25, 2021
Research Laboratories of Saigon High Tech Park (SHTP Labs), Vietnam	Participating Researchers from MANA: · Toyohiro Chikyow (PI)	MOU: · signed on Oct 17, 2016 · valid until Oct 17, 2021
Post-Silicon Semiconduc-tor Institute, Korea Institute of Science and Technology (KIST), Korea	Participating Researchers from MANA: · Minoru Osada (PI)	MOU: · signed on Sep 21, 2016 · valid until Sep 21, 2021
MacDiarmid Institute for Advanced Materials and Nanotechnology, New Zealand	Participating Researchers from MANA: · Tomonobu Nakayama (Deputy Director) · Tadaaki Nagao (PI)	MOU: · signed on Aug 18, 2016 · valid until Aug 18, 2021
Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina, Italy	Participating Researchers from MANA: · Katsuhiko Ariga (PI) · Jonathan Hill (GL)	MOU: · signed on Jun 30, 2016 · valid until Jun 30, 2021
University of Chemistry and Technology (UCT), Czech Republic	Participating Researchers from MANA: · Masakazu Aono (Director, PI)	MOU: · signed on Jan 18, 2016 · valid until Jan 18, 2021
University of Wollongong (UOW), Australia	Participating Researchers from MANA: · Yoshio Bando (PI) · Yusuke Yamauchi (PI)	MOU: · signed on Sep 29, 2015 · valid until Sep 29, 2020
University of Science and Technology of Hanoi (USTH), Vietnam	Participating Researchers from MANA: · Katsuhiko Ariga (PI)	MOU: · signed on Sep 24, 2015 · valid until Sep 24, 2020

Molecular Engineering & Sciences Institute (MoIES), University of Washington (UW), USA	Participating Researchers from MANA: ・Guoping Chen (PI) ・Mitsuhiro Ebara (GL)	MOU: ・signed on Sep 15, 2015 ・valid until Sep 15, 2020
Department of Materials Science and Engineering, Promotion Center for Global Materials Research, National Cheng Kung University (CKU), Taiwan	Participating Researchers from MANA: ・Takayoshi Sasaki (Director) ・Minoru Osada (PI)	MOU: ・signed on May 30, 2015 ・valid until May 30, 2020
Paul Drude Institute for Solid State Electronics (PDI), Germany	Participating Researchers from MANA: ・Toyohiro Chikyow (PI) ・Takahiro Nagata (GL) ・Yoshiyuki Yamashita (Principal Researcher)	MOU: ・signed on May 29, 2015 ・valid until May 29, 2020
Institute for Energy Materials, Chongqing University of Science & Technology (CQUST), China	Participating Researchers from MANA: ・Kazuya Terabe (PI) ・Minoru Osada (PI)	MOU: ・signed on May 15, 2015 ・valid until May 15, 2020

2. Status of Collaboration with Overseas Satellites

2-1. Coauthored Papers

- List the refereed papers published between FY 2017 and FY 2019 that were coauthored between the Center's researcher(s) in domestic institution(s) (include satellite institutions) and overseas satellite institution(s). List them by overseas satellite institution in the below blocks.
- Transcribe data in same format as in Appendix 1. Italicize the names of authors affiliated with overseas satellite institutions.

Note: Authors with MANA affiliation are underlined.

Overseas Satellite 1; UCLA (USA); PI: James K. Gimzewski (Total: 2 papers)

1) *K.S. Scharnhorst*, J.P. Carbajal, *R.C. Aguilera*, E.J. Sandouk, M. Aono, *A.Z. Stieg*, *J.K. Gimzewski*, *Atomic switch networks as complex adaptive systems*, Japanese Journal of Applied Physics **57**, 03ED02 (2018). doi: 10.7567/JJAP.57.03ED02
Brief Description: Complexity is an increasingly crucial aspect of societal, environmental and biological phenomena. Using a dense unorganized network of synthetic synapses it is shown that a complex adaptive system can be physically created on a microchip built especially for complex problems. These neuro-inspired atomic switch networks (ASNs) are a dynamic system with inherent and distributed memory, recurrent pathways, and up to a billion interacting elements. We demonstrate key parameters describing self-organized behavior such as non-linearity, power law dynamics, and multistate switching regimes. Device dynamics are then investigated using a feedback loop which provides control over current and voltage power-law behavior. Wide ranging prospective applications include understanding and eventually predicting future events that display complex emergent behavior in the critical regime.

2) A. Diaz-Alvarez, R. Higuchi, P. Sanz-Leon, I. Marcus, Y. Shingaya, *A.Z. Stieg*, *J.K. Gimzewski*, Z. Kuncic, T. Nakayama, *Emergent dynamics of neuromorphic nanowire networks*, Scientific Reports **9**(1), 14920 (2019). doi: 10.1038/s41598-019-51330-6
Brief Description: Neuromorphic networks are formed by random self-assembly of silver nanowires.

Silver nanowires are coated with a polymer layer after synthesis in which junctions between two nanowires act as resistive switches, often compared with neurosynapses. We analyze the role of single junction switching in the dynamical properties of the neuromorphic network. A model of the electrical network with atomic switches reproduces the relation between individual nanowire junctions switching events with current pathway formation or destruction. This relation is further manifested in changes in 1/f power-law scaling of the spectral distribution of current. The emergent dynamics shown by polymer-coated Ag nanowire networks places this system in the class of optimal transport networks, from which new fundamental parallels with neural dynamics and natural computing problem-solving can be drawn.

Overseas Satellite 2; CNRS-CEMES (France); PI: Christian Joachim (Total: 5 papers)

1) *W.H. Soe*, Y. Shirai, *C. Durand*, Y. Yonamine, K. Minami, *X. Bouju*, M. Kolmer, K. Ariga, *C. Joachim*, W. Nakanishi, *Conformation Manipulation and Motion of a Double Paddle Molecule on an Au(111) Surface*, ACS Nano **11**(10), 10357 (2017). doi: 10.1021/acsnano.7b05314
Brief Description: The molecular conformation of a bisbinaphthyldurene (BBD) molecule is manipulated using a low-temperature ultrahigh-vacuum scanning tunneling microscope (LT-UHV STM) on an Au(111) surface. BBD has two binaphthyl groups at both ends connected to a central durene leading to anti/syn/flat conformers. The key BBD electronic states for a step-by-step STM inelastic excitation lateral motion on the Au(111) are presented requiring no mechanical interactions between the STM tip apex and the BBD.

2) S. Srivastava, H. Kino, *C. Joachim*, *Quantum half-adder Boolean logic gate with a nano-graphene molecule and graphene nano-electrodes*, Chemical Physics Letters **667**, 301 (2017).
doi: 10.1016/j.cplett.2016.11.009
Brief Description: A molecule Boolean 1/2-adder is designed and the XOR and AND truth table calculated at +0.1 V using 4 graphene electrodes. It functions with level repulsion and destructive interferences effects using 4 molecule electronic states in a quantum Hamiltonian computing approach (QHC) with the abrupt change of the molecular orbital weight of those 4 calculating states as a function of the logical input configuration. The logical inputs enter rotating the two nitro groups of the central board. With QHC, a complex Boolean digital function can be implemented employing the same graphene material for interconnects and the molecule calculating parts.

3) S. Srivastava, H. Kino, S. Nakaharai, E. Verveniotis, Y. Okawa, S. Ogawa, *C. Joachim*, M. Aono, *Quantum transport localization through graphene*, Nanotechnology **28**(3), 035703 (2017).
doi: 10.1088/1361-6528/28/3/035703
Brief Description: Localization of atomic defect-induced electronic transport through a single graphene layer is calculated using a full-valence electronic structure description as a function of the defect density and taking into account the atomic-scale deformations of the layer. The elementary electronic destructive interferences leading to Anderson localization are analyzed. The low-voltage current intensity decreases with increasing length and defect density, with a calculated localization length zeta = 3.5 nm for a defect density of 5%. The difference from the experimental defect density of 0.5% required for an oxide surface-supported graphene to obtain the same. is discussed, pointing out how interactions of the graphene supporting surface and surface chemical modifications also control electronic transport localization.

4) E. Verveniotis, Y. Okawa, K. Watanabe, T. Taniguchi, T. Taniguchi, M. Osada, *C. Joachim*, M. Aono, *Self-Sensitization and Photo-Polymerization of Diacetylene Molecules Self-Assembled on a Hexagonal-Boron Nitride Nanosheet*, Polymers **10**(2), 206 (2018). doi: 10.3390/polym10020206
Brief Description: Long poly-diacetylene chains are excellent candidates for planar, on-surface synthesized molecular electronic wires. Since hexagonal-Boron Nitride (h-BN) was identified as the best available atomically flat insulator for the deposition of poly-diacetylene precursors, we

demonstrate the polymerization patterns and rate on it under UV-light irradiation, with subsequent polymer identification by atomic force microscopy. The results on h-BN indicate self-sensitization which yields blocks comprised of several polymers, unlike on the well-studied graphite/diacetylene system, where the polymers are always isolated. This work sets the stage for conductance measurements of single molecular poly-diacetylene wires on h-BN.

5) E. Verveniotis, Y. Okawa, S. Nakaharai, S. Ogawa, T. Nakayama, M. Aono, *C. Joachim*, *Observation of room temperature electronic localization through a single graphene layer on sapphire*, Japanese Journal of Applied Physics **58**(5), 055007 (2019). doi: 10.7567/1347-4065/ab0884
Brief Description: A He+ ion beam is used to induce electronic localization, on a single graphene layer exfoliated on an ultra-flat sapphire substrate, based on crystalline defects and with a lateral irradiation precision of 1 nm. Inducing a 1% carbon defect density by step by step irradiation of a 100-nm-wide band on the supported graphene increases its electrical resistance from 0.90 to 133 k Omega. The resistance build-up was monitored in situ and in real time by measuring the I(t) current intensity through the graphene monolayer flake during its irradiation. The whole process takes place on an ultra-polished sapphire surface used to retain the planarity of the graphene. We propose that local heating of the graphene by irradiation promotes the migration of the created atomic carbon defects to the edge of the flake. This inherently moderates the increase of resistance with time during He+ irradiation due to the gradual re-opening of low-voltage graphene ballistic channels.

Overseas Satellite 3; GIT (USA); PI: Zhong Lin Wang (Total: 0 papers)

Overseas Satellite 4; UCL (UK); PI: David R. Bowler (Total: 6 papers)

1) T. Hirakawa, T. Suzuki, *D.R. Bowler*, T. Miyazaki, *Canonical-ensemble extended Lagrangian Born-Oppenheimer molecular dynamics for the linear scaling density functional theory*, Journal of Physics: Condensed Matter **28**(40), 405901 (2017). doi: 10.1088/1361-648X/aa810d
Brief Description: We discuss the development and implementation of a constant temperature (NVT) molecular dynamics scheme that combines the Nose-Hoover chain thermostat with the extended Lagrangian Born-Oppenheimer molecular dynamics (BOMD) scheme, using a linear scaling density functional theory (DFT) approach. An integration scheme for this canonical-ensemble extended Lagrangian BOMD is developed and discussed in the context of the Liouville operator formulation. Linear scaling DFT canonical-ensemble extended Lagrangian BOMD simulations are tested on bulk silicon and silicon carbide systems to evaluate our integration scheme. The results show that the conserved quantity remains stable with no systematic drift even in the presence of the thermostat.

2) A. Nakata, Y. Futamura, T. Sakurai, *D.R. Bowler*, *T. Miyazaki*, *Efficient Calculation of Electronic Structure Using O(N) Density Functional Theory*, Journal of Chemical Theory and Computation **13**(9), 4146 (2017). doi: 10.1021/acs.jctc.7b00385
Brief Description: We propose an efficient way to calculate the electronic structure of large systems by combining a large-scale first-principles density functional theory code, CONQUEST, and an efficient interior eigenproblern solver, the Sakurai Sugiura method. The electronic Hamiltonian and charge density of large systems are obtained by CONQUEST, and the eigenstates of the Hamiltonians are then obtained by the Sakurai Sugiura method. Applications to a hydrated DNA system and adsorbed P-2 molecules and Ge hut clusters on large Si substrates demonstrate the applicability of this combination on systems with 10,000+ atoms with high accuracy and efficiency.

3) K. Sagisaka, J. Nara, *D.R. Bowler*, *Importance of bulk states for the electronic structure of semiconductor surfaces: implications for finite slabs*, Journal of Physics: Condensed Matter **29**(14), 145502 (2017). doi: 10.1088/1361-648X/aa5f91
Brief Description: We investigate the influence of slab thickness on the electronic structure of the Si(100)-p(2x2) surface in density functional theory (DFT) calculations, considering both density of

states and band structure. Our calculations, with slab thicknesses of up to 78 atomic layers, reveal that the slab thickness profoundly affects the surface band structure, particularly the dangling bond states of the silicon dimers near the Fermi level. We find that, to precisely reproduce the surface bands, the slab thickness needs to be large enough to completely converge the bulk bands in the slab. In the case of the Si(100) surface, the dispersion features of the surface bands, such as the band shape and width, converge when the slab thickness is larger than 30 layers. Complete convergence of both the surface and bulk bands in the slab is only achieved when the slab thickness is greater than 60 layers.

4) C. Romero-Muniz, A. Nakata, P. Pou, *D.R. Bowler*, T. Miyazaki, R. Perez, *High-accuracy large-scale DFT calculations using localized orbitals in complex electronic systems: the case of graphene-metal interfaces*, Journal of Physics: Condensed Matter **30**(50), 505901 (2018).
doi: 10.1088/1361-648X/aaec4c
Brief Description: Over many years, computational simulations based on density functional theory (DFT) have been used extensively to study many different materials at the atomic scale. However, its application is restricted by system size, leaving a number of interesting systems without a high-accuracy quantum description. In this work, we calculate the electronic and structural properties of a graphene-metal system significantly larger than in previous plane-wave calculations with the same accuracy. For this task we use a localised basis set with the CONQUEST code, both in their primitive, pseudo-atomic orbital form, and using a recent multi-site approach. This multi-site scheme allows us to maintain accuracy while saving computational time and memory requirements, even in our exemplar complex system of graphene grown on Rh(111) with and without intercalated atomic oxygen.

5) *C. O'Rourke*, *S.Y. Mujahed*, *C. Kumarasinghe*, T. Miyazaki, *D.R. Bowler*, *Structural properties of silicon-germanium and germanium-silicon core-shell nanowires*, Journal of Physics: Condensed Matter **30**(46), 465303 (2018). doi: 10.1088/1361-648X/aae617
Brief Description: Core-shell nanowires made of Si and Ge can be grown experimentally with excellent control for different sizes of both core and shell. We have studied the structural properties of Si/ Ge and Ge/Si core-shell nanowires aligned along the [1 10] direction, with diameters up to 10.2 nm and varying core to shell ratios, using linear scaling density functional theory. We analyse the character of the intrinsic strain distribution and show that, regardless of the composition or bond direction, the Si core or shell always expands. In contrast, the strain patterns in the Ge shell or core are highly sensitive to the location, composition and bond direction. The highest strains are found at heterojunction interfaces and the surfaces of the nanowires. This detailed understanding of the atomistic structure and strain paves the way for studies of the electronic properties of core-shell nanowires and investigations of doping and structure defects.

6) *D.R. Bowler*, *J.S. Baker*, *J.T.L. Poulton*, *S.Y. Mujahed*, J. Lin, S. Yadav, Z. Raza, T. Miyazaki, *Highly accurate local basis sets for large-scale DFT calculations in conquest*, Japanese Journal of Applied Physics **58**(10), 100503 (2019). doi: 10.7567/1347-4065/ab45af
Brief Description: Given the widespread use of density functional theory (DFT), there is an increasing need for the ability to model large systems (beyond 1000 atoms). We present a brief overview of the large-scale DFT code CONQUEST, which is capable of modelling such large systems, and discuss approaches to the generation of consistent, well-converged pseudo-atomic basis sets which will allow such large-scale calculations. We present tests of these basis sets for a variety of materials, comparing to fully converged plane wave results using the same pseudopotentials and grids.

Overseas Satellite 5; University of Helsinki (Finland) / University of Montreal (Canada); PI: Francoise M. Winnik (Total: 5 papers)

1) J D. Abu Saleh, *J. Niskanen*, Y. Xue, D. Golberg, *F.M. Winnik*, A. Sosnik, *Boron nitride nanotube-based amphiphilic hybrid nanomaterials for superior encapsulation of hydrophobic cargos*, Materials Today

Chemistry **6**, 45 (2017). doi: 10.1016/j.mtchem.2017.09.003
Brief Description: We report an organic-inorganic hybrid core-shell nanomaterial obtained by conjugation of an amphiphilic monomethoxy-poly(ethylene glycol)-b-poly(epsilon-caprolactone) diblock copolymer to hydroxylated boron nitride nanotubes (BNNTs). The extent of copolymer grafting reached 64% w/w, an exceptionally high value. The hybrid materials exhibit excellent physical stability in water and an outstanding loading capacity (31.3% w/w) for curcumin, a hydrophobic drug. Moreover, they present good compatibility with the Caco2 cell line, a model of intestinal epithelium. Our findings demonstrate the potential of multifunctional hybrid BNNTs to serve as a platform for complex amphiphilic nanoparticle architectures with improved features.

2) G. Beaune, A.Y.W. Lam, S. Dufour, *F.M. Winnik*, F. Brochard-Wyart, *How gluttonous cell aggregates clear substrates coated with microparticles*, Scientific Reports **7**, 15729 (2017).
doi: 10.1038/s41598-017-15665-2
Brief Description: We study the spreading of cell aggregates deposited on adhesive substrates decorated with microparticles (MPs). A cell monolayer expands around the aggregate. The cells on the periphery of the monolayer take up the MPs, clearing the substrate as they progress and forming an aureole of cells filled with MPs. We study the dynamics of spreading and determine the width of the aureole and the level of MP internalization in cells as a function of MP size, composition, and density. From the radius and width of the aureole, we quantify the volume fraction of MPs within the cell, which leads to an easy, fast, and inexpensive measurement of the cell - particle internalization.

3) S. Chandra, G. Beaune, N. Shirahata, *F.M. Winnik*, *A one-pot synthesis of water soluble highly fluorescent silica nanoparticles*, Journal of Materials Chemistry B **5**(7), 1363 (2017).
doi: 10.1039/c6tb02813f
Brief Description: We report a one-pot synthesis of water dispersible fluorescent silica nanoparticles (NPs) functionalized with terminal amine groups, starting from silicon tetrabromide (SiBr4) and aminopropyltriethoxy silane (APTES). The NPs range from 1 to 2 nm in diameter, and exhibit an intense blue emission with a quantum yield (QY) of around 34% in water. They were characterized using XRD, XPS, TEM and FTIR spectroscopy for structural analysis. A tentative mechanism explaining the origin of the NPs emission in the blue region is presented based on the distinctive features of their low temperature photoluminescence (PL), photoluminescence excitation (PLE) spectrum and time correlated single photon counting lifetime decay profiles. The outstanding PL QY and photostability of the NPs, together with their water dispersibility and biocompatibility, constitute a unique set of properties among existing silica NPs and enable the application of the NPs in various fields.

4) S. Chandra, Y. Masuda, N. Shirahata, *F.M. Winnik*, *Transition-Metal-Doped NIR-Emitting Silicon Nanocrystals*, Angewandte Chemie - International Edition **56**(22), 6157 (2017).
doi: 10.1002/anie.201700436
Brief Description: Impurity-doping in nanocrystals significantly affects their electronic properties and diversifies their applications. Herein, we report the synthesis of transition metal (Mn, Ni, Co, Cu)-doped oleophilic silicon nanocrystals (SiNCs) through hydrolysis/polymerization of triethoxysilane with acidic aqueous metal salt solutions, followed by thermal disproportionation of the resulting gel into a

doped-Si/SiO2 composite that, upon HF etching and hydrosilylation with 1-n-octadecene, produces free-standing octadecyl-capped doped SiNCs (diameter approximate to 3 to 8 nm; dopant < 0.2 atom %). Metal-doping triggers a red-shift of the SiNC photoluminescence (PL) of up to 270 nm, while maintaining high PL quantum yield (26% for Co doping).

5) G. Beaune, U. Nagarajan, F. Brochard-Wyart, *F.M. Winnik*, *Polymeric Nanoparticles Limit the Collective Migration of Cellular Aggregates*, Langmuir **35**(23), 7396 (2019). doi: 10.1021/acs.langmuir.8b01736
Brief Description: Controlling the propagation of primary tumors is fundamental to avoiding the epithelial to mesenchymal transition process leading to the dissemination and seeding of tumor cells

throughout the body. Here we demonstrate that nanoparticles (NPs) limit the propagation of cell aggregates of CT26 murine carcinoma cells used as tumor models. The spreading behavior of these aggregates incubated with NPs is studied on fibronectin-coated substrates. We demonstrate that the spreading of the cell monolayer is slowed down in the presence of NPs and occurs only above a threshold concentration that depends on the size and surface chemistry of the NPs. The mechanism of slowdown is explained by the increase in cell-cell interactions due to the NPs adsorbed on the membrane of the cells. The present results demonstrate that NPs can modulate the collective migration of cells; therefore, they may have important implications for cancer treatment.

Overseas Satellite 6; Strasbourg University (France); PI: Gero Decher (Total: 0 papers)

Overseas Satellite 7; University of Pennsylvania / Penn State University (USA); PI: Thomas E. Mallouk (Total: 0 papers)

2-2. Status of Researcher Exchanges

- Using the below tables, indicate the number of researcher exchanges between the Center (include domestic satellite institutions) and overseas satellite institutions during the period of FY 2017-FY 2019. Enter by institution and fiscal year.
- Write the number of principal investigator visits in the upper space and the number of other researcher visits in the lower space.

Overseas Satellite 1; UCLA (USA); PI: James K. Gimzewski

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	1	0	0	1
Other researchers	3	0	0	3
Total	4	0	0	4

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	4	2	1	7
Other researchers	1	1	0	2
Total	5	3	1	9

Overseas Satellite 2; CNRS-CEMES (France); PI: Christian Joachim

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	0	0	0	0
Other researchers	1	0	0	1
Total	1	0	0	1

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	4	4	3	11
Other researchers	2	1	0	3
Total	6	5	3	14

Overseas Satellite 3; GIT (USA); PI: Zhong Lin Wang

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	0	0	0	0
Other researchers	1	0	0	1
Total	1	0	0	1

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	1	0	0	1
Other researchers	1	0	0	1
Total	2	0	0	2

Overseas Satellite 4; UCL (UK); PI: David R. Bowler

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	3	2	3	8
Other researchers	1	1	1	3
Total	4	3	4	11

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	2	3	1	6
Other researchers	2	1	0	3
Total	4	4	1	9

Overseas Satellite 5; University of Helsinki (Finland) / University of Montreal (Canada); PI: Francoise M. Winnik

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	0	0	0	0
Other researchers	0	0	1	1
Total	0	0	1	1

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	1	2	3	6
Other researchers	0	1	0	1
Total	1	3	3	7

Overseas Satellite 6; Strasbourg University (France); PI: Gero Decher

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	1	1	0	2
Other researchers	0	1	0	1
Total	1	2	0	3

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	0	1	0	1
Other researchers	0	1	0	1
Total	0	2	0	2

Overseas Satellite 7; University of Pennsylvania / Penn State University (USA); PI: Thomas E. Mallouk

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	0	0	0	0
Other researchers	0	0	0	0
Total	0	0	0	0

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	0	1	0	1
Other researchers	2	1	0	3
Total	2	2	0	4

3. Holding and Participating in International Research Meetings

3-1. Holding international Research Meetings

- Indicate the number of international research conferences or symposiums held between FY 2017 and FY 2019, and give up to five examples of the most representative ones using the table below.

FY 2017: 5 meetings	FY 2018: 7 meetings	FY 2019: 3 meetings
Major examples (meeting titles, places and dates held)		Number of participants
MANA International Symposium 2018 Tsukuba, March 5-7, 2018		From domestic institutions: 267 people From overseas institutions: 45 people

MANA International Symposium 2019 Tsukuba, March 4-6, 2019	From domestic institutions: 317 people From overseas institutions: 68 people
MANA International Symposium 2020 Tsukuba, March 1-3, 2020 * Due to the new coronavirus, the program has been considered according to the abstract book.	From domestic institutions: 281 people From overseas institutions: 48 people *Number of registrants
International Symposium on Advanced Inorganic Materials, Tsukuba, August 3-5, 2017	From domestic institutions: 140 people From overseas institutions: 62 people
The 3rd International Workshop TOPOLOGY: The New Horizon of Materials Science and Nanophotonics Tsukuba June 12-13, 2019	From domestic institutions: 132 people From overseas institutions: 21 people

3-2. Participating in International Research Meetings

- Give up to five examples of the most representative case in which the Center, not individual researchers, participated in international research meetings to enhance the visibility and brand of the Center or of the overall WPI Program

Meeting titles, places, dates held and number of participants	Form of participation (e.g. operating a booth)	Number of participants from the Center
NanoMat 2017, Fukuoka, Japan, May 17-19, 2019, 50 Attendees	Conference Presentation (research and introduction of our institution)	3 people
AAAS Annual Meeting Austin, TX, USA, February 15-19, 2018, 10,000 Attendees Washington Dc, USA, February 14-17, 2019, 10,000 Attendees	Booth activities	2 people (2018) 3 people (2019)
EMRS 2018 Spring Meeting, Strasbourg, France, June 18-22, 2018, 3,000 Participants	Booth activities, Workshop	3 people
EMRS 2019 Spring Meeting, Nice, France, May 27-31, 2019, 3,000 Participants	Booth activities, Workshop	4 people
NanoMat 2019, Paris, France, June 3-5, 2019, 50 Attendees	Conference Presentation (research and introduction of our institution)	4 people

* Estimated number of participants

4. List of the Cooperative Research Agreements with Overseas Institutions

- Indicate the number of agreements concluded with overseas institutions still in effect as of the end of FY 2019 (March 31, 2020). Give five examples of the most representative agreements.

Number of effective agreements (as of March 31, 2020): 36

Five examples of the most representative agreements:

1. Name of the Agreement: Memorandum of Understanding with CEMES-CNRS, Toulouse, France (MANA Satellite)
   Dates of the Agreement: Signed on Dec 21, 2018; valid until Dec 21, 2023. Originally signed on May 30, 2008; renewed 2x.
   Counterpart in the Agreement: MANA Satellite PI: Christian Joachim
   Summary of the Agreement: Scientific collaboration on Molecular devices and related materials. Performing research on the design, manufacture, and atomic manipulation of nanocircuits. In addition, work on the theory of surface electron interconnection.

2. Name of the Agreement: Memorandum of Understanding with University College London (UCL), UK (MANA Satellite)
   Dates of the Agreement: Signed on Nov 13, 2017; valid until Nov 13, 2022. Originally signed on Oct 8, 2012; renewed 1x.
   Counterpart in the Agreement: MANA Satellite PI: David R. Bowler
   Summary of the Agreement: Scientific collaboration on Electronic structure calculations of nanowires. Computational physics (development of the linear scaling DFT code "CONQUEST") and collaboration with experimental groups (model the structure and properties of core-shell nanowires).

3. Name of the Agreement: Memorandum of Understanding with University of Helsinki, Finland (MANA Satellite)
   Dates of the Agreement: Signed on Jun 23, 2018; valid until Jun 23, 2023.
   Counterpart in the Agreement: MANA Satellite PI: Francoise M. Winnik
   Summary of the Agreement: Scientific collaboration on Preparation and function of inorganic-organic nanoparticles. Performing various interdisciplinary fusion research that utilizes nanotubes and nanoparticle materials developed by MANA researchers.

4. Name of the Agreement: Memorandum of Understanding with University of Queensland, Brisbane, Australia
   Dates of the Agreement: Signed on Oct 9, 2018; valid until Oct 9, 2023.
   Counterpart in the Agreement: Yusuke Yamauchi (Professor, University of Queensland, MANA PI)
   Summary of the Agreement: Scientific collaboration on Quest for future applications of nanomaterials. Performing research on porous graphene nanomesh to synthesize novel low-dimensional functional carbon materials that are suitable for scalable production.

5. Name of the Agreement: Memorandum of Understanding with University of Sydney, Australia
   Dates of the Agreement: Signed on Nov 19, 2019; valid until Nov 19, 2024. Originally signed on Feb 16, 2016; replaced 1x.
   Counterpart in the Agreement: Zdenka Kuncic (Professor, University of Sydney)
   Summary of the Agreement: Scientific collaboration on Adaptive Nanosystems. Performing research on emergent dynamics of networks of unreliable elements that leads to a new research field of "synthetic intelligence."

5. Postdoctoral Positions through Open International Solicitations

- In the columns "number of applications" and "number of selections," put the total number (upper) and the number and percentage of overseas researchers in the < > brackets (lower).
- In Appendix 3b, describe the status of employment of postdoctoral researchers.

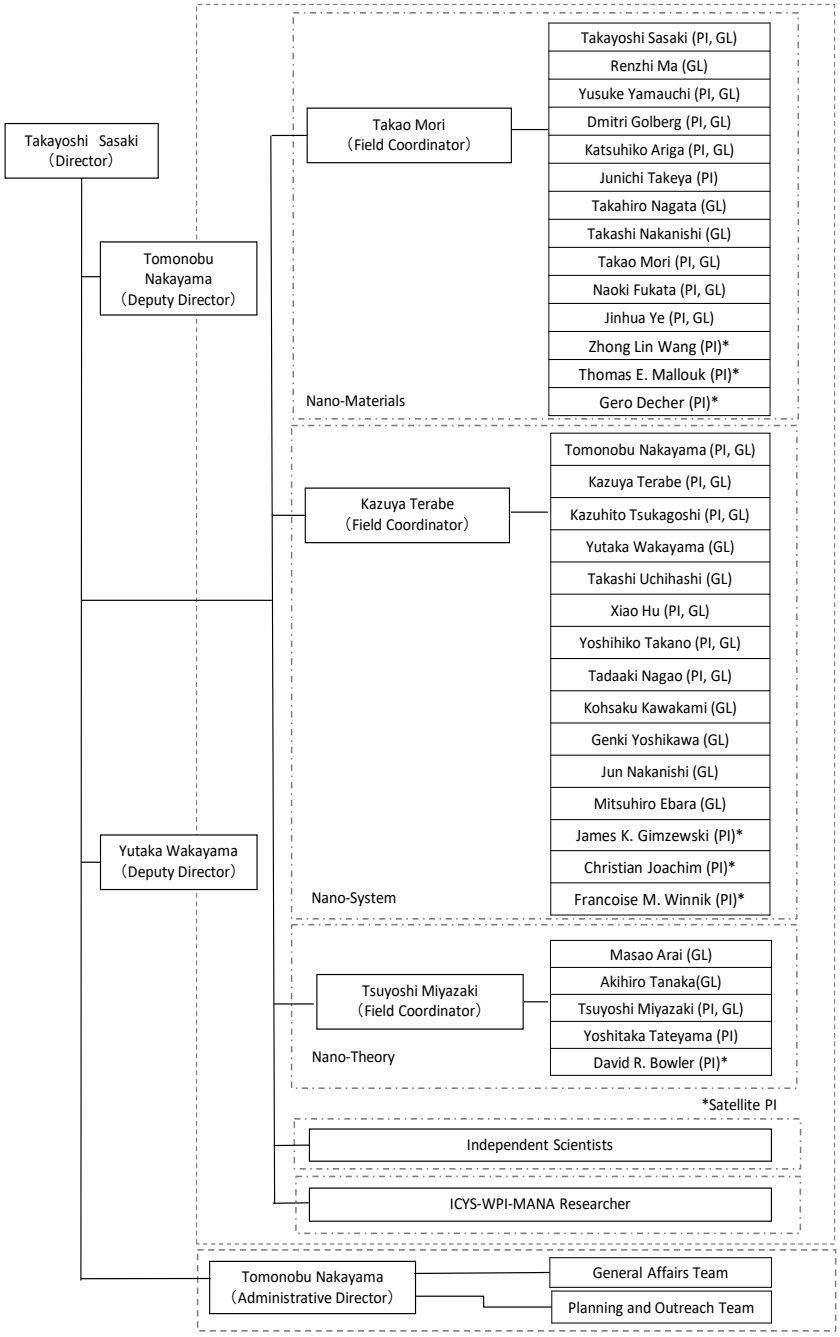
Fiscal year	Number of applications	Number of selections
FY 2016	Not Available	9
	〈 , %〉	〈8, 89%〉
FY 2017	106	5
	〈101, 95%〉	〈4, 80%〉
FY 2018	72	6
	〈70, 97%〉	〈5, 83%〉
FY 2019	58	4
	〈56, 97%〉	〈3, 75%〉

6. Diagram of Management System

6-1.

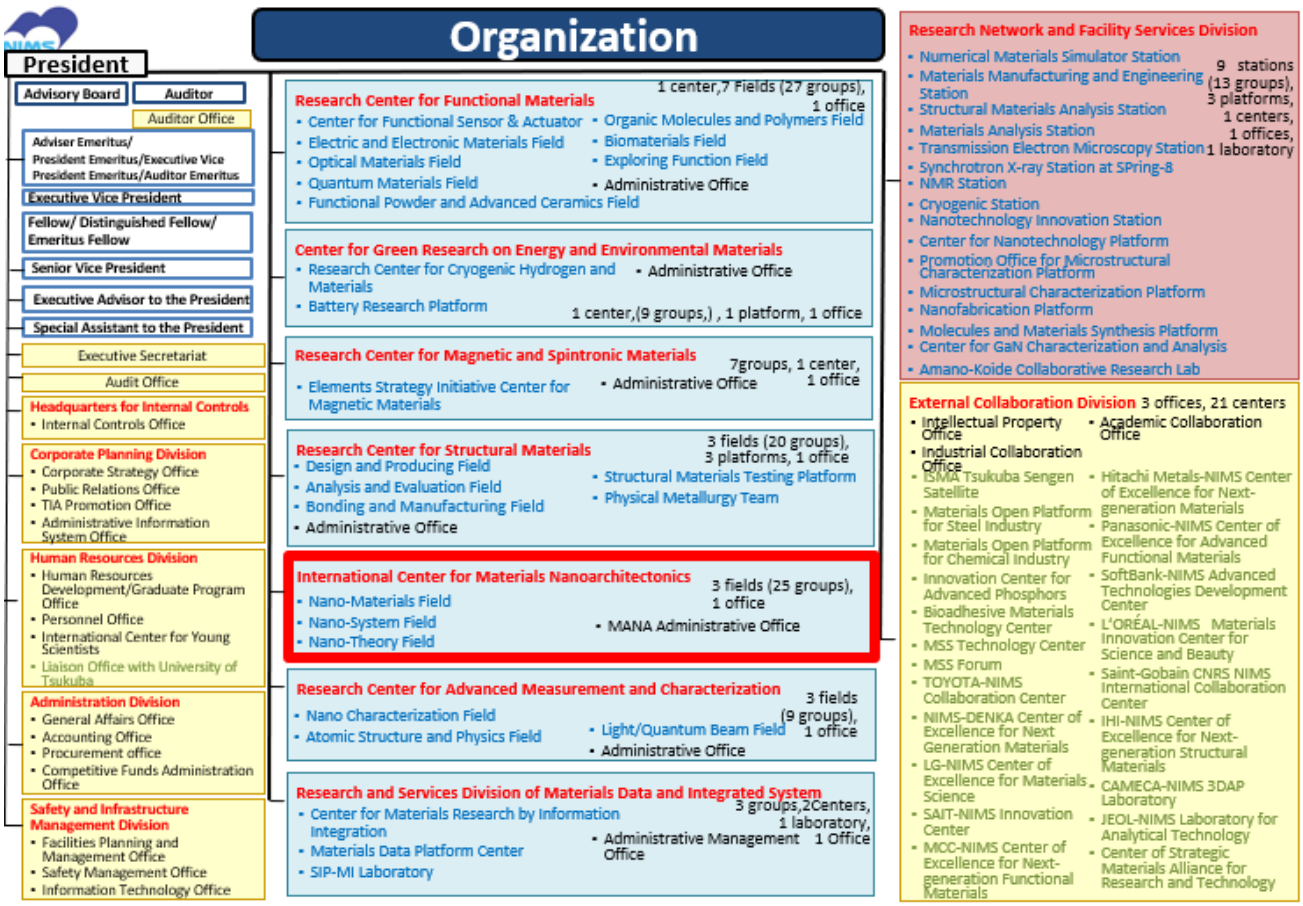
- Diagram the Center's management system within the Center in an easily understood manner.
- If any changes have been made in the Center's management system vis-à-vis that stated in the application for WPI Academy center certification, describe them. Especially describe any important changes made in such as the center director, administrative director, head of host institution, and officer(s) in charge at the host institution (e.g., executive vice president for research).

Since FY2018, MANA uses a team of 2 deputy directors to strengthen the operation. In FY2018, the NIMS Executive Vice President responsible for MANA has changed from Dr. Daisuke Fujita to Dr. Kazuhiro Hono.



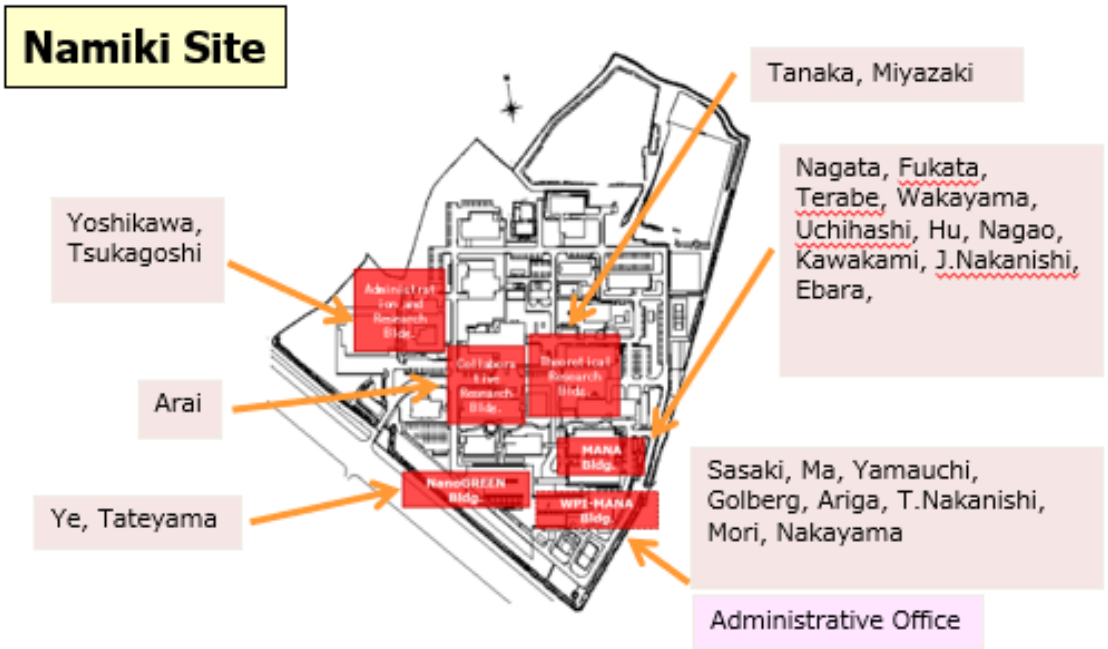
6-2.

- Make a diagram of the organizational chart to show Center's position within the host institution.



7. Campus Map

- Draw a simple map of the campus showing where the main office and principal investigator(s) are located.




Sengen Site
Takano
Central Bldg.

Appendix3-1a Number of Center Personnel FY2016-FY2019

	FY2016		FY2017		FY2018		FY2019	
	Number of persons	%	Number of persons	%	Number of persons	%	Number of persons	%
Researchers	170		176		175		179	
Overseas researchers	69	40.6%	68	38.6%	75	42.9%	76	42.5%
Female researchers	27	15.9%	22	12.5%	21	12.0%	28	15.6%
Principal investigators (PIs)	26		21		23		23	
Overseas PIs	8		7		9		9	
Female PIs	2		2		2		2	
Other researchers	86		84		80		81	
Overseas researchers	12		11		10		11	
Female researchers	9		9		8		9	
Postdocs	58		71		72		75	
Overseas Postdocs	49		50		56		56	
Female Postdocs	16		11		11		17	
Research support staffs	32		104		109		97	
Administrative staffs	15		19		19		18	
TOTAL	217		299		303		294	

Number of persons who were/have been paid using the host institution's operating budget (excluding indirect funding) among the above persons.

	FY2016	FY2017	FY2018	FY2019
Principal investigators (PIs)	0	16	16	16
Other researchers	31	87	83	72
Postdocs	0	34	32	32
Research support staffs	5	50	81	82
Administrative staffs	3	23	20	23

※ Make consistent with the number of persons reported in Appendix 3-2.

Changes vis-à-vis the Center's application for academy center certification

※ If changes have been made vis-à-vis the Center's application for academy center certification, describe the main changes and the reasons for them.

Not applicable

Appendix 3-1b Career Path of WPI Postdocs

Enter the information below during the period from the start of the center through the end of FY 2019.

- For each person, fill in the spaces to the right. More spaces may be added.
- Leave "Position as of April 2020" blank if Unknown.

Japanese Postdocs

Employment period	Position before employed at WPI center		Next position after WPI center		Position as of April 2020*	
	Position title, organization	Country where the organization	Position title, organization	Country where the organization	Position title, organization	Country where the organization
2007/10/1-2010/3/31	AIST, Postdoc fellow	Japan	Tokyo Zoukei U., Lecturer	Japan	U. Tokyo, Researcher	Japan
2007/10/1-2011/3/31	Kumamoto U., JSPS fellow	Japan	Kyushu U., Associate professor	Japan	Kyushu U., Associate professor	Japan
2008/4/1-2010/3/31	U. Tsukuba, PhD Candidate	Japan	TIT, Assistant professor	Japan	TIT, Assistant professor	Japan
2008/4/1-2010/3/31	Osaka U., Postdoc fellow	Japan	AIST, Postdoc fellow	Japan	Sandisk Corporation, Researcher	Japan
2008/4/1-2010/8/31	Rice U., Graduate research assistant	USA	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan
2008/4/1-2011/3/31	NIMS, JST-I CORP fellow	Japan	Mitsuboshi Diamond Ltd., Researcher	Japan	Mitsuboshi Diamond Ltd., Researcher	Japan
2008/4/1-2011/3/31	Meijo U., JSPS fellow	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan
2008/4/1-2011/3/31	U. Tsukuba, PhD Candidate	Japan	RIKEN, JSPS fellow	Japan	Natl. Inst. of Tech. Nagano Coll., Associate professor	Japan
2008/4/1-2012/6/30	Tohoku U., Postdoc fellow	Japan	Tohoku U., Assistant professor	Japan	Tohoku U., Associate professor	Japan
2008/5/7-2011/4/30	Kanagawa U., Postdoc fellow	Japan	Suzhou U., Postdoc fellow	China	Kanagawa U., Technical engineer	Japan
2008/7/1-2010/3/31	U. Coll. London, LCN, Postdoc fellow	UK	U. of Bologna, Research Fellow	Italy	Tokyo Denki U., Professor	Japan
2008/10/1-2010/3/31	Tokyo U. of Agriculture &Tech., PhD Candidate	Japan	Ultizyme International Ltd., Researcher	Japan	U. of North Carolina at Chapel Hill, Postdoc fellow	USA
2008/12/1-2011/9/30	U. Tokyo, Researcher	Japan	TDK, Researcher	Japan	TDK, Tech. & IP HQ, A&D C., Senior researcher	Japan

2009/3/1-2010/4/30	Lund U., Postdoc fellow	Sweden	U. of California, Irvine, Postdoc fellow	USA	Missouri State U., Assistant professor	USA
2009/4/1 -2014/3/31	Waseda U., JSPS fellow	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan
2009/4/1-2011/3/31	U. Coll. London, LCN, Postdoc Fellow	UK	Tohoku U., Assistant professor	Japan	Tohoku U., Associate professor	Japan
2009/4/1-2011/7/1	TIT, PhD Candidate	Japan	Yamagata U., Associate professor	Japan	Tokyo Metropolitan Industrial Tech. Res. Inst., Researcher	Japan
2009/4/1-2011/7/30	U. of Basel, Visiting Scientist	Switzerland	NIMS, Independent scientist (Permanent researcher)	Japan	NIMS, Group leader	Japan
2009/4/1-2013/3/31	U. Tsukuba, Project Assistant professor	Japan	NIMS, Postdoc fellow	Japan	RIKEN, Postdoc fellow	Japan
2009/11/1-2010/6/30	Japan Women's U., Postdoc fellow	Japan	U. Electro-Communications, Associate professor	Japan	U. Electro-Communications, Associate professor	Japan
2009/11/6-2010/11/6	U. Tokyo, PhD Candidate	Japan	NIMS, JSPS fellow	Japan	Tokyo U. of Sc., Junior Associate professor	Japan
2010/4/1-2012/3/31	U. Tsukuba, PhD Candidate	Japan	Tokyo U. of Sc., Associate professor	Japan	Sumitomo Heavy Industries, Ltd., Research Engineer	Japan
2010/4/1-2012/3/31 2013/6/1-2016/5/31	Kagoshima U., PhD Candidate U. Alberta, Postdoc fellow	Japan Canada	U. Alberta, Postdoc fellow Shizuoka Inst. S&T, Lecturer	Canada Japan	Shizuoka Inst. S&T, Associate professor	Japan
2010/4/1-2012/6/30	Osaka Prefecture U., PhD Candidate	Japan	NIMS, Independent scientist (Permanent Position)	Japan	NIMS, Permanent researcher	Japan
2010/4/1-2012/8/31	Kyoto U., PhD Candidate	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan
2010/4/1-2013/3/31	Osaka U., Postdoc fellow	Japan	Maeda and Partners, Patent office staff	Japan	Maeda and Partners, Patent office staff	Japan
2010/8/1-2013/3/31	Kyushu U., JSPS fellow	Japan	Waseda U., Assistant professor	Japan	TIT, Assistant professor	Japan
2010/9/1-2011/11/18	U. of Oklahoma, Postdoc fellow	USA	Private Company	USA		
2010/10/1-2011/3/31	U. Tsukuba, PhD Candidate	Japan	NIMS, Engineer (Permanent Position)	Japan	NIMS, Engineer (Permanent Position)	Japan
2011/4/1 -2013/6/30	Kyushu U., PhD Candidate	Japan	NIMS, Permanent researcher	Japan	Kyushu U., Associate professor	Japan
2011/4/1-2012/4/30	U. Tsukuba, PhD Candidate	Japan	Lawrence Berkeley Natl. Lab., Visiting Research Scholar	USA	Tohoku U., Assistant professor	Japan
2012/3/5-2013/2/28	Paris-Sud U., LPS, Postdoc fellow	France	NIMS, Postdoc fellow	Japan	KIOXIA, Administration manager	Japan

2012/4/1 -2016/7/31	Waseda U., PhD Candidate	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan
2012/4/1 -2015/1/15	NIMS, JSPS fellow	Japan	Mitsubishi Elec. Corporation, N/A	Japan	Mitsubishi Elec. Corporation, N/A	Japan
2012/4/1-2012/11/30	U. Tokyo, PhD Candidate	Japan	Yamanashi U., Assistant professor	Japan	Yamanashi U., Associate professor	Japan
2012/6/1-2018/3/31	U. Tsukuba, PhD Candidate	Japan	U. Tokyo , JSPS fellow,	Japan	U. Tokyo, JSPS fellow,	Japan
2012/7/1 -2014/3/31	Keio U., Postdoc fellow	Japan	Sapporo Sacred Heart Sch., Teacher	Japan	Sapporo Sacred Heart Sch., Teacher	Japan
2012/10/1-2014/9/30 2015/8/1-2018/3/31	U. Tokyo, Postdoc fellow -	Japan	NIMS, Postdoc fellow NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan
2013/4/1 -2014/3/31	U. Tsukuba, PhD Candidate	Japan	Tokyo U. of Sc., Assistant professor	Japan	Tokyo U. of Sc., Junior Associate professor	Japan
2013/4/1 -2015/3/31	U. Tsukuba, Postdoc fellow	Japan	Tokyo U. of Agriculture & Tech., Assistant professor	Japan	Tokyo U. of Sc., Junior Associate professor	Japan
2013/4/1-2014/12/31 2016/3/1-2018/7/15	NIMS, Postdoc fellow Kent State U., Postdoc fellow	Japan USA	KENT State U., Postdoc fellow U. Tokyo, Project Assistant	USA	U. Tokyo, Project Assistant professor	Japan
2013/4/1-2017/3/31	Okayama U., JSPS student	Japan	Kyoto U., JSPS fellow	Japan	Osaka U., Assistant professor	Japan
2013/4/1-2018/1/31	Meiji U., PhD Candidate	Japan	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan
2013/4/1-2020/2/29	Meiji U., Student	Japan	Sony Corporation, Engineer	Japan	Sony Corporation, Engineer	Japan
2013/5/1-2017/3/31	NIMS, Postdoc fellow	Japan	NIMS, Postdoc researcher	Japan	NIMS, ICYS Researcher	Japan
2013/6/1 -2015/3/31	NIMS, Postdoc fellow	Japan	Tokyo U. of Sc., Postdoc fellow	Japan	NIMS, Permanent researcher	Japan
2013/6/1-2015/5/31	Inst. for Molecular Sc., Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan		
2013/8/1 -2016/3/31	NIMS, Postdoc fellow	Japan	Osaka U., Assistant professor	Japan	Osaka U. ISIR, Assistant professor	Japan
2014/4/1 -2015/3/31	Kumamoto U. Assistant professor	Japan	Kitakyushu Coll., Natl. Inst. Tech., Assistant professor	Japan	Kumamoto U., Assistant professor	Japan
2014/4/1 -2016/3/31	U. Tokyo, PhD Candidate	Japan	Tokyo Metropolitan U., Lecturer	Japan	Tokyo Metropolitan U., Associate professor	Japan
2014/4/1-2015/12/31	Hokkaido U., JSPS fellow	Japan	Sagami Chem. Res. C., Postdoc fellow	Japan	Sagami Chem. Res. Center, Postdoc researcher	Japan

2014/4/1-2016/10/31	Kyushu U., Researcher	Japan	AIST, Researcher	Japan	Kogakuin U., Assistant professor	Japan
2014/4/1-2017/3/31	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Koujunndo Chemical Lab. Co., Ltd., Researcher	Japan
2014/4/1-2018/3/31	Meiji U., PhD Candidate	Japan	Appl. Mat. Japan Inc., Researcher	Japan	Appl. Mat. Japan Inc., Researcher	Japan
2014/4/1-2018/3/31	UCLA, Postdoc fellow	USA	Tokyo Electron Ltd., Researcher	Japan	Tokyo Electron Kyushu Ltd., Researcher	Japan
2014/5/1-2014/11/30	U. Tokyo, PhD Candidate	Japan	Local Gov., Officer	Japan	Local Gov., Officer	Japan
2015/1/1-2017/9/30	U. Tokyo, Project Assistant professor	Japan	NIMS, Permanent researcher (Permanent researcher)	Japan	NIMS, Independent scientist (Permanent researcher)	Japan
2015/4/1-2017/12/31	RIKEN, Postdoc fellow	Japan	Kumamoto U., Assistant Processor	Japan	Kumamoto U., Assistant Processor	Japan
2015/4/1-2018/3/31	Technical U. of Berlin, Postdoc fellow	Germany	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan
2015/4/1-2018/3/31	U. Tsukuba, PhD Candidate	Japan	TEIJIN Ltd., Researcher	Japan	TEIJIN Ltd., Researcher	Japan
2015/5/1-2017/3/31	Natl. Inst. of Standards and Tech., Guest researcher	USA	NIMS, Postdoc fellow	Japan	NIMS, Engineer (Permanent researcher)	Japan
2016/4/1-2017/3/31	U. Tsukuba, Postdoc fellow	Japan	Kyushu Institute of Tech., Assistant professor	Japan	Kyushu Institute of Tech., Assistant professor	Japan
2016/4/1-2018/3/31	U. Tsukuba, Postdoc fellow	Japan	U. Tokyo, Academic Support staff	Japan	U. Tokyo, Academic Support Staff	Japan
2016/4/1-2019/3/31	Waseda U., Student	Japan	Sony Corporation, Engineer	Japan	Sony Corporation, Engineer	Japan
2016/4/1-2019/3/31	NIMS, Postdoc fellow	Japan	NIMS, JSPS fellow	Japan	NIMS, JSPS fellow	Japan
2016/4/1-2019/3/31	Waseda U., Student	Japan	SONY Corporation, Engineer	Japan	SONY Corporation, Engineer	Japan
2016/6/1-2019/3/31	U. Tsukuba, PhD Candidate	Japan	Zeon Corporation, N/A	Japan	Zeon Corporation, N/A	Japan
2016/10/1-2018/10/31	U. of Washington, Postdoc fellow	USA	NIMS, Independent scientist (Permanent researcher)	Japan	NIMS, Independent scientist (Permanent researcher)	Japan
2016/12/1-2017/10/31	Meiji U., Assistant professor	Japan	SUMSANG Japan Corporation, Researcher	Korea	SUMSANG Japan Corporation, Researcher	Japan
2017/1/1-2019/3/31	U. Tokyo, Project Research fellow	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan

2017/4/1-2018/3/31	U. Tokyo, PhD Candidate	Japan	TIT, Assistant professor	Japan	TIT, Assistant professor	Japan
2017/4/1-2019/3/31	NIMS, Postdoc fellow	Japan	Pico Therm Corporation, Engineer	Japan	Pico Therm Corporation, Engineer	Japan
2017/4/1-2019/3/31	U. Tsukuba, PhD Candidate	Japan	Panasonic Corporation, Engineer	Japan	Panasonic Corporation, Engineer	Japan
2017/4/1-2020/3/31	Meiji U., Student	Japan	Panasonic Corporation, Engineer	Japan	Panasonic Corporation, Engineer	Japan
2017/5/1-2018/3/31	U. Tokyo, PhD Candidate	Japan	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan
2017/9/1-2020/3/31	Tokyo U. of Sc., Student	Japan	Ricoh Company, Ltd., Engineer	Japan	Ricoh Company, Ltd., Engineer	Japan
2017/9/1-2020/3/31	Tokyo U. of Sc., Student	Japan	Canon Inc., Engineer	Japan	Canon Inc., Engineer	Japan
2018/3/1-2019/7/31	Seijo U., Project Assistant professor	Japan	U. Tokyo, Project Assistant professor	Japan	U. Tokyo, Project Assistant professor	Japan
2018/3/1-2020/3/31	U. Tokyo, JSPS Fellow	Japan	PI Crystal, Inc., Engineer	Japan	PI Crystal, Inc., Engineer	Japan
2018/4/1-2018/7/31	Kumamoto U., PhD Candidate	Japan	KIOXIA Corporation, Engineer	Japan	KIOXIA Corporation, N/A	Japan
2018/4/1-2019/3/31	Tokyo Metropolitan U., Postdoc fellow	Japan	Tokyo Metropolitan U., Project Assistant professor	Japan	Tokyo Metropolitan U., Project Assistant professor	Japan
2019/4/1-2020/3/31	U. Tokyo, PhD Candidate	Japan	U. Tokyo, JSPS fellow	Japan	U. Tokyo, JSPS fellow	Japan

Overseas Postdocs

Employment period	Position before employed at WPI center		Next position after WPI center		Position as of April 2020*		Nationality
	Position title, organization	Country where the organization is located	Position title, organization	Country where the organization is located	Position title, organization	Country where the organization is located	
2007/10/1-2009/10/24	Bergische U. Wuppertal, Humboldt Research Fellow	Germany	ADOCIA Lyon, Head of Chem. Team	France	ADOCIA Lyon, Head of Chem. Team, Project Leader	France	French
2007/10/1-2009/8/31	U. of S&T of China, Research assistant	China	AIST, Researcher	Japan	Osaka City U., Associate professor	Japan	Chinese
2007/12/1-2009/11/1	U. Bayreuth, Research Fellow	Germany	Ashapura Minechem Ltd., R&D Manager	India	Ashapura Minechem Ltd., R&D Manager	India	Indian
2008/1/1 -2009/5/31	U. Tsukuba, PhD Candidate	Japan	Japan Fine Ceramics Center, Senior researcher	Japan	Japan Fine Ceramics Center, Senior researcher	Japan	Chinese
2008/2/21-2008/3/31	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Madanapalle Inst. of Tech. & Sc., D. of Chem., Assistant professor & Head	India	Indian
2008/4/1 -2008/12/31	Ben-Gurion U., IIse Kartz C. for Meso & Nanoscale S&T , Postdoc	Israel	IACS, C. for Adv. Mat., Scientist	India	IACS, C. for Adv. Mat., Professor	India	Indian
2008/4/1 -2008/8/31	CAS, Postdoc fellow	China	Changchun Inst. of Appl. Chem., CAS, Professor	China	Changchun Inst. of Appl. Chem., CAS, Professor	China	Chinese
2008/4/1 -2009/7/22	U. Oxford, Material Sc., MSc by research	UK	Max Planck Inst. for Polymer Res., Postdoc fellow	Germany	UC Berkeley, Senior Research fellow	USA	Italian
2008/4/1 -2009/9/30	Imperial Coll. London, Postdoc fellow	UK	Panasonic Manufacturing UK Ltd., Fuel Cell R&D Engineer	UK	Panasonic Manufacturing, UK, Ltd. Team leader	UK	British
2008/4/1 -2010/2/16	Tohoku U., JST fellow	Japan	Uppsala U., Associate professor	Sweden	Uppsala U., Associate professor	Sweden	Swedish
2008/4/1 -2010/2/28	U. Tsukuba PhD Candidate	Japan	U. Alabama, MINT, Postdoc fellow	USA	First Solar Inc., Manufacturing Engineer	USA	Indian
2008/4/1 -2010/3/31	U. Heidelberg, Postdoc fellow	Germany	H.C.Starck Ltd., Associate Manager	Germany	H.C.Starck Ltd., Associate Manager	Germany	German
2008/4/1 -2010/3/31	RIKEN, JST CREST researcher	Japan	Tokyo U. of Sc., Associate professor	Japan	Kyoto U., CPIER, Researcher	Japan	Chinese
2008/4/1 -2010/3/31	TIT, Postdoc fellow	Japan	Committee of Zhejiang Qúzhōu High-Tech Park, Section Chief	China			Chinese
2008/4/1 -2010/8/31	U. Tokyo, Postdoc fellow	Japan	Shanghai Jiao Tong U., D. Phys. & Astronomy, Research fellow	China	Shanghai Jiao Tong U., Dept. Phys. & Astronomy, Professor	China	Chinese
2008/4/1 -2010/9/30	Brigham Young U., Analytical Chem., PhD Candidate	USA	NIMS, Postdoc fellow	Japan			American
2008/4/1 -2011/3/31	Indian Institute of Sc., PhD Candidate	India	Jawaharlal Nehru C. for Adv., Sc. Res. Faculty (Ramanujan fellow)	India	IISER Mohali, Assistant professor	India	Indian
2008/4/1 -2011/7/13	U. Tsukuba, PhD Candidate	Japan	Los Alamos Natl. Lab., Theoretical Div., Postdoc	USA	Los Alamos Natl. Lab., Theoretical Div., Staff Scientist	USA	Chinese
2008/4/1 -2012/3/31	Zhongxin International Semiconductor Develt. Co., Ltd,	China	Tianjin U., Associate professor	China	East China U. of S&T, Assistant Dean & Associate professor	China	Chinese
2008/6/1 -2011/3/31	Inst. of Metal Research, CAS, PhD Candidate	China	Ningbo Inst. Mat. Tech. &. Eng., CAS, Associate professor	China	Southwest Jiaotong U. Professor	China	Chinese

2008/6/16-2011/3/31	Peking U., D. of Elec., Postdoc fellow	China	MIT, Postdoc fellow	USA	Xiamen U., Minjiang Rivers Scholar Professor	China	Chinese
2008/7/1 -2009/7/1	Zhejiang U. Hangzhou, D. of Phys., Professor	China	Zhejiang U. Hangzhou, D. of Phys., Professor	China	Zhejiang U. Hangzhou, D. of Phys., Professor	China	Chinese
2008/7/1 -2011/3/31	AIST, JSPS fellow	Japan	Hebei U. of Tech., Sch. of Mat. Sc. & Eng., Professor	China	Soochow U., Coll. of Phys., Optronics. & Energy, Professor	China	Chinese
2008/7/15-2010/7/14	Nanyang Technological U., Postdoc fellow	Singapore	Griffith U., Environmental Futures Res. Inst., Research fellow	Australia	U. Jinan (UJN), Sch. of Phys. & Tech., Professor	China	Chinese
2008/7/15-2010/9/30	U. Karlsruhe, Visiting Scientist	Germany	Nanjing U. of Aeronautics and Astronautics, Professor	China	Nanjing U. of S&T, Inst. Optronics. & Nanomaterials, Professor, head	China	Chinese
2008/7/25-2010/10/31	Res. Inst. of Petroleum Industry, Researcher	Iran	Yazd U., Phys. D., Assistant professor	Iran	Yazd U., Phys. D., Associate professor	Iran	Iranian
2008/8/1 -2010/7/31	NIIST, Researcher	India	Gov. Medical Coll., D. of Neurology, Researcher	India	Shell Tech. C., Bangalore, Research scientist	India	Indian
2008/8/1 -2011/3/31	TIT, Postdoc fellow	Japan	Meiji U., Researcher	Japan	Qualtec Co., Ltd. Senior researcher	Japan	Chinese
2008/8/13-2010/8/12 2013/4/22-2014/8/8	IOP, CAS, Assistant professor IOP, CAS, Assistant professor	China	Inst. High Energy Phys., Assist.prof. IOP, Associate professor	China	IOP, S.K.L. Surface physics, Associate professor	China	Chinese
2008/8/20-2010/8/19	Defense Metallurgical Res. Lab., Scientist	India	Indira Gandhi C. for Atomic Research, Kalpakkam, Professor	India	ARCI, IITs Chennai, Regional Director	India	Indian
2008/8/28-2009/8/27	IOP, CAS, Postdoc	China	Wuhan Inst. of Phys.& Math., Associate professor	China	Wuhan Inst. of Phys.& Math., Associate professor	China	Chinese
2008/8/30-2010/12/15	Wuhan U., PhD Candidate	China	UC San Diego, Postdoc fellow	USA	U. of Electronic S&T of China, Professor	China	Chinese
2008/9/1 -2009/8/31	IOP, CAS, PhD Candidate	China	IOP, CAS, Associate professor	China	IOP, CAS, Professor	China	Chinese
2008/9/1 -2010/8/31	Shanghai Inst. of Ceramics, CAS, Researcher	China	U. South Australia, D. Information Tech., Research associate	Australia			Chinese
2008/9/1 -2011/3/31	Indian Inst. of Chem. Tech., Senior Research fellow	India	NIMS, Postdoc fellow	Japan	IITs Roorkee, Assistant professor	India	Indian
2008/9/1 -2011/3/31	CAS, Research associate	China	NIMS, ICYS researcher	Japan	Hefei Inst. of Phys. Sc., High Mag. Field Lab., Academic scientist	China	Chinese
2008/9/1 -2011/3/31	U. of Hyderabad, PhD Candidate	India	North Carolina State U., Postdoc	USA	Sastra U., Professor	India	Indian
2008/9/1 -2011/8/31	Inst. of Solid State Phys., CAS, Assistant professor	China	Fudan U., Professor	China	Fudan U., Professor	China	Chinese
2008/9/11-2010/9/10	Moscow State U., PhD Candidate	Russia	Agrorus Company-Ryazan, Leading engineer	Russia			Russian
2008/10/1-2009/10/18	Seoul Natl. U., Postdoc fellow	Korea	AIST, Researcher	Japan	Shanghai Jiatong U., Associate professor	China	Chinese
2008/10/1-2009/3/31	Tohoku U., Postdoc fellow	Japan	Southeast U., Professor	China	Southeast U., Processor	China	Chinese
2008/10/1-2009/3/31	Nanjing U., PhD Candidate.	China	Jiangsu U., Professor	China	IBN, Senior Research Scientist	Singapore	Chinese

2008/10/1-2009/6/30	TIT, JSPS fellow	Japan	Imperial Coll. London, D. Electrical & Elec. Eng., Postdoc fellow	UK	U. of CAS, Inst. of Semiconductors, Professor	China	Chinese
2008/10/6-2012/10/8	Changchun Inst. of Appl. Chem., Postdoc fellow	China	Changchun Inst.Appl.Chem., S.K.L. Electroanalytical Chem., Professor	China	Changchun Inst.Appl.Chem., S.K.L. Electroanalytical Chem., Professor	China	Chinese
2008/11/10-2011/3/31	Shanghai Inst. of Ceramics, Assistant researcher	China	Kochi U., Postdoc fellow	Japan	Hebei U. Tech., Sch. of Mat. Sc. & Eng., Associate professor	China	Chinese
2008/11/1-2009/3/31	China U. of Petroleum, Assistant professor	China	Tsinghua U., Assistant professor	China	China U. of Petroleum-Beijing, Professor	China	Chinese
2008/11/1-2009/8/31	The Chinese U. of Hong Kong, Postdoc fellow	China	HUST, S.K.L. Mat. Proc. and Die & Mold Tech., Associate professor	China	HUST, S.K.L. Mat. Proc. and Die & Mold Tech., Professor	China	Chinese
2008/11/1-2011/3/31	Yokohama Natl. U., JSPS fellow	Japan	ARCI, Leader	India	TAS IICT-Hyderabad, QRS Scientist	India	Indian
2008/12/1-2010/3/30	Zhejiang Univ, S.K.L. of Silicon Mat., PhD Candidate	China	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan	Chinese
2008/12/2-2009/11/13	Sungkyunkwan U., Senior researcher	Korea	Samsung Elec. Co., Ltd., Researcher	Korea	Samsung Elec. Co., Ltd., N/A	Korea	Korean
2009/2/1 -2010/7/31	Saha Inst. of Nuclear Phys., Postdoc fellow	India	Visva-Bharati U., D. of Phys., Assistant professor	India	Visva-Bharati U., D. of Phys., Professor	India	Indian
2009/3/1 -2010/4/30	Autonomous U. of Barcelona, Assistant professor	Spain	Max Planck Inst., Intelligent Systems, Group leader	Germany	Institue for Bioengineering of Catalonia, Professor	Spain	Spanish
2009/3/16-2011/10/31	Lanzhou Inst. of Chem. Phys., CAS, PhD Candidate	China	Lanzhou U., Professor	China	Lanzhou Inst. of Chem. Phys.,CAS, Professor	China	Chinese
2009/3/3 -2011/3/4	U. of Aveiro, D. of Chem., Postdoc fellow	Portugal	Jilin U., Associate professor	China	Jilin U., Associate professor	China	Chinese
2009/4/1 -2009/9/30	Bhabha Atomic Res. C., Scientific Officer	India	Bhabha Atomic Res. C., Scientific Officer	India	Bhabha Atomic Res. C., Scientific officer & Assistant professor	India	Indian
2009/4/1 -2010/3/31	U. Tokyo, JSPS Fellow	Japan	Korea Institute of Energy Research, Professor	Korea	Dongguk U., Professor	Korea	Italian
2009/4/1 -2010/3/31	IITs, Senior project associate	India	Nagoya Inst. of Tech., VBL Postdoc fellow	Japan			Indian
2009/4/1 -2011/3/31	Natl. U. Singapore, Postdoc fellow	Singapore	Inst. of Process Eng., CAS, Researcher	China	U. of CAS, Professor	China	Chinese
2009/4/1 -2012/3/31	Monash U., Postdoc fellow	Australia	Helmholtz-Zentrum Geesthacht, Scientist	Germany	Brunel U. London, Head of Academic Affairs, Reader	UK	Australian
2009/5/1 -2010/3/31	AIST, Postdoc fellow	Japan	South China Normal U., Professor	China	South China Normal U., Professor	China	Chinese
2009/5/1 -2012/3/31	Shizuoka U., Researcher	Japan	Shouxihu, Yangzhou U., Chem.& Chem. Eng., Assistant professor	China	Yangzhou U., Associate professor	China	Chinese
2009/5/1 -2014/4/30	Jabalpur U., Surface Phys. D., PhD Candidate	India	Tohoku U., Research assistant	Japan	Central U. of South Bihar, UGC Assistant professor	India	Indian
2009/6/1 -2011/5/31	Inst. of Solid State Phys., CAS, Research Fellow	China	Kyoto U., Postdoc fellow	Japan	Qufu Normal U., Sch. of Phys. & Phys Eng., Associate professor	China	Chinese

2009/6/6 -2011/5/31	U. Rome, D. of Chem. S&T, Postdoc fellow	Italy	U. of Rome, Postdoc fellow	Italy	Kings Coll. London, Researcher	UK	Italian
2009/7/1 -2010/12/31	UC Santa Barbara, Postdoc fellow	USA	LIM Innovations, Chief Technology Officer	USA	Global Tech. Connection, Managing Engineer	USA	American
2009/7/1 -2012/3/31	Jawaharlal Nehru U., Raman Res. Inst., PhD Candidate	India	NIMS, Postdoc fellow	Japan	IITs Patna, Assistant professor	India	Indian
2009/7/15-2010/7/14	Autonomous U. of Barcelona, Postdoc fellow	Spain	Nanyang Technological U., Postdoc fellow	Singapore	Nanyang Technological U. Sc. Phys. & Math. Sc., Senior lecturer	Singapore	Italian
2009/7/27-2012/10/31	Nanyang Technological U., Div. of Phys. & Appl. Phys., Postdoc fellow	Singapore	Changchun Inst. of Optics, Fine Mechanics and Phys., Professor	China	Changchun Inst. of Optics, Fine Mechanics and Phys., Professor	China	Chinese
2009/8/1 -2011/3/31	Indian Inst. of Chem. Tech., Senior Research Fellow	India	UC Berkeley, Postdoc fellow	USA	Deckman Coulter, Senior Development Scientist	USA	Indian
2009/8/1 -2014/7/31	Institute of Phys., CAS, PhD Candidate	China	U. of Strasbourg, Nanochemistry Lab., Postdoc fellow	France	Nanjing U., Sch. of Electronic Sc. & Eng., Associate professor	China	Chinese
2009/8/15-2010/8/14	U. Oxford, Postdoc fellow	UK	U. Tsukuba, Project Associate professor	Japan	Ochanomizu U., Project Associate professor	Japan	British
2009/9/1 -2012/8/31	U. of S&T, D. of Mat. Sc. & Eng., PhD Candidate	China	Xi'an Technological U., Assistant professor	China	King Abdullah U. of S&T, Research Scientist	Saudi Arabia	Chinese
2009/9/4 -2011/9/3	AIST, Postdoc Fellow	Japan	NIMS, Permanent Researcher	Japan	Nanjing U. of S&T, Sch. Mat. Sc. & Eng., Professor	China	Chinese
2009/10/1-2011/3/31	Nanjing U., PhD Candidate	China	NIMS, Postdoc fellow	Japan	CNST/UMD, NIST Postdoc Associate	USA	Chinese
2009/10/1-2013/11/15	AIST, Postdoc Fellow	Japan	Natl. C. for Nanoscience & Tech. China, Associate professor	China	Natl. C. for Nanoscience & Tech. China, Associate professor	China	Chinese
2009/10/1-2012/9/30	Osaka U., JSPS fellow	Japan	U. Tokyo, Project Assistant professor	Japan	Natl. Inst. of Information and Communications Tech., Researcher	Japan	Korean
2009/10/1-2012/9/30	Max Planck Inst. of Colloids and Interfaces, Postdoc fellow	Germany	Southeast U., Sch. of Chem. & Chem. Eng., Professor	China	Southeast U., Sch. of Chem. & Chem. Eng., Professor	China	Chinese
2010/1/1 -2013/1/11	Cornell U., Postdoc fellow	USA	Changchun Inst. of Appl. Chem., N/A	China	Changchun Inst. Appl. Chem., Professor	China	Chinese
2010/3/1 -2010/3/31	IITs, PhD Candidate	India	Tohoku U., JSPS fellow	Japan	CSIR-Central Electrochemical Res. Inst., Karaikudi, Scientist	India	Indian
2010/3/15-2013/1/9	IOP Chem. Cordoba, Postdoc fellow	Argentine	UC Berkeley, Postdoc	USA	Natl. U. of Cordoba, Assistant professor	Argentina	Argentine
2010/4/1 -2011/3/31	Saitama U., PhD Candidate	Japan	U. of Nova Gorica, Marie Curie fellow	Slovenia	U. of Nova Gorica, Associate professor	Slovenia	Bulgarian
2010/4/1 -2011/3/31	IOP, CAS, PhD Candidate	China	U. Oxford, Postdoc	UK	Shanghai Tech. U. Shanghai, Assistant professor	China	Chinese
2010/4/1 -2011/9/30	Osaka U., Associate professor	Japan	CSIR-Indian Institute of Chem. Tech., Scientist	India	CSIR-Indian Institute of Chem. Tech., Scientist	India	Indian
2010/4/1 -2012/3/31	U. Tsukuba, PhD Candidate	Japan	U. of New South Wales, Research Associate	Australia	U. of Tech. Sydney, Postdoc fellow	Australia	Chinese
2010/4/1 -2012/4/30	Stanford U., Mat. Sc. & Eng., Postdoc fellow	USA	Korea Res. Inst. of Standards and Sc., Senior researcher	Korea	Korea Res. Inst. of Standards and Sc., Senior researcher	Korea	Korean

2010/4/1 -2012/7/31	Yokohama Natl. U., Postdoc fellow	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan	Nepalese
2010/4/1 -2012/9/30	The Chinese U. of Hong Kong, Research assistant	China	Sun Yat-Sen U., Sch. of Phys.& Eng., Associate professor	China	Sun Yat-Sen U., Sch. of Phys. & Eng., Associate professor	China	Chinese
2010/4/1 -2013/3/31	RIKEN, JST researcher	Japan	Tokyo Metropolitan U., Assistant Processor	Japan			Jordanian
2010/4/1 -2013/3/31	GIT., Sch. Mat. Sc. & Eng., PhD Candidate	USA	TIT, Postdoc fellow	Japan	TIT, Sch. of Eng., Adjunct Assistant professor	Japan	Chinese
2010/4/5 -2015/8/31	Jawaharlal Nehru C. for Adv. Sc. & Res., PhD Candidate	India	IISER Tirupati, D. of Phys., Assistant professor	India	IISER Tirupati, D. of Phys., Assistant professor	India	Indian
2010/5/1 -2012/3/31	Warsaw U. of Tech., Postdoc fellow	Poland	Warsaw U. of Tech., Research assistant	Poland	Warsaw U. Tech., Mat. Design Div., Staff	Poland	Polish
2010/5/1 -2012/4/30	Tohoku U., Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Samsung SDI, Principal Engineer	Korea	Korean
2010/5/16-2011/3/31	Huazhong Normal U., PhD Candidate	China	Hebei U. of Tech., Sch. of Mat. Sc. & Eng., Professor	China	Hebei U. Tech., Sch. of Mat. Sc. & Eng., Professor	China	Chinese
2010/6/1 -2012/3/31	U. of Pennsylvania, Phys. Chem. Biomaterials, Postdoc fellow	USA	IITs Mandi, Assistant professor	India	IITs Mandi, Associate Dean, Associate professor	India	Indian
2010/7/1 -2011/6/30	Yangzhou U., D. of Chem., Teacher	China	Yangzhou U., Coll. of Chem. & Chem. Eng., Associate professor	China	Yangzhou U., Coll. of Chem. Chem. Eng., Associate professor	China	Chinese
2010/8/1 -2011/7/31	U. of Washington, D. of Bioengineering, Postdoc Fellow	USA	Stratos Genomics Inc., Scientist	USA	Quantitative Scientific Solutions, Lead scientist	USA	American
2010/8/1 -2013/7/31	U. Tsukuba, PhD Candidate	Japan	Ulsan Natl. Inst. of S&T, Researcher	Korea	Wuhan U. of Tech., C. for Smart Mat. & Device, Professor	China	Chinese
2010/8/1 -2013/7/31	Shanghai Inst. of Ceramics, CAS, PhD Candidate	China	Huazhong U. S&T, Sch. of Mat. S&T, Associate professor	China	Huazhong U. S&T, Sch. of Mat. S&T, Associate professor	China	Chinese
2010/8/1 -2014/4/30	U. Tsukuba, PhD Candidate	Japan	Soochow U., Coll. of Chem., Chem. Eng.. & Mat. Sc., Professor	China	Soochow U., Coll. of Chem., Chem. Eng. & Mat. Sc., Professor	China	Chinese
2010/8/3 -2012/6/30	U. of Rome, PhD Candidate	Italy	Osaka U., Postdoc fellow	Japan	Xi'an Jiaotong U., Associate professor	China	Italian
2010/8/14-2011/3/31	U. Poitiers & Istanbul Tech. U., PhD Scholarship from French Gov.	Turkey	Istanbul Technical U., Research Assistant	turkey	Istanbul Tech. U., D. of Chem., Associate professor	Turkey	Turkish
2010/8/20-2012/8/19	Nanyang Tech. U., Temasek Lab., Research Assistant	Singapore	Nanyang Tech. U., Research Fellow	Singapore	Stamford Sch., Executive Board Member	Singapore	Indonesian
2010/9/1 -2011/3/31	TIT, Postdoc fellow	Japan	Nanjing U. of S&T, Researcher	China	Nanjing U. of S&T, Inst. Optoelect.& Nanomat., Associate professor	China	Chinese
2010/9/1 -2012/3/31	Shivaji U., D. of Phys., PhD Candidate	India	The U. of Queensland, Postdoc fellow	Australia	Qatar Env. and Energy Res. Inst., Scientist	Qatar	Indian
2010/9/1 -2013/8/31	Inst. of Chem., CAS, PhD Candidate	China	Huazhong U. of S&T, Professor	China	Huazhong U. of S&T, Professor	China	Chinese
2010/9/1 -2015/3/31	NIMS, Postdoc fellow	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan	Chinese

2010/9/10-2012/12/8	Heidelberg U., PhD Candidate	Germany	Vietnam Academy of S&T, Inst. Mat. Coresearcher	Vietnam	Vietnam Academy of S&T, Inst. Mat. Sc., Permanent researcher	Vietnam	Vietnamese
2010/9/27-2012/6/23	Washington State U., Research assistant	USA	NIH, Maryland, NRC Research Associate	USA	Evonik Co., Ltd., Scientist	USA	Indian
2010/10/1-2013/6/21	Beihang U., PhD Candidate	China	NIMS, Postdoc fellow	Japan	Beihang U., C. of Condensed Matter & Mat. Phys., Associate professor	China	Chinese
2010/10/1-2013/9/30	Inst. of Chem., CAS, PhD Candidate	China	NIMS, ICYS Researcher	Japan	Beijing Jiaotong U., D. of Phys., Sch. of Sc., Professor	China	Chinese
2010/10/1-2013/9/30	IOP, CAS, Beijing Lab. for Condensed Matter Phys.,	China	Meiji U., Postdoc fellow	Japan	IOP, CAS, Associate professor	China	Chinese
2010/10/11-2012/10/10	Loughborough U., PhD Candidate	UK	NIMS, Postdoc fellow	Japan	Inst. Charles Gerhardt Montpellier, Engineer	France	Spanish
2010/11/18-2013/11/17	Charles U., D. of Macromolecular Phys., Research associate	Czech Republic	NIMS, Postdoc fellow	Japan	NIMS, Independent scientist (Permanent Position)	Japan	Czech
2010/12/15-2012/4/30	Nagoya U., Postdoc fellow	Japan	Inst. of Proc. & Eng., CAS, Professor	China	Inst. of Proc. & Eng., CAS, Professor	China	Chinese
2011/1/1 -2011/5/31	ETH-Zurich, Senior Scientist, Group leader	Switzerland	MIT, Senior Scientist	USA	ETH Zurich, Professor	Switzerland	Swiss
2011/2/1 -2011/5/31	Revolt Tech. Ltd., Chief Engineer	UK	Revolt Tech. Ltd., N/A	UK	MIT, Research Engineer	USA	German
2011/2/1 -2013/1/31	French Atomic Energy Commission, Research Engineer	France	Shiv Nadar U., D. of Phys., Assistant professor	India	Shiv Nadar U., D. of Phys., Assistant professor	India	Indian
2011/4/1 -2011/10/13	U. of S&T of China, PhD Candidate	China	Hefei U. of Tech., Professor	China	Fujian Inst. of Res. on the Structure of Matter, Professor	China	Chinese
2011/4/1 -2011/9/14	Peking U., PhD Candidate	China	Peking U., Assistant professor	China	Peking U., Assistant professor	China	Chinese
2011/4/1 -2013/3/31	Ibaraki U., Postdoc fellow	Japan	Natl. Inst. of Tech., D. of Phys., Assistant professor	India	Shiv Nadar U. D. of Phys., Assistant professor	India	Indian
2011/4/1 -2014/1/31	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Lanzhou U., Sch. of Phys. S&T, Professor	China	Chinese
2011/4/1 -2014/6/18	Institute of Physics, Prague, Research assistant	Czech Republic	Institute of Physics,Prage, Optics D., Research Assistant	Czech Republic	Kanazawa U., WPI-Nano Life Sc. Inst., Assistant professor	Japan	Russian
2011/5/1 -2012/4/30	Korea Institute of S&T, Postdoc fellow	Korea	U. of Puerto Rico, Postdoc fellow	Puerto Rico	U. of Bayreuth, Postdoc researcher	Germany	Indian
2011/5/1 -2013/4/30	Shandong U., PhD Candidate	China	NIMS, Postdoc fellow	Japan	Shandong U., Sch. of Mat. Sci. & Eng., Associate professor	China	Chinese
2011/5/9 -2013/5/8	Shaoxing U., Phys. D., Lecturer	China	Shaoxing U., Phys. D., Associate professor	China	Shaoxing U., Math. Phys. & Information Sc., Professor	China	Chinese
2011/6/16-2012/6/15	Warsaw U. of Tech., PhD Candidate	Poland	Warsaw U. of Tech., Researcher	Poland	Warsaw U. of Tech., Researcher	Poland	Polish
2011/7/1 -2011/11/30	U. of Bristol, Royal Society U., Research fellow	UK	U. of Bristol, Assistant professor	UK	U. of Bristol, Professor	UK	British
2011/7/1 -2012/8/31	U. of Hong Kong, Research assistant	Hong Kong	U. of Sheffield, Sheffield Inst. for Translational Neuroscience Postdoc	UK			Hong-Kong

2011/9/5 -2015/9/4	NIMS, JSPS fellow	Japan	Herbert Gleiter Inst. Nanoscience, Nanjing U. of S&T, Professor	China	Herbert Gleiter Inst. Nanoscience, Nanjing U.of S&T, Prof., Junior PI	China	Chinese
2011/9/20-2013/8/31	IIS Bangalore, Research Associate	India	IIS Bangalore, Research Associate	India	Mount Carmel Coll., Bangalore, D. Chem. Co-Ordinator	India	Indian
2011/10/1-2013/2/28	East China Normal U., Graduate researcher	China	Melbourne Sch. of Eng.(MSE), U. of Melbourne, Research fellow	Australia	East China Normal U., D. of Phys., Associate professor	China	Chinese
2011/10/1-2013/7/29	Hong Kong Product. Council, Mat. Tech. Div., Associate consultant	Hong Kong	Nano & Adv. Mat. Inst. Ltd., Assistant Technical Manager	China	Hong Kong Gov., Manager	China	Hong-Kong
2011/10/1-2014/9/1	Hunan U., PhD Candidate	China	Temple U., Assistant professor	USA	Temple U. Assistant professor	USA	Chinese
2011/11/1-2013/10/31	Okayama U., PhD Candidate	Japan	NIMS, Postdoc fellow	Japan	Taiyuan U. of Tech., Professor	China	Chinese
2011/11/1-2013/10/31	Katholieke U., Wim Dehaen Lab., Assistant Doctor	Belgium	U. of Southampton, Research fellow	UK	Janssen Pharmaceutical Co. of Johnson & Johnson, Staff Engineer	Belgium	Belgian
2011/11/13-2013/3/31	U. of Rome, Vergata, PhD Candidate	Italy	St. Anne's U.Hospital Brno, Internatl. Clinical Res. C., Junior	Czech Republic	International Clinical Res. C., Senior researcher	Czech Republic	Italian
2011/11/29-2013/11/28	U. of Bordeaux, Physical-Chem., PhD Candidate	France	Erdyn Consultants, Consultant	France	Chez ASI, Data consultant,	France	French
2011/12/1-2012/11/30	GLOBALFOUNDRIES Singapore Pte. Ltd., Senior Engineer	Singapore	Intellectual Property Office of Singapore, Officer	Singapore	Intellectual Property Office of Singapore, Officer	Singapore	Singaporean
2011/12/1-2013/8/31	Grenoble U., Inst. of Tech., Grenoble, PhD Candidate	France	Dongguk U., D. of Energy & Mat. Eng., Assistant professor	Korea	Nanjing U. of Posts and Telecommunications, Professor	China	Chinese
2011/12/1-2014/1/31	U. of Oregon, Postdoc fellow	USA	IBN, Research Scientist	Singapore	Kalasalingam U., C. Supramolecular Chem., Professor	India	Indian
2011/12/1-2015/2/28	NIMS, Postdoc fellow	Japan	Qatar Foundation, Senior Scientist	Qatar	Hamid Bin Khalifa U., Qatar Env. & Energy Res. Inst., Associate professor	Qatar	Algerian
2011/12/1-2015/4/30	Saga U., PhD Candidate	Japan	NIMS, JSPS fellow	Japan	North Carolina Agricultural and Technical State U., Assistant professor	USA	Indian
2012/01/01-2012/12/31	Shanghai Jiao Tong U., Assistant researcher	China	Max Planck Inst. of Colloids & Interfaces, D. Colloid Chem.,	Germany	Shanghai Jiaotong U., Associate professor	China	Chinese
2012/1/10-2013/3/31	GIT., Sch. of Chem. & Biomolecular Eng., Postdoc fellow	USA	U. Tokyo, Assistant professor	Japan	NIMS, Permanent researcher	Japan	Thai
2012/4/1 -2012/9/14	U. Rome, D. of Chem. S&T, PhD Candidate	Italy	U. of Liverpool, Research assistant	UK			Italian
2012/4/1 -2013/12/27	Katholieke Universiteit Leuven, PhD Candidate	Belgium	Procter & Gamble, Administrative project assistant	Belgium	Avery Dennison Industry, Product Development Engineer	Belgium	Belgian
2012/4/1 -2014/11/30	U. Tsukuba, PhD Candidate	Japan	NIMS, JSPS fellow	Japan	Trinity Coll. Dublin, Group leader	Ireland	Iranian
2012/4/1 -2014/6/30	NIMS, Postdoc fellow	Japan	NIMS, Independent Scientist (Permanent Position)	Japan	NIMS, Permanent researcher	Japan	Chinese
2012/4/1 -2015/8/31	Natl. C. for Nanoscience and Tech. of China, N/A	China	Natl. C. for Nanoscience & Tech. of China, Assistant professor	China	Natl. C. for Nanoscience &Tech. of China, Assistant professor	China	Chinese
2012/4/11-2019/7/8	NIMS, Postdoc fellow	Japan	SAL Silicon Austria Lab., Senior system scientist	Austria	SAL Silicon Austria Lab., Senior System Scientist	Austria	Vietnamese

2012/5/1 -2013/6/30	Warsaw U. of Tech., Mat. Sci.& Eng., PhD Candidate	Poland	Warsaw U. of Tech., Research Fellow	Poland	Warsaw U. of Tech,, Scientific and Technical Staff	Poland	Polish
2012/6/20-2014/5/31	Huazhong U. of S&T, Assistant professor	China	Hebei U. of Tech., Sch. of Mat. Sc. & Eng., Associate professor	China	Hebei U. of Tech., Mat. Sc. & Eng., Associate professor	China	Chinese
2012/8/1 -2014/7/31	Flinders U., PhD Candidate	Australia	U. Nottingham, Postdoc fellow	UK	Self-employed, Communications & Eng., Agreement Specialist	Australia	Australian
2012/10/1-2013/7/29	Natl. Taiwan U., D. of Chem. Eng., Postdoc fellow	Taiwan	Natl. Taiwan U., Postdoc fellow	Taiwan	AIST, Researcher	Japan	Taiwanese
2012/10/1-2014/3/31	Korea U., PhD Candidate	Korea	Samsung Co., Ltd., Engineer	Korea	Samsung Co., Ltd., Engineer	Korea	Korean
2012/10/1-2014/7/29	U. of Hyderabad, PhD Candidate	India	Bharathidasan U., DST-Inspire, Faculty member	India	Bharathidasan U., DST-Inspire faculty member	India	Indian
2012/10/1-2016/8/31	NIMS, JSPS Fellow	Japan	Beijing Jiaotong U., Professor	China	Beijing Jiaotong U., Professor	China	Chinese
2012/11/1-2013/10/31	IOP, CAS, Postdoc fellow	China	Shandon U., Assistant researcher	China	Shandon U., Associate researcher	China	Chinese
2012/11/1-2014/10/31	Colorado State U., Postdoc fellow	USA	IITs Kanpur, D. of Chem., Postdoc fellow	India	D. Humanities & Sc., Guru Nanak Inst. of Tech., Assistant professor	India	Indian
2012/11/1-2014/10/31	NIMS, Postdoc fellow	Japan	Beijing Inst. of Nanoenergy & Nanosystems, Postdoc fellow	China			Chinese
2012/11/1-2014/11/1	Nanjing U., Assistant professor	China	Nanjing U., Assistant professor	China	Nanjing U., Sch. of Phys., Senior Engineer	China	Chinese
2012/11/1-2015/4/30	TIT, PhD Candidate	Japan	Private company, N/A	Japan			Chinese
2012/11/1-2015/9/10	Natl. U. Singapore, PhD Candidate	Singapore	Nanyang Tech. U., Postdoc fellow	China	NCFS, Res. & Risk Assessment D. Researcher	Singapore	Singaporean
2012/11/12-2013/10/31	U. Sydney, PhD Candidate	Australia	U. Sydney, Research Associate	Australia			Chinese
2012/11/5-2013/5/31	U. Cambridge, Cavendish Lab., PhD Candidate	UK	Dongguk U., Research Professor	Korea	Sun Yat-en U., Professor	China	Chinese
2013/1/15-2014/1/20	Inst. of Electrophysics, Natl. Chiao Tung U., Postdoc fellow	Taiwan	Natl. Chung-Hsing U., D. of Phys., Assistant professor	Taiwan	Natl. Chung-Hsing U., D. of Phys., Associate professor	Taiwan	Chinese
2013/1/7 -2013/8/17	Natl. Taiwan U., Associate professor	Taiwan	Natl. Taiwan U., Associate professor	Taiwan	Natl. Taiwan U., Professor	Taiwan	Taiwanese
2013/2/1 -2013/12/27	Fujian Inst. of Res. on Structure of Matter, CAS, Postdoc fellow	China	State U. New Jersey, Postdoc fellow	USA			Chinese
2013/2/1 -2013/7/31	Dublin City U., Postdoc fellow	Ireland	Natl. Biophotonics & Imaging Platform Ireland, Technical Officer	Ireland	Osmania U., Assistant professor	India	Indian
2013/2/1 -2013/8/31	U. of Bristol, EPSRC Adv. Research fellow	UK	U. Bath, D. of Chem., Researcher	UK	U. Bath, D. of Chem., Senior researcher	UK	British
2013/2/1 -2014/2/28	Budapest U. of Tech. & Economics, PhD Candidate	Hungary	CNRS, Postdoc fellow	France	ams AG (Austria Mikro System) Co., Ltd., R&D Staff Engineer	Switzerland	Hungarian
2013/4/1 -2013/6/30 2015/10/1-2017/3/31	Changchun Inst.Adv.Chem., Postdoc NIMS, Postdoc fellow	China Japan	NIMS, JSPS Fellow NTU, Mat. Sc. & Eng., Postdoc	Japan Singapore	Beijing Institute of Tech., Professor	China	Chinese

2013/4/1 -2014/3/31 2017/5/1-2019/6/30	Jadavpur U., PhD Candidate Sun Yat-Sen U., Postdoc fellow	India China	Bose Inst., Honorary researcher NIMS, Postdoc fellow	India Japan	NIMS, Postdoc fellow	Japan	Indian
2013/4/1 -2014/3/31	U. Montreal, Research assistant	Canada	BIOASTRA Technologies Inc., Platform leader	Canada	TALLC Corporation, Senior Scientist	Canada	Polish
2013/4/1 -2014/3/31	Waseda U., PhD Candidate	Japan	NIMS, ICYS researcher	Japan	Nanjing U., Sch. of Eng. & Appl. Sc., Professor	China	Chinese
2013/4/1 -2015/3/31	U. Tokyo , Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Tianjin U., Sch. Chem. Eng. & Tech., Associate professor	China	Chinese
2013/4/1 -2015/3/31	NIMS, Postdoc fellow	Japan	Natl. Inst. of Tech., Nagaland, Assistant professor	India	Natl, Inst. of Tech., Nagaland, Assistant professor	India	Indian
2013/4/1 -2015/9/30	U. Western Ontario, Postdoc fellow	Canada	NIMS, Postdoc fellow	Japan	Nanjing U. of Aeronautics & Aeronautics, Professor	Japan	Chinese
2013/4/1 -2016/3/31	Ningbo Inst. Mat. Tech.& Eng., Postdoc	China	Soochow U., Postdoc fellow	China	Ningbo Inst. of Mat. Sc. & Eng., Associate professor	China	Chinese
2013/4/1-2018/3/31	U. Tsukuba, Student	Japan	Hitachi High-Tech GLOBAL Corporation, Researcher	Japan	Hitachi High-Tech GLOBAL Corporation, Product developer	Japan	Korean
2013/5/1 -2015/3/31	Hong Kong Polytechnic U., N/A	Hong Kong	Kansei Gakuin U., JSPS Fellow	Japan	Cardiff U., Sch. of Phys. & Astronomy, Lecturer	UK	Chinese
2013/5/1 -2015/4/24	U. Groningen, PhD Candidate	Netherland	Natl. U. Singapore, D. of Phys., Research fellow	Singapore	Natl. U. Singapore, D. of Phys., Research fellow	Singapore	Indonesian
2013/5/1-2017/6/30	Hanyang U., Research Assistant professor	Korea	NIMS, Postdoc fellow	Japan	Keio U., Graduate Sch. of Media & Governance, Associate professor	Japan	Korean
2013/6/1 -2015/8/31	U. Hong Kong, Postdoc fellow	Hong Kong	Harbin Inst. of Tech., Professor	China	Harbin Inst. of Tech., Professor	China	Chinese
2013/9/1 -2014/8/31	Soochow U., Inst. of Functional Nano & Soft Mat., Lecturer	China	Soochow U., Inst. of Functional Nano & Soft Mat., Lecturer	China	Soochow U., Inst. of Functional Nano & Soft Mat., Associate professor	China	Chinese
2013/9/1 -2018/9/30	Helmholtz-Zentrum Berlin, Postdoc	Germany	U. Groningen, Research technician	Netherland	U. Groningen, Research Technician	Netherland	German
2013/9/1-2016/8/31 2017/3/1-2018/5/31	Freie U. Berlin, Postdoc fellow Freie U. Berlin, Humboldt Postdoc	Germany	Texas A&M U., Invited fellow NIMS, Postdoc fellow	USA Japan	NIMS, Postdoc fellow	Japan	Belgians
2013/9/1-2019/3/6	Waseda U., Student	Japan	East China Normal U., Researcher	China	East China Normal U., Researcher	China	Chinese
2013/10/1-2014/9/30	Hokkaido U., Postdoc fellow	Japan	Harima Chem. Industry , Researcher	Japan	Harima Chem. Industry , N/A	Japan	Chinese
2013/10/1-2015/9/30	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	SEMES Co., Ltd., Staff engineer	Korea	Korean
2013/10/1-2017/10/19	Shivaji U., Postdoc Fellow	India	CSIR-Central Electrochemical Res. Inst., Researcher	India	IITs Jummu, Group leader	India	Indian
2013/10/1-2017/3/31	IACS, Research Associate	India	NIMS, Postdoc fellow	Japan	BITS Pilani, Hyderabad, Assistant professor	India	Indian
2013/10/1-2017/6/30	Waseda U., PhD Candidate	Japan	Nanjing U., Eng. & Appl. Sc. D., Researcher	China	Nanjing U., Eng. & Appl. Sc. D., Researcher	China	Chinese

2013/11/18-2014/12/31 2015/1/1-2017/12/18	U. Strasbourg, Postdoc fellow -	France Japan	NIMS, ICYS Researcher Trinity Coll. Dublin, Research Fellow	Japan -	U. Montpellier, ICGM Associate professor	France	French
2014/1/1 -2015/7/31	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan			Czech Republic
2014/1/1 -2015/7/31	Natl. Thing Hua U., Postdoc fellow	Taiwan	CSIR-Central Electrochemical Research Institute, Researcher	India	IITs Jammu, Assistant professor	India	Indian
2014/2/1-2016/7/13	U. Cambridge, Research Associate,	UK	U. Oxford, Glasstone research fellow	UK	U. Birmingham, Lecturer	UK	British
2014/2/1-2017/3/31	Institute Curie, Postdoc fellow	France	Aalto U., Sch. of S&T, Senior Postdoc Fellow	Finland	Aalto U., Senior Postdoc Fellow	Finland	French
2014/3/1 -2015/2/28	U. Würzburg, Humboldt fellow	Germany	Jinan U., Inst. of Photonics Tech., Professor	China	Jinan U., Inst. of Photonics Tech., Professor	China	Chinese
2014/3/1 -2015/2/28	U. Cambridge, PhD Candidate	UK	Natl. Sun Yat-sen U., Assistant professor	Taiwan	Natl. Sun Yat-sen U., Assistant professor	Taiwan	Taiwanese
2014/3/10-2016/3/9	DICP, S.K.L. Catalysis, PhD Candidate	China	Beijing Inst. of Tech., Associate professor	China	Beijing Inst. of Tech., Sch. of Mat. Sci. & Eng., Associate professor	China	Chinese
2014/3/1-2017/2/28	IITs Khaaragpur, PhD Candidate	India	Aalt U., Postdoc fellow	Finland	Aalt U., Postdoc fellow	Finland	Indian
2014/4/1 -2014/9/30	U. Tokyo, Postdoc fellow	Japan	East China Normal U., Shanghai, Dept. of Phys., Associate professor	China	East China Normal U. Shanghai, D. of Phys., Associate professor	China	Chinese
2014/4/1 -2015/3/31	Nagoya U., Postdoc fellow	Japan	BML Corporation, Engineer	Japan	COVANCE Inc., MSE	Japan	Chinese
2014/4/1 -2016/2/29	Natl. Inst. of Natural Sc., PhD Candidate	Japan	Huazhong U. of S&T, Associate professor	China	Huazhong U. of S&T, Associate professor	China	Chinese
2014/4/10-2018/3/31	Vellore Inst. of Tech., Postdoc fellow	India	VIT Bhopal U., Assistant professor	India	VIT Bhopal U., Assistant professor	India	Indian
2014/4/1-2016/11/30	Kwangwoon U., Postdoc fellow	Korea	Samsung Adv. Inst. of Tech., Researcher	Korea	Samsung Adv. Inst. of Tech., Researcher	Korea	Korean
2014/4/1-2017/3/31	IACS, PhD Candidate	India	Nanyang Tech. U., Sch. of Chem. & Biomedical Eng., Research fellow	Singapore	Shinshu U., Researcher	Japan	Indian
2014/4/1-2017/3/31	Waseda U., PhD Candidate	Japan	Bharathiar U., D. of Biotechnology, Assistant professor	India	Bharathiar U., D. of Biotechnology, Assistant professor	India	Indian
2014/4/1-2018/3/31	IOP of the Czech Academy of Sc., Postdoctoral fellow	Czech Republic	Micron Tech. Inc., Tech. D. Engineer	Japan	Micron Tech. Inc., Tech. D. Engineer	Japan	Greek
2014/4/1-2018/6/30	U. Tsukuba, Student	Japan	NIMS, Postdoc fellow	Japan	Samsung Elec. Co., Ltd., Researcher	Korea	Korean
2014/4/1-2019/3/31	Shanghai Normal U., PhD Candidate	China	NIMS, Postdoc fellow	Japan	NIMS, JSPS Fellow	Japan	Chinese
2014/4/1-2019/3/31	U. Tsukuba, PhD Candidate	Japan	U. Tsukuba, Foreign Res. Fellow	Japan	AIST, Postdoc fellow	Japan	Chinese
2014/5/1 -2014/12/31	U. Tsukuba, PhD Candidate	Japan	Soochow U., Associate professor	China	Soochow U., C. of Phys. Optronics. & Energy, Associate professor	China	Chinese
2014/5/1 -2015/1/15	U. Tokyo, Postdoc fellow	Japan	AIST, Postdoc Fellow	Japan	Veolia, R6D Project Manager	France	French

2014/5/1-2016/4/30	Ajou U., Research Assistant	Korea	Kyowa-chem. Industry, R&D d., Researcher	Japan	Kyowa-chem. Industry, R&D D., Researcher	Japan	Vietnamese
2014/5/1-2016/8/31	IITs Kanpur, Research associate	India	International Inst. of Information Tech., Bangalore, Postdoc fellow	India	CEMES, CNRS Toulouse, Postdoc fellow	France	Indian
2014/6/1 -2015/7/31	Aarhus U., PhD	Denmark	Inst. for Molecular Medicine, Postdoc fellow	Denmark	Myanmar Carlsberg, Co., Ltd., Assistant Q&A Manager	Myanmar	Burmese
2014/6/1-2016/5/31	U. Grenoble, PhD Candidate	France	U. Tsukuba, Graduate Sch. of Pure & Appl. Sc., Assistant professor	Japan	U. Tsukuba, Graduate Sch. of Pure & Appl. Sc., Assistant professor	Japan	French
2014/6/1-2016/7/31	CSIR-Central Leather Res. Inst. Adyar, PhD Candidate	India					Indian
2014/6/9-2017/7/10	IACS Jadavpur, Postdoc fellow	India	HPCL, Green R&D C., Senior Research Officer	India	HPCL, Green R&D C., Senior Research Officer	India	Indian
2014/7/1 -2015/7/6	Western Kentucky U., N/A	USA	King Faisal U., Assistant professor	Saudi Arabia	King Faisal U., Assistant professor	Saudi Arabia	Indian
2014/7/1-2017/3/31	Hokkaido U., PhD Candidate	Japan	Nanyang Tech. U., Sch. of Chem. & Biomedical Eng., Postdoc fellow	Singapore	Nanyang Tech. U., Sch. of Chem. & Biomedical Eng., Postdoc fellow	Singapore	Chinese
2014/8/1 -2015/4/30	Technical U. of Munich, Postdoc fellow	Germany	CSIR-Central Electrochemical Res. Inst., Scientist	India	CSIR-Central Electrochemical Res. Inst., Scientist	India	Indian
2014/8/7 -2015/8/6	U. Houston, N/A	USA	U. Houston, Postdoc fellow	USA			Chinese
2014/9/1-2018/12/31	Waseda U., PhD Candidate	Japan	NIMS, Technical Staff	Japan	Xi'an Jiaotong U., Postdoc fellow	China	Pakistani
2014/10/1-2015/3/31	Kanazawa U., PhD Candidate	Japan	NIMS, Postdoc fellow	Japan	NIMS, Guest researcher	Japan	Chinese
2014/10/1-2016/12/31	TIT, PhD Candidate	Japan	NIMS, ICYS researcher	Japan	Zhengzhou U., Professor	China	Chinese
2014/10/1-2017/3/31	Hokkaido U., PhD Candidate	Japan	U. Sydney, Sch. of Phys., Research associate	Australia	Tianjin U., Professor	China	Chinese
2014/11/1-2018/9/30	Inst. of Chem., Academia Sinica, Postdoc fellow	Taiwan	Coromandel International Ltd., Deputy Manager R6D	India	Coromandel International Ltd., Deputy Manager R6D	India	Indian
2014/11/20-2018/3/31	U. Wollongong, Research assistant	Australia	NIMS, ICYS Researcher	Japan	NIMS, ICYS Researcher	Japan	Australian
2014/12/1-2016/11/30	Japan Adv. Inst. of S&T, Postdoc fellow	Japan	CSIR-Central E-chem. Res. Inst., DST INSPIRE Faculty	India	CSIR-Central E-chem. Res. Inst., DST INSPIRE Faculty	India	Indian
2015/2/1-2017/1/31	Dalian U. of Tech., Postdoc fellow	China	Nagoya Institute of Tech., Postdoc fellow	Japan	AIST, Project researcher	Japan	China
2015/2/1-2018/1/31	NIMS, Postdoc fellow	Japan	CORNES Technologies Ltd., Customer Service Engineer	Japan	CORNES Technologies Ltd., Product Scientist	Japan	French
2015/3/1 -2015/11/30	NIMS, Postdoc fellow	Japan	Yamagata U., Assistant professor	Japan			German
2015/4/1 -2015/12/31	AIST, Postdoc fellow	Japan	Sumitomo Seika Chem. Co., Ltd., N/A	Japan	Sumitomo Seika Chem. Co., Ltd., N/A	Japan	Chinese
2015/4/1 -2018/3/31	AIST, Postdoc fellow	Japan	NIMS, Permanent researcher	Japan	NIMS, Permanent researcher	Japan	Rumanian

2015/4/1-2017/3/31	Nanyang Tech. U., & CREATE, Research Staff	Singapore					Indian
2015/4/1-2017/3/31	Tokyo U. of Sc., JSPS Fellow	Japan	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Nepalese
2015/4/1-2018/3/31	U. Tsukuba, Student	Japan	Micron Memory Japan, Research Engineer	Japan	Micron Memory Japan, Ltd. Research Engineer	Japan	Chinese
2015/4/1-2018/3/31	China Jiliang U., Student	China	AIST, Postdoc Fellow	Japan	AIST, Postdoc Fellow	Japan	Chinese
2015/4/1-2018/6/30	U. Tsukuba, PhD Candidate	Japan	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Korean
2015/5/1-2018/4/30	AIST, Postdoc fellow	Japan	U. Tsukuba, Researcher	Japan	Samsung Electronic Co., Ltd., Principal Engineer	Korea	French
2015/5/1-2019/3/31	Hokkaido U. PhD Candidate	Japan	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Chinese
2015/5/7-2017/5/6	U. St Andrews, Sch. of Chem., Visiting scholar	UK	Ruhr-U. Bochum, Humboldt Postdoc fellow	Germany	North China Electric Power U., Professor	China	Chinese
2015/7/7-2017/12/6	Nanjing U. of S&T, Postdoc fellow	China	NIMS, JSPS Fellow	Japan	Nanjing U. of S&T, Lab. of Soft Chem. & Functional. Mat., Lector	China	Chinese
2015/8/1-2016/11/30	King Abdullah U. of S&T, Postdoc fellow	Saudi Arabia	Chalmers U. of Tech., Researcher	Sweden	Kuwait Coll. of S&T, Assistant professor	Kuwait	Indian
2015/8/1-2017/3/31	NIMS, Postdoc fellow	Japan	AIST, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Egyptian
2015/8/20-2017/8/31	Hebei U. of Tech., PhD Candidate	China	Hebei U. of Tech., Researcher	China	Hebei U. of Tech., Associate professor	China	Chinese
2015/9/1 -2016/1/30	Flinders U., Postdoc fellow	Australia	Flinders U., Sch. of Medicine, Postdoc fellow	Australia			Australian
2015/9/1-2018/8/31	Waseda U., Student	Japan	South-Central U. for Nationalities, lecturer	China	South-Central U. for Nationalities, Senior lecturer	China	Chinese
2015/9/14-2017/8/4	Kyushu U., Postdoc fellow	Japan	Fujian Inst. of Res. on the Structure of Matter, Professor	China	Fujian Inst. of Res. on the Structure of Matter, Professor	China	Chinese
2015/10/1-2016/9/30	CAS, Postdoc fellow	China	Nanyang Tech. U., N/A	Singapore	Nanyang Tech. U., N/A	Singapore	Chinese
2015/10/1-2017/2/28	Natl. Korea Maritime & Ocean U. PhD Candidate	Korea	Nanometrics Co., Ltd., Application Scientist	Korea	KLA Corporation, Application Engineer	Korea	Korean
2015/10/1-2017/3/31	Tokyo Metropolitan U. PhD Candidate	Japan	Fuzho U., D. of Biological Eng., Associate professor	China	Fuzho U., D. of Biological Eng., Associate professor	China	Chinese
2015/10/1-2017/3/31	NIMS, Postdoc Fellow	Japan	North China U. of S&T, Associate professor	China	North China U. of S&T, Associate professor	China	Chinese
2015/10/1-3017/10/13	Charles U., Prague, D. Surface & Plasma Sc., Postdoc fellow	Czech Republic	Jabil Inc., Manufacturing engineer	Ukraine	Catholic U. Louvain, Postdoc fellow	Belgium	Ukrainian
2015/11/1-2017/3/31	Tsinghua U., PhD Candidate	China	Beijing Inst. of Tech., D. Mat. Phys. Chem., Assistant professor	China	Beijing Inst. of Tech., D. Mat. Phys. Chem., Assistant professor	China	Chinese
2015/11/16-2019/7/31	Natl. Taiwan U., Postdoc fellow	Taiwan	Renewable Energy Corporation, REC Solar, Principal engineer	Singapore	Renewable Energy Corporation, REC Solar, Principal Engineer	Singapore	Indian

2015/11/25 -2019/11/30	Changchun Inst. of Appl. Chem., Associate professor	China	Tianjin U., Professor	China	Tianjin U., Professor	China	Chinese
2015/11/29-2017/11/28	HEFCE, Bristol, Higher Education Policy Advisor	UK	NIMS, Postdoc fellow	Japan	Edanz Group Japan, Senior editor & Res. consultant	Japan	Nigerian
2016/3/1-2017/3/31	IISER Bhopal, PhD Candidate	India	Clemson U., Postdoc fellow	USA	U. of Limerick, Postdoc fellow	Ireland	Indian
2016/4/1-2017/3/31	IACS, Center for Adv. Mat., Researcher	India	Jogamaya Devi Coll., Kolkata, Assistant professor	India	Jogamaya Devi Coll., Kolkata, Associate professor	India	Indian
2016/4/1-2017/3/31	NIMS, Postdoc fellow	Japan	IFW Dresden, Postdoc fellow	Germany	Hunan U., Coll. of Mat. Sc. & Eng., Professor	China	Chinese
2016/4/1-2017/3/31	Hokkaido U., PhD Candidate	Japan	NIMS, Postdoc fellow	Japan	Wenzhou U., Coll. of Elec & Electronic Eng., Lecturer	China	Chinese
2016/4/1-2017/7/17	NIMS, Postdoc fellow	Japan	Mindanao State U. Iligan Inst. of Tech., Professor	Philippine	Mindanao State U. Iligan Inst. of Tech., Professor	Philippine	Filipino
2016/4/1-2018/3/31	U. Tsukuba, Student	Japan	CM Plus Corporation, Process Engineer	Japan	CM Plus Corporation, Process Engineer	Japan	Indonesian
2016/4/1-2019/3/31	U. Tsukuba, PhD Candidate	Japan	U. Lahore, Assistant professor	Pakistan	U. Lahore, Assistant professor	Pakistan	Pakistan
2016/4/1-2019/3/31	Waseda U., PhD Candidate	Japan	East China Normal U., Researcher	China	East China Normal U., Researcher	China	Chinese
2016/4/1-2020/3/31	Kyushu U., Student	Japan	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Vietnamese
2016/5/8-2018/5/7	Institute of Jean Lamour, Postdoc fellow	France	ICMCB, Postdoc fellow	France	ICMCB, Postdoc fellow	France	French
2016/6/14-2019/8/31	Georgia Inst. of Tech., PhD Candidate	USA	Mitsubishi Chem. Co., Ltd., N/A	Japan	Mitsubishi Chem. Co., Ltd., N/A	Japan	Indian
2016/9/12-2018/6/30	Waseda U., Student	Japan	NIMS, JSPS fellow	Japan	Beihang U. (BUAA) , Associate professor	China	Chinese
2016/9/12-2018/9/11	NIMS, JSPS researcher	Japan	NIMS, Postdoc fellow	Japan	NIMS, Postdoc fellow	Japan	Australian
2016/10/1-2017/3/31	NIMS, JSPS Fellow	Japan	Northwestern U., D. of Biomedical Eng., Postdoc fellow	USA	Northwestern U., D. of Biomedical Eng., Postdoc fellow	USA	Chinese
2016/10/1-2017/6/23	Durham U., PhD Candidate	UK	Korea Basic Sc. Institute, Senior researcher	Korea	Korea Basic Sc. Institute, Senior researcher	Korea	Korean
2016/10/1-2017/9/6	Khalifa U., Lecturer	UAE	Intel Corporation, Yield Engineer	Ireland	Intel Corporation, Yield Engineer	Ireland	Irish
2016/10/11-2018/6/30	Huazhong U. of S&T, Mat. Sc., PhD Candidate	China	KIOXIA Corporation, Researcher	Japan	KIOXIA Corporation, Researcher	Japan	Chinese
2016/10/11-2018/10/10	U. of Reading, PhD Candidate	UK	CHRISMAT, Postdoc fellow	France	CHRISMAT, Postdoc fellow	France	French
2016/10/26-2017/5/19	CNRS Thales, Research associate	France	Ningbo Inst. of Mat. Tech. Eng., Researcher & Team leader	China	Ningbo Inst. of Mat. Tech. Eng., Researcher & Team Leader	China	Chinese
2017/1/1-2019/3/31	TIT, PhD Candidate	Japan	Zhengzhou U., Professor	China	Zhengzhou U., Professor	China	Chinese

2017/3/15-2019/12/31	MIT, Postdoc fellow	USA	JCNS F. Julich GmbH, Research software Engineer	Germany	JCNS F. Julich GmbH, Research software Engineer	Germany	English
2017/3/16-2018/11/30	Natl. U. of Singapore, Research staff	Singapore	NIMS, ICYS researcher	Japan	NIMS, ICYS researcher	Japan	Chinese
2017/3/21-2019/9/30	U. Wien, Guest scientist	Austria	Inst. of Tech. Bandung, Math. & Natural Sc., Research staff	Indonesia	Inst. of Tech. Bandung, Math. & Natural Sc., Research Staff	Indonesia	Indonesian
2017/4/1-2018/2/28	U. Wollongong, PhD Candidate	Australia	Tech. U. Berlin/ U. Potsdam, Humboldt Postdoc fellow	Germany	Tech. U. Berlin/ U. Potsdam, Humboldt Postdoc fellow	Germany	Australian
2017/4/1-2019/3/31	Kyushu U., PhD Candidate	Japan					Indonesian
2017/7/1-2019/3/31	SPINTEC Grenoble, Postdoc fellow	France	TII, Assistant professor	Japan	TII, Assistant professor	Japan	Russian
2017/10/1-2018/6/30	U. Tsukuba, Student	Japan	GREMAN, Postdoc researcher	France	ST Microelectronics Ltd., Researcher	France	French
2017/10/1-2019/3/31	IACS, Mat. Sc., Postdoc fellow	India	NIMS, Postdoc fellow	Japan	IACS, Mat. Sc., Department member	India	Indian
2017/10/1-2019/9/30	Hong Kong Polytechnic U., Research Associate	China	South China Normal U., Professor	China	South China Normal U., Professor	China	Chinese
2017/11/1/2020/3/31	U. Tokyo, PhD Candidate	Japan	U. Oxford, Postdoc fellow	UK	U. Oxford, Postdoc fellow	UK	Chinese
2017/11/1-2018/4/10	Liaocheng U., Associate professor	China	Liaocheng U., Professor	China	Liaocheng U., Professor	China	Chinese
2017/11/25-2019/11/24	Vellore Inst. of Tech., Assistant professor	India	NIMS, JSPS Fellow	Japan	NIMS, JSPS Fellow	Japan	Indian
2017/11/28-2019/11/25	Concept Life Sc. Chapel-en-le-Frith, Employee	UK	NIMS, ICYS fellow	Japan	NIMS, ICYS Fellow	Japan	British
2018/2/1-2020/2/29	NIMS, JSPS Fellow	Japan	Kyoto U., Specific researcher	Japan	Kyoto U., Specific researcher	Japan	Indian
2018/3/1-2019/11/29	Kyungpook Natl. U., PhD Candidate	Korea	NIMS, JSPS fellow	Japan	NIMS, JSPS Fellow	Japan	Pakistani
2018/3/1-2019/2/28	Nanjing U. Master degree candidate	China	King Abdullah U. of Sc., PhD student	Saudi Arabia	King Abdullah U. of Sc., PhD Student	Saudi Arabia	Chinese
2018/5/1-2020/3/31	U. Tokyo, PhD Candidate	Japan					Chinese
2018/5/16-2019/3/15	CAS, Postdoc fellow	China	Trivenidevi Bhalotia Coll., Assistant professor	India	Trivenidevi Bhalotia Coll., Assistant professor	India	Indian
2018/6/1-2020/3/31	Kumamoto U., Inst. of Pulsed Power Sc., Assistant professor	Japan	Iwate U., Postdoctoral Fellow	Japan	Iwate U., Postdoctoral Fellow	Japan	French
2018/6/1-2020/3/31	Urmia U., PhD Candidate	Iran	NIMS, JSPS Fellow	Japan	NIMS, JSPS Fellow	Japan	Iranian
2018/7/1-2019/8/31	Natl. Cheng Kung U., PhD Candidate	Taiwan	ITRI, C. for Measurement Stand, Researcher	Taiwan	ITRI, Center for Measurement Stand, Researcher	Taiwan	Taiwanese
2018/10/1-2019/3/31	U. Tokyo, PhD Candidate	Japan	CSIRO Land and Water, Postdoc fellow	Australia	CSIRO Land and Water, Postdoc fellow	Australia	Chinese

2018/10/1-2020/1/31	Jilin U., PhD Candidate	China	Jilin U., Assistant professor	China	Jilin U., Assistant professor	China	Chinese
2018/11/1-2020/3/31	U. Washington, PhD Candidate	USA	U. Washington, Medical Intern	USA	U. Washington, Medical Intern	USA	American
2019/4/1-2019/11/30	Indian Inst. of Sc., Researcher	India	U. Calabria, PhD Scholar	Italy	U. Calabria, PhD Scholar	Italy	Indian

Abbreviation List

20191 Employment List attached

Abbreviation	Word
Adv.	Advanced
Appl.	Applied
C.	Centre
Chem.	Chemistry/Chemical
Coll.	College
D.	Department
Div.	Division
Elec.	Electronics
Eng.	Engineering
Env.	Environment
Gov.	Government
HQ	Headquarter
Inc.	Incorporated
Inst.	Institute
IP	Intellectual Property
Lab.	Laboratory
Ltd.	Limited
Mag.	Magnetic
Mat.	Materials
Math.	Mathematics
Natl.	National
Optronics.	Optoelectronics
PhD	Doctor of Philosophy
Phys.	Physics
Postdoc	Postdoctal
Proc.	Processing
R&D	Research and Development
Res.	Research
S&T	Science and Technology
S.K.L.	State Key Laboratory
Sc.	Science
Sch.	School
Tech.	Technology
U.	University

Abbreviation List

20191 Employment List attached

Country	Abbreviation	Formal name of Organization
Australia	CSIRO	The Commonwealth Scientific and Industrial Research Organization
China	CAS	Chinese Academy of Science
China	IOP	Institute of Physics Chinese Academy of Sciences
China	HUST	Huazhong University of Science and Technology
China	LICP	The Lanzhou Institute of Chemical Physics
China	DICP	Dalian Institute of Chemical Physics
France	CEMES	The Centre d'Elaboration de Materiaux et d'Etudes Structurales
France	CHRISMAT	CRISMAT CENTRO INC.
France	CNRS	Centre National de la Recherche Scientifique
France	ICMCB	The Institute for Solid State Chemistry Brodeaux
France	LPS	Laboratoire de Physique des Solides
France	SPINTEC	Spintronique et Technologie des Composants
Germany	IFW	Leibniz Institute for Solid State and Materials Research Dresden
Germany	JCNS	Julich Centre for Neutron Science
India	ARCI	International Advanced Research Centre for Powder Metallurgy and New Materials
India	BITS	Rirla Institute of echnology and Science
India	CSIR	Council of Science and Industrial Research
India	HPCL	Hindustan Petroleum Corporation Limited
India	IACS	Indian Association for the Cultivation of Science
India	IICT	Indian Insitute of Chemical Technology
India	IIS	Indian Institute of Science
India	IISER	Indian Institute of Science Education and Research
India	IITs	The Indian Institutes of Technology
India	NIIST	National Institute for Interdisciplinary Science and Technology
India	TAS	Telangana Academy of Sciences
India	VIT	Vellore Institue of Technology
Japan	AIST	The National Institute of Advanced Industrial Science and Technology
Japan	ICYS	International Center for Young Scientists
Japan	JSPS	Japan Society for the Promotion of Science
Japan	NIMS	National Institute for Materials Science
Japan	RIKEN	Institute of Physical and Chemical Research
Japan	TIT	Tokyo Institute of Technology
Singapore	CREATE	Campus of Research Excellence and Technological Enterprise
Singapore	IBN	Institute of bioengineering and nanotechnology
Singapore	NCFS	The National Centre of Food Science
Spain	IBEC	Institute for Bioengineering of Catalonia
Switzerland	ETH-Zurich	Eidgenössische Technische Hochschule Zürich
Taiwan	ITRI	The Industrial Technology Research Institute
UK	HEFCE	Higher Education Funding Council for England
UK	LCN	London Center for Nanotechnology
USA	CNST	Center for Nanoscale Science and Technology

USA	GIT	Georgia Institute of Technology
USA	MINT	Materials for Information Technology
USA	MIT	Massachusetts Institute of Technology
USA	NIH	National Institutes of Health
USA	NIST	National Institute of Standards and Technology
USA	UC	University of California

Project Expenditures FY2016

（Thousand yens）

	Amount	Details	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Funding by WPI Academy		Government Subsidies except Funding from WPI Academy		Donations		Indirect funding		Joint research projects		Competitive funding		Others	
			Total costs	Details (no. of persons)	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details
Personnel	355,630	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Center director			19,095	Center director 1										
	0	Funding by WPI Academy		Administrative director			14,865	Administrative direct 1										
	1,241,101	Government Subsidies except Funding from WPI Academy	0	Principal investigator 0	0	Principal investigator 0	233,540	Principal investigator 19	0	0	0	0	0	0	0	0	0	0
	0	Donations		・Full-time／Japanese		・Full-time／Japanese	196,819	・Full-time／Japane 15										
	0	Indirect funding		・Concurrent／Japanese		・Concurrent／Japanese	4,459	・Concurrent／Japa 1										
	0	Joint research projects		・Full-time／Overseas		・Full-time／Overseas	32,262	・Full-time／Overse 3										
	0	Competitive funding		・Concurrent／Overseas		・Concurrent／Overseas	0	・Concurrent／Over 0										
	0	Others	272,572	Other researchers 31	0	Other researchers 0	557,022	51	0	0	0	0	0	0	0	0	0	0
				・Associate professor /Assistant professor		・Associate professor /Assistant professor		・Associate professor /Assistant professor										
			272,572	・Others 31		・Others	557,022	・Others 51										
				Postdocs		Postdocs	332,607	Postdocs 86										
			53,728	Research support staffs 5		Research support staffs	24,825	Research support staffs 5										
			29,330	Administrative staffs 3		Administrative staffs	59,146	Administrative staffs 15										
Subtotal	1,596,731		355,630	39	0	0	1,241,101	178	0	0	0	0	0	0	0	0	0	0
Project activities	431,541	Operational subsidies to National University Corporations/Incorporated Administrative Agency	15,092	Reward of inviting scientists														
	0	Funding by WPI Academy	16,061	Cost of temporary workers														
	0	Government Subsidies except Funding from WPI Academy	32,409	Research startup cost														
	0	Donations	45,000	Cost of satellite organizations														
	0	Indirect funding	9,476	Cost of international symposiums														
	0	Joint research projects	36,046	Cost of consumables														
	0	Competitive funding	192,218	Cost of utilities														
	0	Others	85,239	Other costs														
Subtotal	431,541		431,541		0		0		0		0		0		0		0	
Travel	77,611	Operational subsidies to National University Corporations/Incorporated Administrative Agency	50	Domestic travel costs														
	0	Funding by WPI Academy	14,582	Overseas travel cost														
	0	Government Subsidies except Funding from WPI Academy	62,114	Travel and accommodations cost for invited scientists														
	0	Donations	865	Travel expenses for assignment														
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	77,611		77,611		0		0		0		0		0		0		0	
Equipment	129,539	Operational subsidies to National University Corporations/Incorporated Administrative Agency	853	Structural and characterization equipment														
	0	Funding by WPI Academy	128,686	Calculation Equipment														
	0	Government Subsidies except Funding from WPI Academy																
	0	Donations																
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	129,539		129,539		0		0		0		0		0		0		0	
Research projects	627,828	Operational subsidies to National University Corporations/Incorporated Administrative Agency	627,828	Research projects					1,308	Donations			116,360	Joint research projects	262,950	Government Subsidies	3,360	Private Company Subsidies
	0	Funding by WPI Academy							14,174	Foundation Grants					310,674	Grant-in-Aid for Scientific Research	5,349	Other Subsides
	0	Government Subsidies except Funding from WPI Academy																
	15,482	Donations																
	0	Indirect funding																
	116,360	Joint research projects																
	573,624	Competitive funding																
	8,709	Others																
Subtotal	1,342,003		627,828		0		0		15,482		0		116,360		573,624		8,709	
Others	0	Operational subsidies to National University Corporations/Incorporated Administrative Agency																
	0	Funding by WPI Academy																
	0	Government Subsidies except Funding from WPI Academy																
	0	Donations																
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	0		0		0		0		0		0		0		0		0	
Total	3,577,426		1,622,150		0		1,241,101		15,482		0		116,360		573,624		8,709	

Operational subsidies to National University Corporations/Incorporated Administrative Agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速・拡大事業
Government Subsidies except Funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速・拡大事業を除く
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Project Expenditures FY2017

(Thousand yens)

	Amount	Details	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Funding by WPI Academy		Government Subsidies except Funding from WPI Academy		Donations		Indirect funding		Joint research projects		Competitive funding		Others	
			Total costs	Details (no. of persons)	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details
Personnel	1,320,377	Operational subsidies to National University Corporations/Incorporated Administrative Agency	15,960	Center director 1														
	1,536	Funding by WPI Academy	14,751	Administrative director 1														
	0	Government Subsidies except Funding from WPI Academy	176,668	Principal investigator 14	0	Principal investigator 0	0	0	0	0	0	0	0	0	0	0	0	0
	4,755	Donations	128,489	・Full-time／Japane 10		・Full-time／Japanese												
	0	Indirect funding	26,856	・Concurrent／Japa 2		・Concurrent／Japanese												
	16,977	Joint research projects	21,323	・Full-time／Overse 2		・Full-time／Overseas												
	128,867	Competitive funding	0	・Concurrent／Over 0		・Concurrent／Overseas												
	0	Others	917,238	Other researchers 87	0	Other researchers 0	0	0	0	0	0	0	0	0	0	0	0	0
			917,238	・Associate professor /Assistant professor ・Others 87		・Associate professor /Assistant professor ・Others												
			73,747	Postdocs 34	1,536	ICYS-WPI-MANA Researcher 1							2,865	Postdocs 2	103,488	Postdocs 24		
			47,110	Research support staffs 50					4,755	Research support staffs 1			14,111	Research support staffs 14	25,378	Research support staffs 19		
			74,901	Administrative staffs 23														
Subtotal	1,472,511		1,320,377	210	1,536	1	0	0	4,755	1	0	0	16,977	16	128,867	43	0	0
Project activities	489,338	Operational subsidies to National University Corporations/Incorporated Administrative Agency	660	Reward of inviting scientists	1,470	Reward of inviting scientists												
	7,083	Funding by WPI Academy	5,583	Cost of international symposiums	594	Cost of temporary workers												
	0	Government Subsidies except Funding from WPI Academy	38,778	Cost of consumables	4,416	Cost of international symposiums												
	0	Donations	196,430	Cost of utilities	302	Other costs												
	0	Indirect funding	247,887	Other costs														
	0	Joint research projects																
	0	Competitive funding																
	0	Others			302	Other costs												
Subtotal	496,421		489,338		7,083		0		0		0		0		0		0	
Travel	76,969	Operational subsidies to National University Corporations/Incorporated Administrative Agency	11,688	Domestic travel costs	0	Domestic travel costs												
	21,354	Funding by WPI Academy	44,656	Overseas travel cost	1,923	Overseas travel cost												
	0	Government Subsidies except Funding from WPI Academy	18,331	Travel and accommodations cost for invited	19,431	Travel and accommodations cost for invited												
	0	Donations	2,294	Travel expenses for assignment														
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	98,323		76,969		21,354		0		0		0		0		0		0	
Equipment	0	Operational subsidies to National University Corporations/Incorporated Administrative Agency																
	0	Funding by WPI Academy																
	0	Government Subsidies except Funding from WPI Academy																
	0	Donations																
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	0		0		0		0		0		0		0		0		0	
Research projects	208,332	Operational subsidies to National University Corporations/Incorporated Administrative Agency	208,332	Research projects					1,323	Donations			92,428	Joint research projects	267,572	Government Subsidies	0	Private Company Subsidies
	0	Funding by WPI Academy							4,862	Foundation Grants					261,766	Grant-in-Aid for Scientific Research	2,316	Other Subsides
	0	Government Subsidies except Funding from WPI Academy																
	6,185	Donations																
	0	Indirect funding																
	92,428	Joint research projects																
	529,337	Competitive funding																
	2,316	Others																
Subtotal	838,599		208,332		0		0		6,185		0		92,428		529,337		2,316	
Others	0	Operational subsidies to National University Corporations/Incorporated Administrative Agency							-4,755	Personnel*			-16,977	Personnel*	-128,867	Personnel*		
	0	Funding by WPI Academy																
	0	Government Subsidies except Funding from WPI Academy																
	-4,755	Donations*																
	0	Indirect funding																
	-16,977	Joint research projects*																
	-128,867	Competitive funding*																
	0	Others																
Subtotal	-150,598		0		0		0		-4,755		0		-16,977		-128,867		0	
Total	2,755,256		2,095,017		29,973		0		6,185		0		92,428		529,337		2,316	

*Research projects are included in Personal expense then deducting.

Operational subsidies to National University Corporations/Incorporated Administrative Agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速・拡大事業
Government Subsidies except Funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速・拡大事業を除く
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Project Expenditures FY2018

（Thousand yens）

	Amount	Details	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Funding by WPI Academy		Government Subsidies except Funding from WPI Academy		Donations		Indirect funding		Joint research projects		Competitive funding		Others	
			Total costs	Details (no. of persons)	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details
Personnel	1,211,261	Operational subsidies to National University Corporations/Incorporated Administrative Agency	15,960	Center director 1														
	12,317	Funding by WPI Academy	15,375	Administrative directo 1														
	0	Government Subsidies except Funding from WPI Academy	131,773	Principal investigator 14	0	Principal investigator 0	0	0	0	0	0	0	0	0	0	0	0	0
	8,877	Donations	113,320	・Full-time／Japane 8		・Full-time／Japanese												
	0	Indirect funding	2,509	・Concurrent／Japa 4		・Concurrent／Japanese												
	24,814	Joint research projects	14,828	・Full-time／Overse 1		・Full-time／Overseas												
	149,717	Competitive funding	1,116	・Concurrent／Over 1		・Concurrent／Overseas												
	0	Others	753,703	Other researchers 83	0	Other researchers 0	0	0	0	0	0	0	0	0	0	0	0	0
			753,703	・Associate professor /Assistant professor ・Others 83		・Associate professor /Assistant professor ・Others												
			106,421	Postdocs 32	12,317	ICYS-WPI-MANA Researchers 2			3,399	Postdocs 2			9,962	Postdocs 2	111,148	Postdocs 29		
			125,715	Research support staffs 81					5,478	Research support staffs 2			14,852	Research support staffs 12	29,877	Research support staffs 30		
			62,314	Administrative staffs 20		Administrative staffs									8,692	Administrative staffs 3		
Subtotal	1,406,986		1,211,261	232	12,317	2	0	0	8,877	4	0	0	24,814	14	149,717	62	0	0
Project activities	305,264	Operational subsidies to National University Corporations/Incorporated Administrative Agency	2,610	Reward of inviting scientists	4,454	International symposiums												
	6,932	Funding by WPI Academy	3,743	International symposiums	2,478	Other costs												
	0	Government Subsidies except Funding from WPI Academy	36,075	Cost of consumables														
	0	Donations	188,098	Cost of utilities														
	0	Indirect funding	74,738	Other costs														
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	312,196		305,264		6,932		0		0		0		0		0		0	
Travel	53,394	Operational subsidies to National University Corporations/Incorporated Administrative Agency	21,537	Domestic travel costs	252	Domestic travel costs												
	10,445	Funding by WPI Academy	29,239	Overseas travel cost	2,436	Overseas travel cost												
	0	Government Subsidies except Funding from WPI Academy	2,618	Travel and accommodations cost for invited scientists	7,758	Travel and accommodations cost for invited scientists												
	0	Donations																
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	63,839		53,394		10,445		0		0		0		0		0		0	
Equipment	0	Operational subsidies to National University Corporations/Incorporated Administrative Agency																
	0	Funding by WPI Academy																
	0	Government Subsidies except Funding from WPI Academy																
	0	Donations																
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	0		0		0		0		0		0		0		0		0	
Research projects	188,262	Operational subsidies to National University Corporations/Incorporated Administrative Agency	188,262	――――――――――					9,117	Donations			151,234	Joint research projects	291,157	Government Subsidies	1,700	Private Company Subsidies
	0	Funding by WPI Academy							32,498	Foundation Grants			12,998	Joint research projects with industry	250,321	Grant-in-Aid for Scientific Research	24,000	Other Subsides
	0	Government Subsidies except Funding from WPI Academy																
	41,615	Donations																
	0	Indirect funding																
	164,232	Joint research projects																
	541,478	Competitive funding																
	25,700	Others																
Subtotal	961,288		188,262		0		0		41,615		0		164,232		541,478		25,700	
Others	0	Operational subsidies to National University Corporations/Incorporated Administrative Agency							-8,877	Personnel*			-24,814	Personnel*	-149,717	Personnel*		
	0	Funding by WPI Academy																
	0	Government Subsidies except Funding from WPI Academy																
	-8,877	Donations*																
	0	Indirect funding																
	-24,814	Joint research projects*																
	-149,717	Competitive funding*																
	0	Others																
Subtotal	-183,408		0		0		0		-8,877		0		-24,814		-149,717		0	
Total	2,560,901		1,758,181		29,694		0		41,615		0		164,232		541,478		25,700	

*Research projects are included in Personal expense then deducting.

Operational subsidies to National University Corporations/Incorporated Administrative Agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速・拡大事業
Government Subsidies except Funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速・拡大事業を除く
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Project Expenditures FY2019

(Thousand yens)

	Amount	Details	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Funding by WPI Academy		Government Subsidies except Funding from WPI Academy		Donations		Indirect funding		Joint research projects		Competitive funding		Others	
			Total costs	Details (no. of persons)	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details
Personnel	1,217,195	Operational subsidies to National University Corporations/Incorporated Administrative Agency	15,972	Center director 1														
	8,221	Funding by WPI Academy	15,345	Administrative director 1														
	0	Government Subsidies except Funding from WPI Academy	131,013	Principal investigator 14	0	Principal investigator 0	0	0	0	0	0	0	0	0	0	0	0	0
	0	Donations	113,491	・Full-time／Japanese 8		・Full-time／Japanese												
	0	Indirect funding	1,692	・Concurrent／Japanese 4		・Concurrent／Japanese												
	51,171	Joint research projects	14,714	・Full-time／Overseas 1		・Full-time／Overseas												
	125,073	Competitive funding	1,116	・Concurrent／Overseas 1		・Concurrent／Overseas												
	0	Others	745,434	Other researchers 72	0	Other researchers 0	0	0	0	0	0	0	0	0	0	Other researchers 0	0	0
				・Associate professor /Assistant professor		・Associate professor /Assistant professor												
			745,434	・Others 72		・Others												
			112,739	Postdocs 32	8,221	ICYS-WPI-MANA Researchers 2							24,054	Postdocs 6	101,462	Postdocs 24		
			127,742	Research support staffs 82									26,539	Research support staffs 17	23,611	Research support staffs 17		
			68,951	Administrative staffs 23									578	Administrative staffs 1				
Subtotal	1,401,659		1,217,195	225	8,221	2	0	0	0	0	0	0	51,171	24	125,073	41	0	0
Project activities	249,470	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Reward of inviting scientists	2,541	Reward of inviting scientists												
	11,580	Funding by WPI Academy	13,378	Cost of temporary workers	3,677	Cost of temporary workers												
	0	Government Subsidies except Funding from WPI Academy	2,319	international symposiums	1,361	international symposiums												
	0	Donations	32,694	Cost of consumables	4,001	Other costs												
	0	Indirect funding	152,286	Cost of utilities														
	0	Joint research projects	48,794	Other costs														
	0	Competitive funding																
	0	Others																
Subtotal	261,051		249,470		11,580		0		0		0		0		0		0	
Travel	39,345	Operational subsidies to National University Corporations/Incorporated Administrative Agency	13,143	Domestic travel costs	29	Domestic travel costs												
	9,291	Funding by WPI Academy	21,836	Overseas travel cost	2,933	Overseas travel cost												
	0	Government Subsidies except Funding from WPI Academy	3,527	Travel and accommodations cost for invited	6,330	Travel and accommodations cost for invited												
	0	Donations	838	Travel expenses for assignment														
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	48,637		39,345		9,291		0		0		0		0		0		0	
Equipment	787	Operational subsidies to National University Corporations/Incorporated Administrative Agency	787	Micro Electric-scale														
	0	Funding by WPI Academy																
	0	Government Subsidies except Funding from WPI Academy																
	0	Donations																
	0	Indirect funding																
	0	Joint research projects																
	0	Competitive funding																
	0	Others																
Subtotal	787		787		0		0		0		0		0		0		0	
Research projects	186,492	Operational subsidies to National University Corporations/Incorporated Administrative Agency	186,492	Research projects					3,993	Donations			195,179	Joint research projects	310,652	Government Subsidies	0	Private Company Subsidies
	0	Funding by WPI Academy							13,166	Foundation Grants			8,774	Joint research projects with industry	218,610	Grant-in-Aid for Scientific Research	24,990	Other Subsides
	0	Government Subsidies except Funding from WPI Academy																
	17,159	Donations																
	0	Indirect funding																
	203,953	Joint research projects																
	529,262	Competitive funding																
	24,990	Others																
Subtotal	961,857		186,492		0		0		17,159		0		203,953		529,262		24,990	
Others	0	Operational subsidies to National University Corporations/Incorporated Administrative Agency											-51,171	Personnel*	-125,073	Personnel*		
	0	Funding by WPI Academy																
	0	Government Subsidies except Funding from WPI Academy																
	0	Donations																
	0	Indirect funding																
	-51,171	Joint research projects*																
	-125,073	Competitive funding*																
	0	Others																
Subtotal	-176,244		0		0		0		0		0		-51,171		-125,073		0	
Total	2,497,746		1,693,290		29,092		0		17,159		0		203,953		529,262		24,990	

*Research projects are included in Personal expense then deducting.

Operational subsidies to National University Corporations/Incorporated Administrative Agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速・拡大事業
Government Subsidies except Funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速・拡大事業を除く
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Appendix 4 Outreach Activities and Their Results

List up to three of the Center's outreach activities carried out during the period between FY 2017 and 2019 that have contributed to enhancing the brand or recognition of your Center and/or the brand of the overall WPI program, and describe its concrete contents and effect in narrative style. (Where possible, indicate the results in concrete numbers.)

Examples:
- As a result of using a new OO press-release method, a OO% increase in media coverage was obtained over the previous year.
- By holding seminars for the public that include people from industry, requests for joint research were received from companies.
- We changed our public relations media. As a resulting of using OO to disseminate information, a OO% increase in inquiries from researchers was obtained over the previous year.
- As a result of vigorously carrying out OO outreach activity, ¥OO in external funding was acquired.

Enter a list of your outreach activities in Attachment 4a.

Example 1: MANA E-BULLETIN

Since December 2017 we have been publishing articles on our specially created website, *MANA E-BULLETIN*, and globally distributing news using press wire services. We have done this to communicate MANA's research findings broadly, to people around the world who are interested in science.

Starting with Volume 8, published in November 2019, we began to distribute on an article-by-article basis, and to incorporate simple and powerful titles and friendly graphics, together with concise contents geared toward eliciting people's interest. As a result, the number of visits per article has significantly increased.

Each volume of the *MANA E-BULLETIN* consists of *FEATURE* article featuring a dialogue among MANA's external research fellows, and three *RESEARCH HIGHLIGHTS* articles showcasing MANA's distinctive research and its latest research findings. The *MANA E-BULLETIN* is published and distributed through wire services three times a year (12 articles in total).

* Change in traffic (page views) between Volume 7 published in July 2019 and Volume 9 published in March 2020 (three volumes in total): an increase from 162 views to 4,460 views.
* Almost all the articles in the newest volume have received more than 1,000 page visits.

Example 2: Visualization of research findings and coordination with NIMS Open House

The number of visitors to NIMS Open House has increased dramatically in the last few years (by a factor of nine, in four years). As part of our efforts to achieve this, we have been active in the visualization of research findings and have engaged in visually interesting activities that may grab people's attention. In one successful example, MANA's Outreach team worked hard on the Smart Polymer Rangers, our very popular squadron heroes who use easily understandable terms to explain what "smart polymers" are (stimuli-responsive polymers). One of the outcomes was the selection in 2016 of MANA Associate PI Dr. Mitsuhiro Ebara (who led this research project, and who transferred from MANA to the National Institute for Materials Science in April 2020) as a "Tsukuba Science Meister" certified by the City of Tsukuba. Prompted by this, we started to receive a notably greater number of opportunities for grassroots promotional activities for MANA's research findings and science education campaigns, including guest lectures at elementary and junior high schools, and lab classes at ranger shows and events. These factors also contributed to the attractiveness of the NIMS Open House, strengthening the ability of MANA's lab/experiential booths to draw a greater number of visitors. Thus, our outreach efforts have made a significant contribution to improving the visibility not only of MANA but also of NIMS, its host institution, making both institutions more recognizable to the general public. In addition, the research work drew attention in the beauty care field, leading to the establishment in 2018 of the NIMS-L'ORÉAL Materials Innovation Center through a partnership between NIMS and L'ORÉAL, the world's largest cosmetics company. We believe that the greater public recognition achieved through our outreach activities influenced L'ORÉAL's decision to invest.

Example 3: MANA Crowdfunding

We began our crowdfunding efforts with the fund-raising activity for WPI in December 2018. We had successful results in both of MANA's crowdfunding projects on *academist*, a crowdfunding platform operated by Academist, Inc. By using titles related to "Creating a New Way of Life and Future

Through the Development of New Materials" and "Things Materials Science Can Contribute to Humanity and Earth" as project themes, to make our projects more approachable, we earned the empathy and interest of many supporters. Our second project coincided with the timing of NIMS Open House 2019. We took advantage of this opportunity and succeeded in improving our visibility among the general public and gaining supporters.

* First Project: "Demonstration of Highly Efficient Solar Water Distillation System" (Senior Researcher Dr. Satoshi Ishii, Graduate Student Ms. Manpreet Kaur) received funding totaling ¥631,600 from 62 supporters (157% of the target of ¥400,000).
* Second Project: "Wearable Artificial Kidney - Development of Smart Nanofiber Meshes to Remove Uremic Toxins –" (Group Leader Dr. Mitsuhiro Ebara) received funding totaling ¥948,920 from 69 supporters (118% of the target of ¥800,000).

Appendix 4a State of Outreach Activities from FY2017 to FY2019

* For each activity, enter the number of times that the activity was held each fiscal year.

Activities	FY2017 (number of activities, times held)	FY2018 (number of activities, times held)	FY2019 (number of activities, times held)
PR brochure, pamphlet	7	7	5
Lectures, seminars for general public	5	5	6
Teaching, experiments, training for elementary, secondary and high school students	7	8	4
Science café	1	0	2
Open house	1	1	1
Participating, exhibiting in events	6	8	5
Press releases	19	10	11
Publications of popular science books	0	0	0
Others (E-BULLETIN NIWS WIRE DISTRIBUTIONS, CROWD FUNDING PROJECTS, WORKSOHPS)	6	9	7

*If there are activities that the center hasn't implemented, delete those lines. If you have other activities, list them in the space between parentheses after "Others" and state the number of times they were held in the spaces on the right. Another line under "Others" can be added, if needed.

<Notes>

Smart Polymer Rangers related Activities	Educational material on nanotechnology, designed for small children and elementary school students. Developed by Group Leader Dr. Mitsuhiro Ebara, who studies functional polymers (macromolecules). In addition to demonstrating various possibilities of polymers through the activities of the squadron heroes, the Smart Polymer Rangers, the project regularly held classes to communicate the power of science and the importance of imagination. The project not only conducted on-site events at local schools but also participated in science-themed events organized by the local government, learning centers, and other local organizations, as well as in national science competitions. Thus, this activity can broadly communicate the fascinating research that is taking place at MANA.
Nanocar race	In 2017, the NIMS-MANA team representing Japan competed in the Nanocar Race, the world's first molecular machine race, that took place at the French National Center for Scientific Research (CEMES-CNRS) in Toulouse, France. Public viewing at the National Museum of Emerging Science and Innovation (in Odaiba) showed parts of the 36-hour race and included a live broadcast from the race site. During the event, in addition to reporting the unfolding of the race, MANA and CNRS researchers presented in panel discussion style the significance of this competition (an epic, worldwide, real-time experiment using molecular machines) and gave examples of future applications. Even though we did not achieve the best results due to unfortunate equipment failures at the race site, we learned valuable lessons that will help us prepare for the next competition, in 2021.
Science Cafe	We conducted a live broadcast during the Nanocar Race in 2017 (at the National Museum of Emerging Science and Innovation), and at the Science Cafe in 2019 (a commercial building in front of Tsukuba Station) to report our activities to the supporters of the two crowdfunding projects we carried out that year. The first event was targeted broadly to the general public, while the second event was more limited, targeting the supporters of our projects. In both events, the ripple effects and the satisfaction of the participants exceeded our expectations. By exchanging opinions candidly with members of the general public who were interested in science, scientists were able to directly listen to the questions and the needs of society. In addition, the direct interaction with people renewed our motivation for research. We are looking forward to making effective use of these activities and expanding our activities.

WPI Academy

Submittal of List of Center's Research Results

Prepare the following two materials and submit them with your Activities Report.

1. Refereed Papers published from 2017 to 2019 (Free format)

List only the Center's refereed papers published during the period from 2017 to 2019. (Note: The list should be for the calendar year, not the fiscal year.)

Divide the papers into two categories, A and B.

A. WPI papers
List papers whose author(s) can be identified as affiliated with the WPI program (e.g., that state "WPI" and the name of the WPI center (WPI-center name)). (Not including papers in which the names of persons affiliated with the WPI program are contained only in the acknowledgements.)

B. WPI-related papers
List papers related to the WPI Academy center but whose authors are not noted in the institutional affiliations as WPI affiliated. (Including papers whose acknowledgements contain the names of researchers affiliated with the WPI program.)

Note: On 14 December 2011, the Basic Research Promotion Division in MEXT's Research Promotion Bureau circulated an instruction requiring paper authors to include the name or abbreviation of their WPI center among their institutional affiliations.

Method of listing paper

- For each, write the author name(s); year of publication; journal name, volume, page(s), and article title. Any listing order may be used as long as format is consistent. (The names of the center researchers do not need to be underlined.)
- If a paper has many authors (say, more than 10), all of their names do not need to be listed.

2. Submission of electronic data of refereed papers published in 2019

- Among the papers listed in the Item 1, provide a .csv file output of the papers published in 2019 from the Web of Science (e.g.) or other database giving the paper's raw data including Document ID. (Note: the Document ID is assigned by paper database.)
- These files do not need to be divided into paper categories.

3. Use in assessments

- The list of papers will be used in assessing the state of WPI Academy center's research

progress.
- It will be used as reference in analyzing the trends and overall state of research in the WPI Program and/or the said WPI Academy center, not for evaluating individual researcher performance.
- The special characteristics of each research domain will be considered when conducting assessments.

Refereed Papers from MANA 2017-2019:

A. WPI papers 2017 (454, A9)

1. Original articles 2017 (418)

1 2017_001	D. Abu Saleh, J. Niskanen, Y. Xue, D. Golberg, F.M. Winnik, A. Sosnik, *Boron nitride nanotube-based amphiphilic hybrid nanomaterials for superior encapsulation of hydrophobic cargos*, Materials Today Chemistry **6**, 45 (2017). doi: 10.1016/j.mtchem.2017.09.003; 2-s2.0-85030323776
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A02 2017_A402	(Book Chapter) J. Haruyama, K. Sodeyama, Y. Tateyama, *Atomic Structures and Electronic States at the Surfaces and Interfaces of $CH_3NH_3PbI_3$ Perovskite*, Theoretical Modeling of Organohalide Provskites for photovoltaic applications 165 (2017). Edited by: G. Giorgi, K. Yamashita. doi: 10.1201/9781315152424; WOS:000440010800006; ISBN:978-1-4987-5079-0; 978-1-4987-5078-3.
A03 2017_A403	(Book Chapter) Z.W. Pei, S. Thiyagu, *Silicon nanostalagmites for hybrid solar cells*, Silicon Nanomaterials Sourcebook Vol II: Hybrid Maerials, Arrays, Networks, and Devices 523 (2017). Edited by: K.D. Sattler. WOS:000440016600025; ISBN:978-1-4987-6388-2; 978-1-4987-6378-3

A04 2017_A404	(Correction) N. Suzuki, M. Osada, M. Billah, Z.A. Alothman, Y. Bando, Y. Yamauchi, M.S.A. Hossain, *Origin of thermally stable ferroelectricity in a porous barium titanate thin film synthesized through block copolymer templating(vol 5, 076111, 2017)*, APL Materials **5**(9) 099901 (2017). doi: 10.1063/1.5000538; WOS:000412099100012
A05 2017_A405	(Correction) S. Yadav, M.K. Masud, M.N. Islam, V. Gopalan, A.K.Y. Lam, S. Tanaka, N.T. NGuyen, M.S. Al Hossain, C.L. Li, Y. Yamauchi, M.J.A. Shiddiky, *Gold-loaded nanoporous iron oxide nanocubes: a novel dispersible capture agent for tumor-associated autoantibody analysis in serum (vol 9, pg 8805, 2017)*, Nanoscale 9(36), 13829 (2017). doi: 10.1039/c7nr90194a; WOS:000411613400050
A06 2017_A406	(Correction) C. Young, R.R. Salunkhe, J. Tang, C.C. Hu, M. Shahabuddin, E. Yanmaz, M.S.A. Hossain, J.H. Kim, Y. Yamauchi, *Zeolitic imidazolate framework (ZIF-8) derived nanoporous carbon: the effect of carbonization temperature on the supercapacitor performance in an aqueous electrolyte (vol 18, pg 29308, 2016)*, Physical Chemistry Chemical Physics **19**(33), 22596 (2017). doi: 10.1039/c7cp90179h; WOS:000408257700072
A07 2017_A407	(Meeting Abstract) S.K. Saha, M. Ebara, T. Aoyagi, *Cross-linked films from star-shape poly(epsilon-caprolactone): Effects of branch number and chain length on elastic properties*, Abstracts of Papers of the American Chemical Society **253**, 423 (2017). WOS:000430569108185
A08 2017_A408	(Meeting Abstract) F. Winnik, P. Claesson, *Temperature-dependent assembly of thermosensitive cationic diblock copolymers in water and on interfaces*, Abstracts of Papers of the American Chemical Society **254**, 340 (2017). WOS:000429525603266

5. Articles written in other than English 2017 (A1)

A09 2017_A501	(Japanese) K. Ariga, W. Nakanishi, *Exploration of Molecular Function (Molecular Recognition and Molecular Machinery) beyond Molecular Design and Synthesis: Surface Science May Bring One-Million-Times Better Results!?*, Journal of Synthetic Organic Chemistry Japan **75**(3), 29 (2017). WOS:000400125400004

B. WPI-related papers 2017 (0)

A. WPI papers 2018 (456, A13)

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2 2018_002	N. Abdullah, M.S.A. Hossain, A. Fatehmulla, W.A. Farooq, M.T. Islam, N. Miyamoto, Y. Bando, Y. Kamachi, V. Malgras, Y. Yamauchi, N. Suzuki, *Preparation of Ultraviolet Curing Type Silicone Rubbers Containing Mesoporous Silica Fillers*, Journal of Nanoscience and Nanotechnology **18**(1), 86 (2018). doi: 10.1166/jnn.2018.14553; WOS:000417546800014; 2-s2.0-85082356598
3 2018_003	N. Abdullah, M.S.A. Hossain, K. Konstantinov, H. Tanabe, M. Matsuura, K. Maekawa, A. Fatehmulla, W.A. Farooq, M.T. Islam, Y. Bando, Y.V. Kaneti, Y. Yamauchi, *Tuning Wall Thicknesses in Mesoporous Silica Films for Optimization of Optical Anti-Reflective Properties*, Journal of Nanoscience and Nanotechnology **18**(1), 100 (2018). doi: 10.1166/jnn.2018.14558; WOS:000417546800017; 2-s2.0-85060337086
4 2018_004	S. Acharya, S. Anwar, T. Mori, A. Soni, *Coupling of charge carriers with magnetic entropy for power factor enhancement in Mn doped $Sn_{1.03}Te$ for thermoelectric applications*, Journal of Materials Chemistry C **6**(24), 6489 (2018). doi: 10.1039/c8tc00788h; WOS:000436030200018; 2-s2.0-85049163637
5 2018_005	T. Agemura, T. Kimura, T. Sekiguchi, *Development of a fountain detector for spectroscopy of secondary electrons in scanning electron microscopy*, Japanese Journal of Applied Physics **57**(4), 046701 (2018). doi: 10.7567/JJAP.57.046701; WOS:000427387500001; 2-s2.0-85044405463
6 2018_006	F. Ahmed, N. Tsujii, T. Mori, *Microstructure analysis and thermoelectric properties of iron doped $CuGaTe_2$*, Journal of Materiomics **4**(3), 221 (2018). doi: 10.1016/j.jmat.2018.02.002; WOS:000442952400008; 2-s2.0-85044965741
7 2018_007	M.M.M. Ahmed, T. Imae, J.P. Hill, Y. Yamauchi, K. Ariga, L.K. Shrestha, *Defect-free exfoliation of graphene at ultra-high temperature*, Colloids and Surfaces A **538**, 127 (2018). doi: 10.1016/j.colsurfa.2017.10.074; WOS:000418586600016; 2-s2.0-85032935230
8 2018_008	S. Aikawa, S. Kim, T. Thurakitseree, E. Einarsson, T. Inoue, S. Chiashi, K. Tsukagoshi, S. Maruyama, *Carrier polarity engineering in carbon nanotube field-effect transistors by induced charges in polymer insulator*, Applied Physics Letters **112**(1), 013501 (2018). doi: 10.1063/1.4994114; WOS:000419392600025; 2-s2.0-85040198009
9 2018_009	J. Aimi, P.H. Wang, C.C. Shih, C.F. Huang, T. Nakanishi, M. Takeuchi, H.Y. Hsueh. W.C. Chen, *A star polymer with a metallo-phthalocyanine core as a tunable charge storage material for nonvolatile transistor memory devices*, Journal of Materials Chemistry C **6**(11), 2724 (2018). doi: 10.1039/c7tc05790c; WOS:000428999300011; 2-s2.0-85044037126
10 2018_010	K. Al-Attafi, A. Nattestad, Q. Wu, Y. Ide, Y. Yamauchi, S.X. Dou, J.H. Kim, *The effect of amorphous TiO_2 in P25 on dye-sensitized solar cell performance*, Chemical Communications **54**(4), 381 (2018). doi: 10.1039/c7cc07559f; WOS:000419379800013; 2-s2.0-85042388141
11 2018_011	A.E. Allah, H.B. Tan, X.T. Xu, A.A. Farghali, M.H. Khedr, A.A. Alshehri, Y. Bando, N.A. Kumar, Y. Yamauchi, *Controlled synthesis of mesoporous nitrogen-doped carbons with highly ordered two-dimensional hexagonal mesostructures and their chemical activation*, Nanoscale **10**(26), 12398 (2018). doi: 10.1039/c8nr02647e; WOS:000438246000019; 2-s2.0-85049870850
12 2018_012	A. Alowasheeir, S. Tominaka, Y. Ide, Y. Yamauchi, Y. Matsushita, *Two-dimensional cyano-bridged coordination polymer of $Mn(H_2O)_2[Ni(CN)_4]$: structural analysis and proton conductivity measurements upon dehydration and rehydration*, CrystEngComm **20**(42), 6713 (2018). doi: 10.1039/c8ce01400k; WOS:000448565300004; 2-s2.0-85055771243
13 2018_013	Y. Anan, M. Koguchi, T. Kimura, T. Sekiguchi, *Development of SEM/STEM-WDX for highly sensitive detection of light elements*, Journal of Instrumentation **13**(2), P02025 (2018). doi: 10.1088/1748-0221/13/02/P02025; WOS:000425721600001; 2-s2.0-85043576726

14 2018_014	O. Anjaneyulu, K. Takeda, S. Ishii, S. Ueda, T. Nagao, P. Xiaobo, T. Fujita, M. Miyauchi, H. Abe, *Light-promoted conversion of greenhouse gases over plasmonic metal–carbide nanocomposite catalysts*, Materials Chemistry Frontiers **2**(3), 580 (2018). doi: 10.1039/c7qm00569e; WOS:000426706500019; 2-s2.0-85051580627
15 2018_016	K. Aramaki, K. Ooishi, M. Fujii, K. Ariga, L.K. Shrestha, *Demonstration of a Novel Charge-Free Reverse Wormlike Micelle System*, Langmuir **34**(29), 8670 (2018). doi: 10.1021/acs.langmuir.8b01632; WOS:000440105100026; 2-s2.0-85049250109
16 2018_017	H. Arandiyan, K. Kani, Y. Wang, B. Jiang, J. Kim, M. Yoshino, M. Rezaei, A.E. Rowan, H. Dai, Y. Yamauchi, *Highly Selective Reduction of Carbon Dioxide to Methane on Novel Mesoporous Rh Catalysts*, ACS Applied Materials & Interfaces **10**(30), 24963 (2018). doi: 10.1021/acsami.8b06977; WOS:000440956000002; 2-s2.0-85051007214
17 2018_018	O. Arcelus, S. Nikolaev, J. Carrasco, I. Solovyev, *Magnetism of $NaFePO_4$ and related polyanionic compounds*, Physical Chemistry Chemical Physics **20**(19), 13497 (2018). doi: 10.1039/c8cp01961d; WOS:000432601300041; 2-s2.0-85047496413
18 2018_019	K. Ariga, D.T. Leong, T. Mori, *Nanoarchitectonics for Hybrid and Related Materials for Bio-Oriented Applications*, Advanced Functional Materials **28**(27), 1702905 (2018). doi: 10.1002/adfm.201702905; WOS:000436929400002; 2-s2.0-85028732433
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20 2018_023	C. Arima, A. Suzuki, A. Kassai, T. Tsuruoka, T. Hasegawa, *Development of a molecular gap-type atomic switch and its stochastic operation*, Journal of Applied Physics **124**(15), 152114 (2018). doi: 10.1063/1.5037657; WOS:000448317300025; 2-s2.0-85054129902
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22 2018_025	P.A. Atanasov, N.N. Nedyalkov, R.G. Nikov, N. Fukata, W. Jevasuwan, T. Subramani, D. Hirsch, B. Rauschenbach, *SERS analyses of thiamethoxam assisted by Ag films and nanostructures produced by laser techniques*, Journal of Raman Spectroscopy **4**9(3), 397 (2018). doi: 10.1002/jrs.5312; WOS:000426512700001; 2-s2.0-85042850952
23 2018_027	A. Azhar, C. Young, Y.V. Kaneti, Y. Yamauchi, A.Y. Badjah, M. Naushad, M. Habila, S. Wabaidur, Z.A. Alothman, J. Kim, *Cyano-bridged Cu-Ni coordination polymer nanoflakes and their thermal conversion to mixed Cu-Ni oxides*, Nanomaterials **8**(12), 968 (2018). doi: 10.3390/nano8120968; WOS:000455323100006; 2-s2.0-85057298672
24 2018_028	A. Azhar, M.B. Zakaria, E.M. Ebeid, T. Chikyow, Y. Bando, A.A. Alshehri, Y.G. Alghamdi, Z.X. Cai, N.A. Kumar, J.J. Lin, H. Kim, Y. Yamauchi, *Synthesis of Hollow Co-Fe Prussian Blue Analogue Cubes by using Silica Spheres as a Sacrificial Template*, ChemistryOpen **7**(8), 599 (2018). doi: 10.1002/open.201800120; WOS:000443224700005; 2-s2.0-85052755580
25 2018_029	A. Azhar, M.B. Zakaria, J. Lin, T. Chikyow, D.J. Martin, Y.G. Alghamdi, A.A. Alshehri, Y. Bando, M.S.A. Hossain, K.C.W. Wu, N.A. Kumar, Y. Yamauchi, *Graphene-Wrapped Nanoporous Nickel-Cobalt Oxide Flakes for Electrochemical Supercapacitors*, ChemistrySelect **3**(29), 8505 (2018). doi: 10.1002/slct.201801174; WOS:000440910300014; 2-s2.0-85051176915
26 2018_030	D. Baba, J. Kim, J. Henzie, C.L. Li, B. Jiang, O. Dag, Y. Yamauchi, T. Asahi, *Electrochemical deposition of large-sized mesoporous nickel films using polymeric micelles*, Chemical Communications **54**(73), 10347 (2018). doi: 10.1039/c8cc04070b; WOS:000444242900025; 2-s2.0-85053350716
27 2018_031	D. Baba, A.S. Nugraha, M. Iqbal, J. Bo, C.L. Li, A.A. Alshehri, J. You, V. Malgras, Y. Yamauchi, T. Asahi, *Nafion (R)-coated mesoporous Pd film toward remarkably enhanced detection of lactic acid*, RSC Advances **8**(19), 10446 (2018). doi: 10.1039/c7ra13026k; WOS:000428581000011; 2-s2.0-85044240916
28	D.I. Badrtdinov, S.A. Nikolaev, A.N. Rudenko, M.I. Katsnelson, V.V. Mazurenko, *Nanoskyrmion engineering with sp-*

2018_032	*electron materials: Sn monolayer on a SiC(0001) surface*, Physical Review B **98**(18), 184425 (2018). doi: 10.1103/PhysRevB.98.184425; WOS:000450994000004; 2-s2.0-85057178984
29 2018_033	P. Bairi, T. Tsuruoka, S. Acharya, Q. Ji, J.P. Hill, K. Ariga, Y. Yamauchi, L.K. Shrestha, *Mesoporous fullerene C70 cubes with highly crystalline frameworks and unusually enhanced photoluminescence properties*, Materials Horizons **5**(2), 285 (2018). doi: 10.1039/c7mh00954b; WOS:000433442800013; 2-s2.0-85043240374
30 2018_034	R. Bekarevich, K. Mitsuishi, T. Ohnishi, F. Uesugi, M. Takeguchi, Y. Inaguma, T. Ohno, K. Takada, *Two-dimensional Gaussian fitting for precise measurement of lattice constant deviation from a selected-area diffraction map*, Microscopy **67**(S1), i142 (2018). doi: 10.1093/jmicro/dfx121; WOS:000428559600016; 2-s2.0-85044536083
31 2018_035	R. Bhattacharjee, S. Tanaka, S. Moriam, M.K. Masud, J. Lin, S.M. Alshehri, T. Ahamad, R.R. Salunkhe, N.T. Nguyen, Y. Yamauchi, M.S.A. Hossain, M.J.A, Shiddiky, *Porous nanozymes: The peroxidase-mimetic activity of mesoporous iron oxide for the colorimetric and electrochemical detection of global DNA methylation*, Journal of Materials Chemistry B **6**(29). 4783 (2018). doi: 10.1039/c8tb01132j; WOS:000439945100008; 2-s2.0-85050742449
32 2018_037	P. Bose, T. Takei, X.L. Li, T. Minowa, R. Rajmohan, P. Vairaprakash, K. Tashiro, *A Glutathione-Responsive Short Sequence of Metal–Organic Complex Array*, ChemBioChem **19**(16), 1706 (2018). doi: 10.1002/cbic.201800252; WOS:000441744200004; 2-s2.0-85050590109
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34 2018_039	E. Carbonell-Sanroma, A. Garcia-Lekue, M. Corso, G. Vasseur, P. Brandimarte, J. Lobo-Checa, D.G. de Oteyza, J.C. Li, S. Kawai, S. Szito, S. Yamaguchi, J.E. Ortega, D. Sanchez-Portal, J.I. Pascual, *Electronic Properties of Substitutionally Boron-Doped Graphene Nanoribbons on a Au(111) Surface*, Journal of Physical Chemistry C **122**(28), 16092 (2018). doi: 10.1021/acs.jpcc.8b03748; WOS:000439661000034; 2-s2.0-85048888596
35 2018_040	K. Chang, H. Pang, X. Hai, G. Zhao, H. Zhang, L. Shi, F. Ichihara, J.H. Ye, *Ultra-small freestanding amorphous molybdenum sulfide colloidal nanodots for highly efficient photocatalytic hydrogen evolution reaction*, Applied Catalysis B **232**, 446 (2018). doi: 10.1016/j.apcatb.2018.03.087; WOS:000434004300049; 2-s2.0-85044619928
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40 2018_046	T.P. Chen, C.W. Lin, S.S. Li, Y.H. Tsai, C.Y. Wen, W.J. Lin, F.M. Hsiao, Y.P. Chiu, K. Tsukagoshi, M. Osada, T. Sasaki, C.W. Chen, *Self-Assembly Atomic Stacking Transport Layer of 2D Layered Titania for Perovskite Solar Cells with*

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42 2018_047	F. Cheng, Z.Q. Ma, L.M. Yu, C. Li, C.X. Liu, Q.Y. Guo, H.J. Li, Y. Yamauchi, Y. Bando, Y.G. Alghamdi, A.A. Alshehri, M.S.A. Hossain, Y.C. Liu, *Effects of morphology of Mg powder precursor on phase formation and superconducting properties of $Mg^{11}B_2$ low activation superconductor*, Journal of Materials Chemistry C **6**(30), 8069 (2018). doi: 10.1039/c8tc02300j; WOS:000441762000015; 2-s2.0-85051058562
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16 2019_016	A.E. Allah, Y. Yamauchi, J. Wang, Y. Bando, H.B. Tan, A.A. Farghali, M.H. Khedr, A. Alshehri, Y.G. Alghamdi, D. Martin, M.A. Wahab, M.S.A. Hossain, A.K. Nanjundan, *Soft-Templated Synthesis of Sheet-Like Nanoporous Nitrogen-Doped Carbons for Electrochemical Supercapacitors*, ChemElectroChem **6**(6), 1901 (2019). doi: 10.1002/celc.201900151; WOS:000509124800001; 2-s2.0-85063256828
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