2020 UNISOKU NEWSLETTER

Foggy Aoi-Ike (Blue-Pond) in Biei-cho, Hokkaido where UNISOKU members visited in the 45th anniversary company trip. The clearer photo is well known as a wallpaper in Mac OS X.

Business Policy 経営方針

UNISOKU continues to contribute to the development of science and technology by providing customers with scientific instruments that satisfy their exploring demands.

UNISOKU was founded by Dr. Toshihiko Nagamura, and since then the company's spirit has been based on his frontier mentality, "Provide unique measurement systems to the society". We first grew up with time-resolved optical instruments such as Stopped-Flow spectroscopy system and Flash Photolysis system. In 1986, UNISOKU started productizing STM systems for the first time in Japan, and afterward, we further developed those STM systems into advanced versions working under extreme experimental environments including ultra-low temperature, ultra-high vacuum conditions. Today, we expand our sales worldwide, and UNISOKU low-temperature STM systems become a de facto standard in the academic communities. We continue to support customers to help them use our systems comfortably and challenge for developing valuable instruments. Our challenge for providing unique instruments to satisfy customers' inquisitive mind, "desire to observe, know and solve" will never change. We realize such instruments with our knowledge and experience and hope to contribute to the development of science and technology, eventually leading to a convenient and prosperous society.

46th Management Plan Meeting

ユニソクはお客様の探究心に応える計測を提供し、お客様の成果を通じて、科学技術の発展に貢献しつづけることを目指します。

株式会社ユニソクは、創業者である長村俊彦の「ユニークな測定器を世の中に提供していく」というチャレンジ精神によって誕生しました。創業当時はストップトフロー分光システムや閃光分解分光システムといった、高速分光システムで事業を拡大しました。
1986 年には当時まだ国内では製造されていなかった走査型トンネル顕微鏡の製品化に成功しました。その後、極低温、超高真空という極限環境の STM を追究することにより、現在では世界に販売を展開し、多くの研究者にご愛用いただくようになりました。ユニソクはユーザーの皆様へのサポートを持続し、皆様に安心して装置をお使いいただけるよう、経営の安定を図りながら、新しい価値の創造に挑戦しつづけ、社員と会社の成長を目指します。
お客様の「観たい」、「知りたい」、「突き止めたい」という探究心に応えるユニークな測定器を提供したいというユニソクのチャレンジ精神は変わることなく、お客様が求める計測を社員の知識と経験で実現し、お客様の成果を通じて科学技術の発展と便利で豊かな社会の実現に貢献することをこれからも志して参ります。

The Code of Conduct 行動指針

Challenge courageously
Even in difficult situations, we try something new with our strong will.

Think positively and look from others standpoints
We express our gratitude not criticize. We achieve goals through mutual cooperation. We think from the standpoints of customers, partners and colleagues, and provide values for them.

Create values
To meet ever-changing social needs, we aim to create values that provide happiness and impressive experience to customers by our knowledge and skills.

Pursue happiness
We work to share happiness with our customers and colleagues.

果敢に挑戦
困難なことでも強い意志を持って果敢に挑戦することを目指します。

物事を前向きに、相手の立場で考える
感謝の気持ちを示し、人を非難せず、互いに協力しながら目標を達成することを目指します。
顧客・取引先・同僚の視点で考え、相手にとって価値あることの提供を目指します。

価値の創造
常に変化する世の中のニーズに応え、知恵と工夫で、幸福と感動を与える価値を創造することを目指します。

幸福の追求
仕事を通じて、顧客や同僚とともに歩み、分かち合える幸福を見つけることを目指します。

COMPANY PROFILE

TRADE NAME	UNISOKU CO., LTD.
CEO	Yutaka Miyatake
FOUNDATION	NOV. 1974
LOCATION	2-4-3 Kasugano, Hirakata, Osaka, Japan
CAPITAL	50,000,000 JPY
BUSINESS	Manufacturing and sales of our own UHV LT SPMs and Optical spectroscopy systems, research and development
EMPLOYEES	47

会社概要

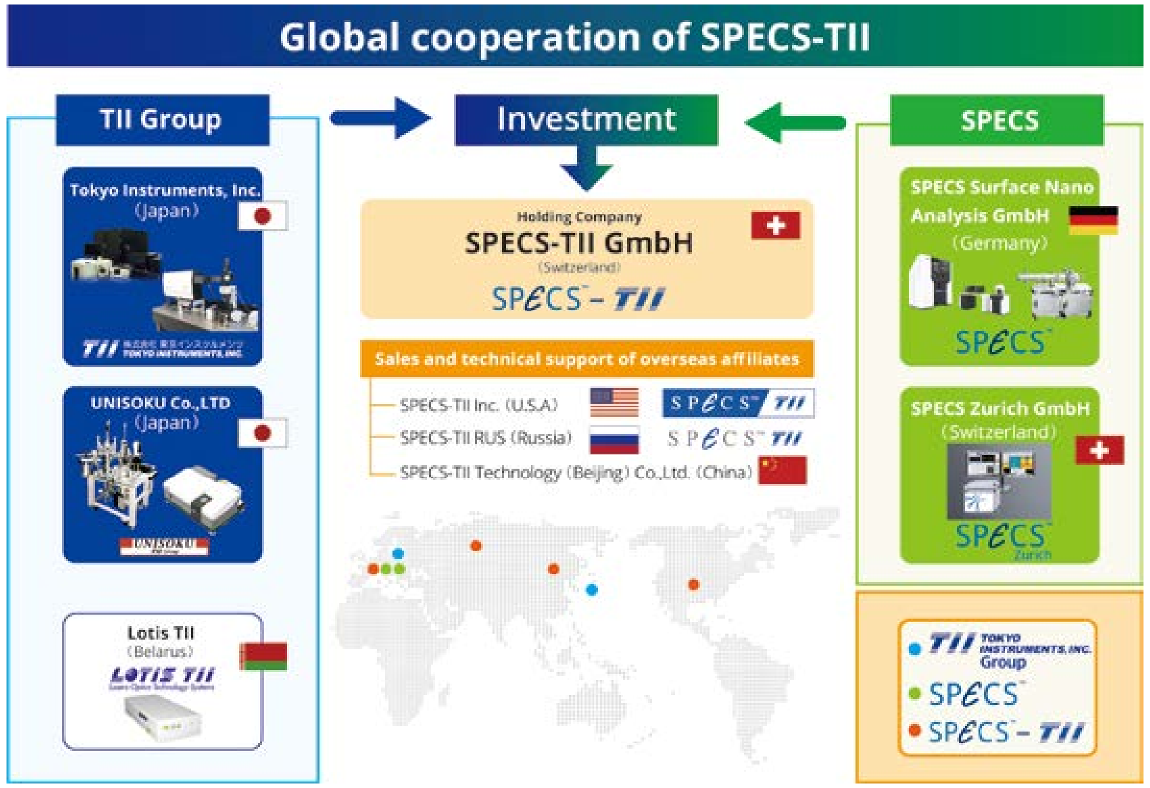
商号	株式会社ユニソク
代表取締役社長	宮武　優
設立	昭和 49 年 11 月
所在地	大阪府枚方市春日野 2 丁目 4 番 3 号
資本金	5000 万円
事業	走査型プローブ顕微鏡、高速分光装置製造販売「研究開発分野」にて事業
社員数	47 名

As a Member of Tokyo Instruments Group

UNISOKU has joined Tokyo Instruments (TII) Group as a subsidiary company in 2010. TII was founded by Shoji Suruga (the former president of UNISOKU) in 1981 with the mission, "Provide the most advanced scientific instruments to domestic researchers and engineers, and do our best to support them to use the instruments with satisfaction". Starting from the imported sales of optical instruments such as lasers and photodetectors, TII has expanded self-developed products business and developed from an import company into a R&D type technology trading company that owns advanced techniques. In 2017, TII group has established a holding company, SPECS-TII GmbH in Switzerland co-founded by SPECS GmbH. In parallel, we have established the local corporations in the U.S., Russia and China to increase sales and improve our customer support from SPECS, TII and UNISOKU. We also plan to establish sales offices in other countries in the near future. UNISOKU aims to provide satisfactory products and service to our customers by strengthening locally based sales and technical support using the global network of SPECS-TII.

東京インスツルメンツグループの一員として

ユニソクは2010年に株式会社東京インスツルメンツの子会社として東京インスツルメンツ（TII）グループに加わりました。東京インスツルメンツは駿河正次（前ユニソク社長）によって「世界最先端の理化学製品をいち早く国内の研究者、開発エンジニアに提供すること、加えて購入製品を満足して使用していただくためのサポート・サービスに全力を尽くす」ことを理念に1981年に創立されました。レーザー、光検出器など分光装置関連の輸入販売に加え、自社開発製品の事業を拡大して輸入商社から高い技術力を持つ研究開発型の技術商社へと発展しました。
TII グループは、2017 年にドイツ SPECS GmbH 社とホールディングス会社 SPECS-TII GmbHをスイスに設立すると同時に、SPECS, TII, UNISOKU の製品の販売とカスタマーサポートを強化するため、米国、ロシア、中国に現地法人を立ち上げました。今後、これら以外の国にも営業拠点設立を計画しています。
ユニソクは、こうした SPECS-TII グローバル連携のネットワークを使い、各地域に根差した販売ならびに技術的サポートを強化し、お客様へのさらなる安心とサービスの提供を目指して参ります。



SPECS-TII Beijing User Meeting in China

SPECS-TII Beijing 主催 ＜中国ユーザーミーティング＞

The meeting was hosted by SPECS-TII Beijing, and users of UNISOKU and SPECS were invited to Kunming, China.
90 people including their families attended and 10 professors introduced their research. On the 2nd day, we enjoyed an excursion to Yunnan Stone Forest. By sharing time together, we could collect direct comments and the newest information from the users.
We believe that the meeting was also a good opportunity for both UNISOKU and SPECS users to mingle.

SPECS-TII Beijingが主催し、ユニソクとSPECSの顧客を中国・昆明に招待しました。招待者のご家族を含む合計90名の参加者にお集まり頂き、およそ10名の先生方に研究内容の紹介をして頂きました。また2日目には、石林への観光を実施し、参加者の多くに楽しんでもらえ、また移動中や観光地での歓談を通して、ユーザーからの直接的な意見や最新の情報を頂くことができました。この会議を通じてUNISOKUとSPECSユーザーの交流を図ることができました。

Events in 2019-2020

1月 JAN

The 1st UNISOKU sales meeting was held, inviting all the distributors around the world.
全代理店集結　第一回セールスミーティング開催

President Miyatake gave a talk at Cryogenics and Superconductivity Society of Japan.
宮武社長　低温工学・超電導学会にて講演

UNISOKU has signed a domestic exclusive distributor agreement with SPECS GmbH for Nanonis Controller sales.
SPECS社のナノニスコントローラの国内総代理店契約を締結　国内販売開始

2月 FEB

The total number of CoolSpeK sales reached 400 (including the former model).
CoolSpeK販売台数が累計400台を突破(旧モデルを含む)

3月 MAR

UNISOKU achieved 44th Invention Award sponsored by the Japan Society for Advancement of Inventions.
"An innovative time-resolved spectroscopic technique to observe so far unobservable chemical reaction in 'gap time region'"
日本発明振興協会 第44回発明大賞「発明功労賞」受賞
『見えなかったすき間時間の化学反応が見える高速分光技術』

4月 APR

Cryogen-free STM under development achieved the base temperature of 3.5 K (the lowest temperature among commercial systems) and successfully obtained atomic resolution images.
開発中の無冷媒STMシステムで3.5 K(業界最低到達温度)、原子分解能STM観察に成功

5月 MAY

UNISOKU entrance garden was renovated.
ユニソク玄関前整備

8月 AUG

R&D grant for a highly sensitive thermal desorption spectroscopy (TDS) system was given by Kiyoshi Ichimura Foundation for New Technology.
市村清新技術財団により高感度TDSの開発助成金授与

UNISOKU joined SPECS TII group user meeting in Kunming, China.
中国　昆明にてSPECS TIIグループ合同　SPMユーザーミーティング参加

UNISOKU opened the official YouTube channel.
ユニソク公式YouTubeチャンネル開設

9月 SEP

SPECS TII Russia received the 1st order of CoolSpeK as an exclusive distributor in Russia.
ロシア代理店としてCoolSpeK初受注(RAS)

10月 OCT

The 45th anniversary company trip to Hokkaido was held.
45周年記念　北海道社員旅行

12月 DEC

The total number of SPM USM1300 sales reached 100.
SPM USM1300 販売台数が累計100台を突破

2020 1月 JAN

UNISOKU STM product was introduced in "Doraemon Science World @ Future Life".
弊社取扱い製品のSTM装置が、小学館発行「ドラえもん科学ワールド 未来のくらし」に掲載

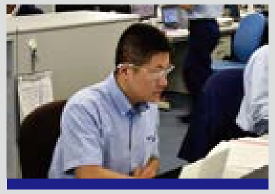
New Face 2019　新入社員紹介

Three new members have joined UNISOKU in 2019. Each of them is expected to play an active role in the optics, production and sales department, respectively.

2019年は3名の新入社員が入社しました。それぞれ分光、製造、営業事務のスペシャリストとして即戦力となり、日々仕事に邁進しています。

世界一の分光製品をつくっていきたいと思います。

製造業にいた経験を活かし職人魂で尽力出来るよう頑張ります！



中国エリア担当です。架け橋となれるよう日々精進しています。

Product Development News in 2019

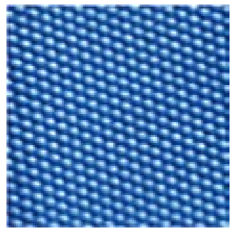
UNISOKU Cryogen-Free STM System Coming Soon

無冷媒STM

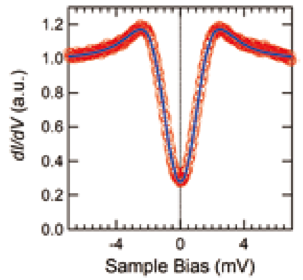
- Base temperature of T_{STM} = 3.5 K achieved
- Low vibration noise level realized by our original design

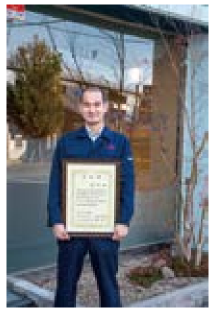
「第18回低温工学・超電導若手合同講演会」にて若手奨励賞 受賞
「パルス管冷凍機を用いた低温走査トンネル顕微鏡の開発」

STM image of HOPG



Superconducting gap of Pb

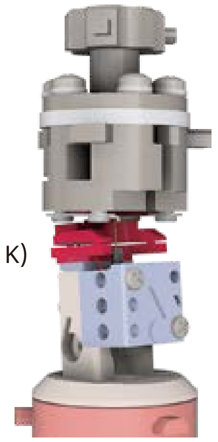




USM1300 Based 400mK-High Magnetic Field-Optical Interference AFM Developed

sMIM　米国プライムナノ社との共同開発

- Ultra-high vacuum condition
- Very low temperature T_{AFM} = 0.4 K
- High magnetic field (11 T)
- Cantilever AFM (fiber interferometer)
- Microwave compatible (~ 3 GHz)
- Wide scan range (15 μ m × 15 μ m@T = 4 K)



The AFM platform was jointly developed with PrimeNano to commercialize the UHV ULT-sMIM (Scanning Microwave lmpedance Microscopy).

このAFMプラットフォームはPrimeNano社とのUHV ULT-sMIM(Scanning Microwave lmpedance Microscopy)製品化の為に開発されました。

＜PrimeNano Inc. Web site＞ https://www.primenanoinc.com/

MHz Amplifier Available Soon in Collaboration with Prof. Milan Allan Group (Leiden University)

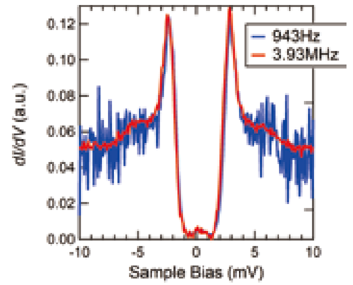
MHzアンプ：ライデン大とのライセンス契約
製品名：RydeenAmp (雷電アンプ)

Advantages

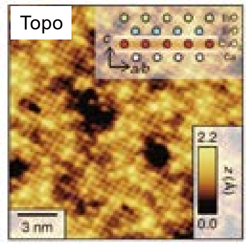
- High resolution tunneling spectroscopy measurements
- Atomic-scale shot noise measurements

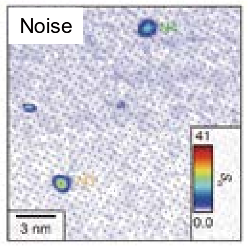
K. M. Bastiaans *et al.*, Rev. Sci. Instrum. **89**, 093709 (2018).

High resolution *dI/dV*



Atomic-scale shot noise measurements





K. M. Bastiaans *et al.*, Nat. Phys. **14**, 1183 (2018).

外部資金

▶市村清新技術財団　新技術開発助成　FY2019-2020
「薄膜材料用超高感度水素検出装置の開発」
東工大細野研との共同開発

▶JST研究成果最適展開支援プログラム(A-STEP)企業主導フェーズ NexTEP-Bタイプ　FY2019-2023(予定)
「時間・スピン分解走査マルチプローブ顕微鏡」
筑波大重川研との共同開発

Publication Stats in 2019

Total number of publications using UNISOKU systems* = 240 (247 in 2018)
Total impact factors ~ 1720 (~ 1266 in 2018)
Corresponding to 40 Nature papers (~ 30 in 2018)
Impact factor per employee ~ 36 (~ 26 in 2018)
Approaching to the impact factor of Nature (~ 43)

The detailed information about the publication list is available on our website.
*including preprints

Popular SPM Research Fields in 2019	Num. of Publications	Average Impact Factor
Graphene	20	8.44
Molecules	20	6.19
Monatomic Films excluding TMDs	18	8.08
Transition Metal Dichalcogenides (TMDs)	13	10.97
Topological Superconductors (Majorana)	11	12.11
Fe-based Superconductors	9	11.82
Topological Materials (Weyl)	8	14.07

Introduction of Products / Users / Publications

Ultra High Vacuum Low Temperature SPM System

USM1200

超高真空低温走査型プローブ顕微鏡システム

Long term SPM measurements realized with low cost cryogen

Cooling performance greatly improved since 2017

- LHe consumption rate: 0.7 L/day
- LHe holding time (10 L): 12 days
- LN_2 holding time (14 L): 1 week

USM1200 Publication List in 2019 (Selected) 論文リスト

"Living Annulative π-Extension Polymerization for Graphene Nanoribbon Synthesis"
Y. Yano *et al.*, Nature **571**, 387 (2019).

"Long-Range Ordered Structures of Corannulene Governed by Electrostatic Repulsion and Surface-State Mediation"
X. Wen *et al.*, J. Phys. Chem. Lett. **10**, 6800 (2019).

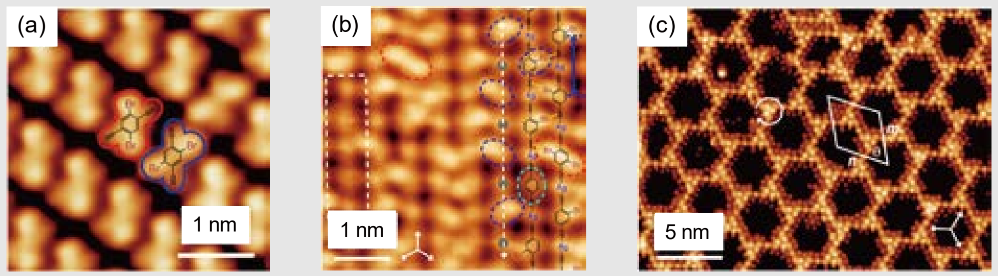
"Unveiling Oxygen Adsorption States on One-Dimensional Pt-Induced Nanowires on Ge(001)"
H. C. Sun *et al.*, J. Phys. Chem. C **123**, 13263 (2019).

"Dechlorinated Ullmann Coupling Reaction of Aryl Chlorides on Ag(111): A Combined STM and XPS Study"
J. Dai *et al.*, Chem. Phys. Chem. **20**, 2367 (2019).

"Reversible Oxidation of Blue Phosphorus Monolayer on Au(111)"
J. L. Zhang *et al.* Nano Lett. **19**, 5340 (2019).

"Stepwise On-Surface Dissymmetric Reaction to Construct Binodal Organometallic Network"
J. Liu *et al.*, Nat. Commun. **10**, 2545 (2019).

Realizing dissymmetric reactions, which allows differentiated functionalization of equivalent sites within one molecule, is crucial for synthetic chemistry and materials science but remains challenging. Liu *et al.* (Wu Kai group, Peking University) demonstrated the dissymmetric reaction of 1,4-dibromo-2,5-diethynylbenzene (2Br-DEB) on Ag(111) in a stepwise manner and revealed the stepwise conversion using STM combined with density functional theory calculations. They found that 2Br-DEB molecules underwent chemical reactions to form 1D alkynyl-silver-alkynyl chains at 300 K and a 2D binodal organometallic network at 320-450 K. Their detailed investigation sheds light on potential application for controlled fabrication of complicated yet ordered nanostructures on a surface.

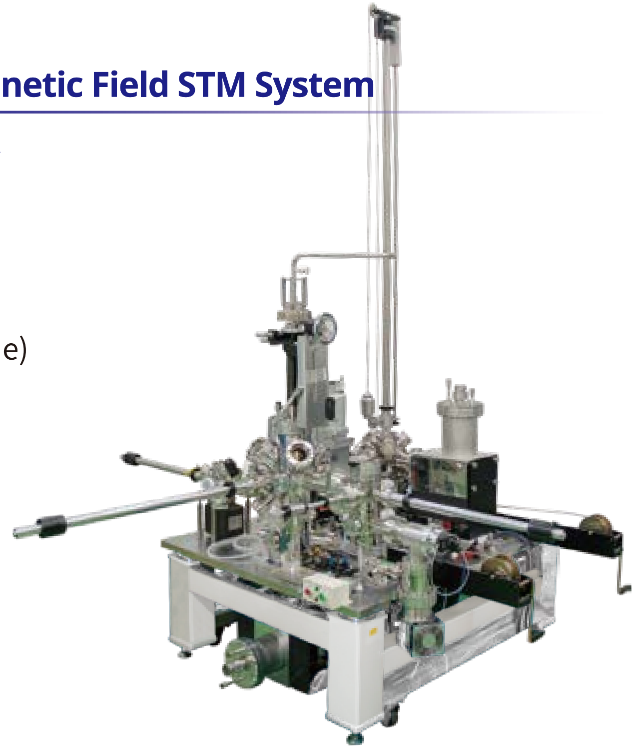


(a) STM image of 2Br-DEB molecules on Ag(111) spontaneously assembled at 150 K.
(b) STM image of the 1D alkynyl-silver-alkynyl chains formed at 300 K.
(c) STM image of the 2D binodal organometallic network formed at 330 K.

Ultra High Vacuum Very Low Temperature High Magnetic Field STM System

USM1300

超高真空極低温強磁場中走査型トンネル顕微鏡システム

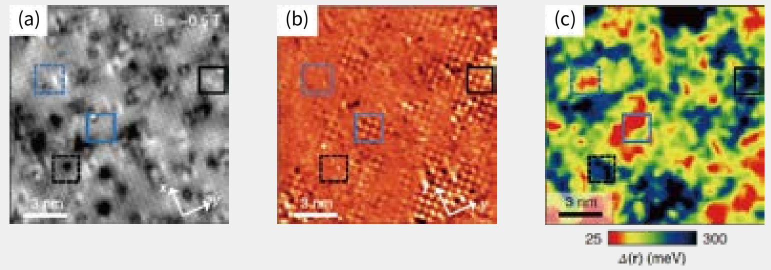


Bestselling very low temperature SPM system

- Base temperature: 350 mK (holding time: 30 h with 14 L ^{3}He)
- Magnetic fields: 11 T, 15 T, 2-2-9 T (standard)
- ^{3}He refrigerator improved since 2017
  - Longer ^{3}He holding time and lower base temperature
  - Noise levels during 1 K pot pumping reduced
- AFM option available
- Total number of shipments reached 100

"Atomic-scale Fragmentation and Collapse of Antiferromagnetic Order in a Doped Mott Insulator"
H. Zhao *et al.*, Nat. Phys. **15**, 1267 (2019). 《**Cover Article**》

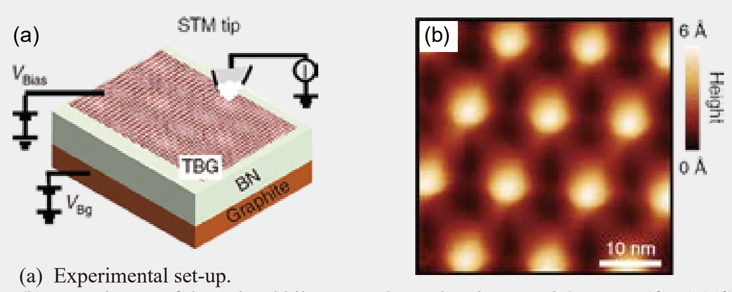
The antiferromagnetic Mott insulator is generally known to exhibit a phase transition from an insulating to a metallic state by carrier doping along with spatially inhomogeneous electronic states varying on nanometer length scales. However, the evolution of the antiferromagnetic order across the phase transition on the same length scales has remained unknown. Zhao *et al.* (Zeljkovic group, Boston College) performed spin-polarized STM to reveal the relation among the antiferromagnetic order, the inhomogeneous electronic state and chemical disorder near the phase transition in a doped Mott insulator $(Sr_{1-x}La)_2IrO_4$. They found that the long-range antiferromagnetic order melts into a short-range fragmented state that is uncorrelated with the energy gap magnitude and the chemical disorder at the surface. Their findings provide a significant insight into how the antiferromagnetic order in a Mott insulator evolves with charge carrier doping and establish spin-polarized STM as a powerful tool for probing atomic-scale magnetism in complex oxides.

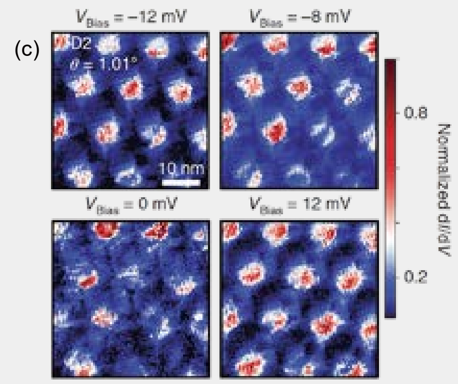


(a) STM image of $(Sr_{1-x}La_x)_2IrO_4$ (x=0.05).
(b) Spin-resolved magnetic contrast map.
(c) Spectral gap map. All images are obtained over an identical region of the sample.

"Electronic Correlations in Twisted Bilayer Graphene Near the Magic Angle"
Y. Choi *et al.*, Nat. Phys. **15**, 1174 (2019).

Twisted bilayer graphene has recently attracted considerable interest because the electronic correlation can be tuned by the rotational angle between two stacking graphene sheets. Especially, at the magic angle ($\theta \sim 1.1^\circ$), the electronic correlation is greatly enhanced and even superconductivity is discovered by carrier doping. Choi *et al.* (Nadj-Perge group, California Institute of Technology) performed low temperature STM measurements (T = 1.5 K) to investigate electronic correlations in this system near the magic angle. A pair of flat electronic bands responsible for the strong correlation are observed to deform when aligned with the Fermi level, indicating greatly enhanced electronic correlations. They also found near the charge neutral point, an enhanced splitting of the flat bands along with symmetry broken density of state maps in the most symmetric moiré regions. This feature could be attributed to the formation of a nematic ground state due to strong electronic interactions. The superconducting state emerging from such symmetry-broken correlated states are expected to be investigated in the near future.





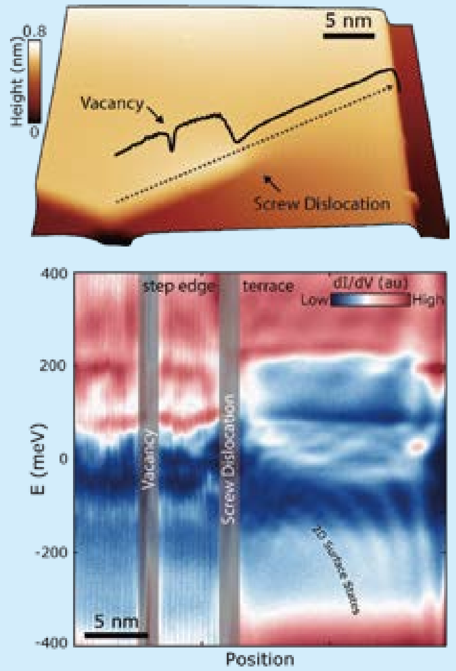
(a) Experimental set-up.
(b) STM image of the twisted bilayer graphene showing a moiré pattern (θ = 1.01°).
(c) Spatially resolved local density of state maps near the charge neutral point showing a symmetry-broken feature in the symmetric moiré region.

Haim Beidenkopf (USM1300 User)

The Weizmann Institute, Israel

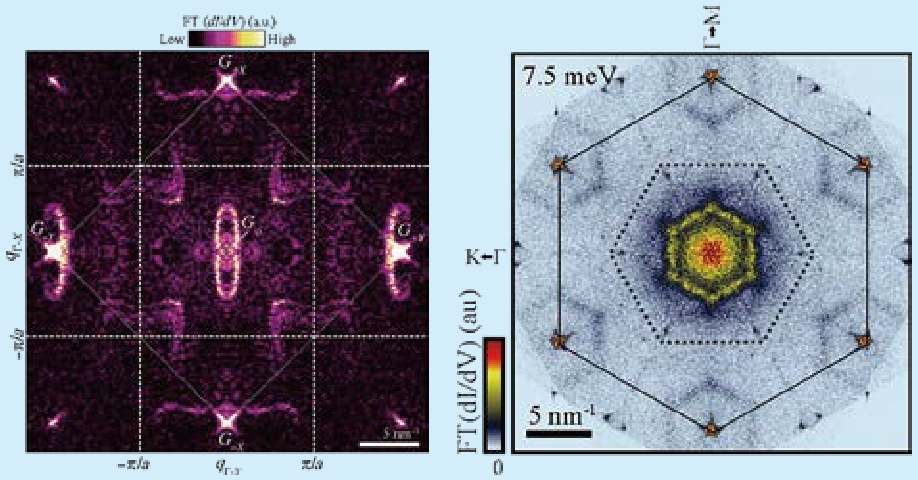
Research Interests

- Scanning tunneling microscopy and spectroscopy
- Molecular beam synthesis of topological nanocrystals and nanowires
- Inducing topology in semiconducting nanowires
- Electronic and magnetic properties of topological states of matter: Weyl semimetals, topological insulators, topological superconductors and correlated materials



Spectroscopic mapping of a screw dislocation and the associated helical edge state in bismuth allowed us to resolve its electronic topological classification

Nayak *et al*., Science Advances **5**, eaax6996 (2019).



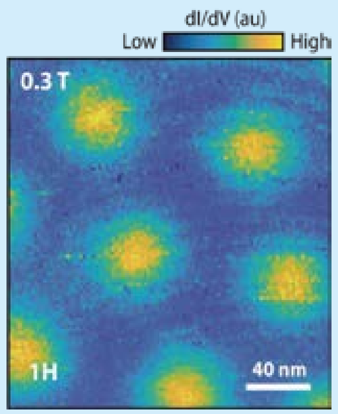
Quasiparticle interference of trivial states and topological Fermi arcs states on:

Left: **"The non centrosymmetric Weyl semimetal TaAs."**

Batabyal *et al*., Science Advances **2**, e1600709 (2016).

Right: **"The magnetic Weyl semimetal $Co_3Sn_2S_2$."**

Morali *et al*., Science **365**, 1286 (2019).



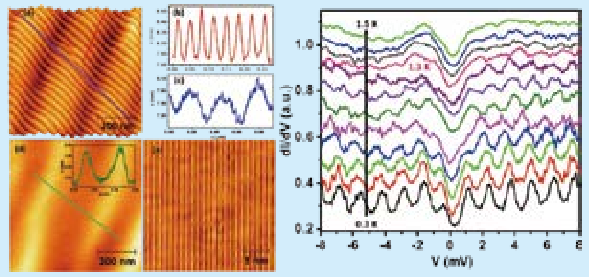
dI/dV map showing a vortex lattice on the surface of the transition metal dichalcogenide $4HbTaS_2$

Goutam Sheet (USM1300 User)

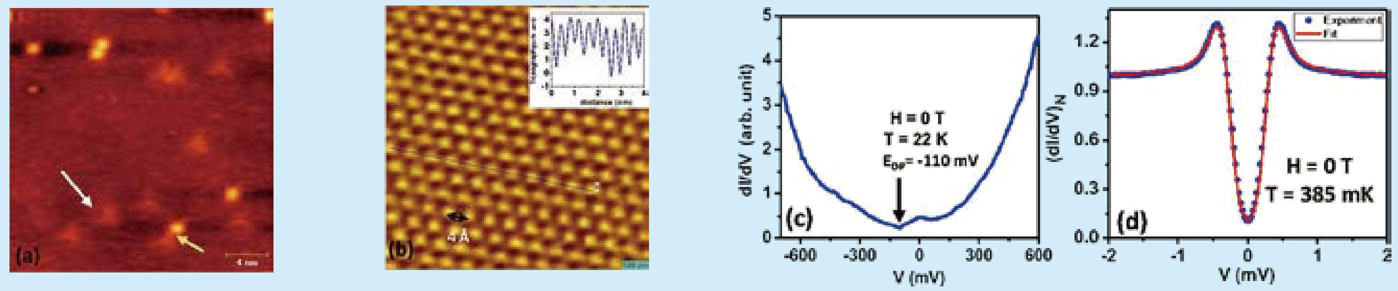
SpIN Lab, Indian Institute of Science Education and Research (IISER) Mohali, India

Research Interests

- Point contact spectroscopy, atomic force microscopy
- Scanning tunneling microscopy and spectroscopy
- Conventional/ unconventional/ topological superconductivity, magnetism, multiferroicity and charge density wave

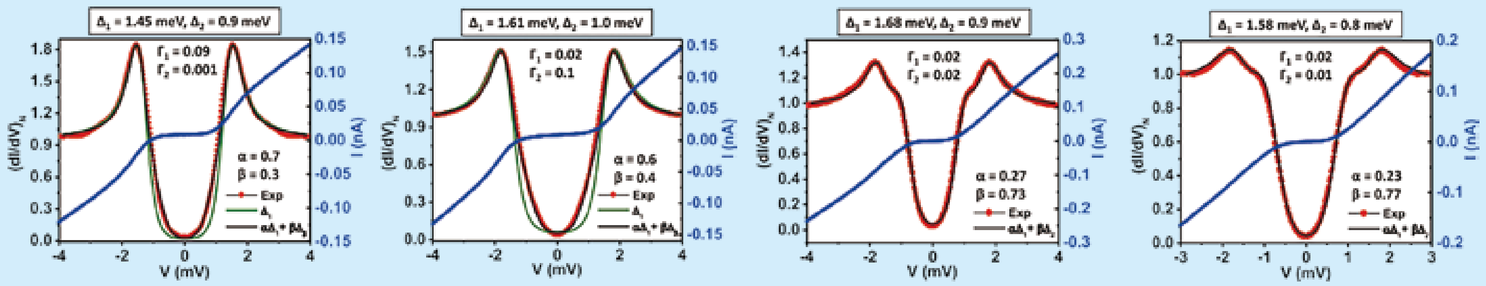


STM topograph of the cleaved surface of Re- $MoTe_2$ obtained in (a) high-strain region and (d) low-strain region, (e) atomically resolved STM- topograph within the same region. On the right, temperature evolution of the STS data. **"Generation of strain-induced pseudo-magnetic field in a doped type-II Weyl semimetal"**, Kamboj *et al*., Phys. Rev. B **100**, 115105 (2019).



(a) Atomic resolution image of the cleaved surface of PdTe2 where two types of defects (indicated by the white and yellow arrows) and quasiparticle interference around them are visible. (b) Zoomed image of a defect-free area. (c) A differential conductance spectrum measured by STS at 22 K and (d) recorded at 385 mK showing clear coherence peak and a low-bias conductance dip.

"Conventional superconductivity in the type-II Dirac semimetal $PdTe_2$", Das *et al*., Phys. Rev. B **97**, 014523 (2018).



(a) Tunneling spectra (*dI/dV* vs V plots) with theoretical fits using Dynes equation showing two gaps measured at 1.9 K on surface of polycrystalline Mo_8Ga_{41}.

"Multiband superconductivity in Mo_8Ga_{41} driven by a site-selective mechanism", Sirohi *et al*., Phys. Rev. B **99**, 054503 (2019).

USM1300 Publication List in 2019 (Selected) 論文リスト

"Fermi-Arc Diversity on Surface Terminations of the Magnetic Weyl Semimetal $Co_3Sn_2S_2$"
N. Morali *et al.*, Science **365**, 1286 (2019).

"Charge-stripe crystal phase in an insulating cuprate"
H. Zhao *et al.*, Nat. Mater. **18**, 103 (2019).

"Negative Flat Band Magnetism in a Spin–Orbit-Coupled Correlated Kagome Magnet"
J. X. Yin *et al.*, Nat. Phys. **15**, 443 (2019).

"Evidence of anisotropic Majorana bound states in 2M-WS_2"
Y. Yuan *et al.*, Nat. Phys. **15**, 1046 (2019).

"Half-Integer level Shift of Vortex Bound States in an Iron-Based Superconductor"
L. Kong *et al.*, Nat. Phys. **15**, 1181 (2019).

"Atomic-Scale Fragmentation and Collapse of Antiferromagnetic Order in a Doped Mott Insulator"
H. Zhao *et al.*, Nat. Phys. **15**, 1267 (2019).

"Interface Engineering of Au(111) for the Growth of 1T′-$MoSe_2$"
F. Cheng *et al.*, ACS Nano **13**, 2316 (2019).

"Unusual Electronic States and Superconducting Proximity Effect of Bi Films Modulated by a $NbSe_2$ Substrate"
L. Peng *et al.*, ACS Nano **13**, 1885 (2019).

"Steering the Achiral into Chiral with a Self-Assembly Strategy"
H. Song *et al.*, ACS Nano **13**, 7202 (2019).

"The Effects of Atomic-Scale Strain Relaxation on the Electronic Properties of Monolayer MoS_2"
D. J. Trainer *et al.*, ACS Nano **13**, 8284 (2019).

"Dimensional Crossover and Topological Phase Transition in Dirac Semimetal Na_3Bi Films"
H. Xia *et al.*, ACS Nano **13**, 9647 (2019).

"Magnetic Hysteresis of Single-Molecule Magnets Adsorbed on Ferromagnetic Substrate"
Z. K. Qi *et al.*, ACS Nano DOI: 10.1021/acsnano.9b04428

"Tuning Single-Atom Electron Spin Resonance in a Vector Magnetic Field"
P. Willke *et al.*, Nano Lett. **19**, 8201 (2019).

"Strongly Compressed Few-Layered $SnSe_2$ Films Grown on a $SrTiO_3$ Substrate: The Coexistence of Charge Ordering and Enhanced Interfacial Superconductivity"
Z. Shao *et al.*, Nano Lett. **19**, 5304 (2019).

"Evidence for d-Wave Superconductivity in Single Layer FeSe/$SrTiO_3$ Probed by Quasiparticle Scattering Off Step Edges"
Z. Ge *et al.*, Nano Lett. **19**, 2497 (2019).

"Directly visualizing the sign change of d-wave superconducting gap in $Bi_2Sr_2CaCu_2O_{8+\delta}$ by phase-referenced quasiparticle interference"
Q. Gu *et al.*, Nat. Commun. **10**, 1603 (2019).

"Resolving the Topological Classification of Bismuth with Topological Defects"
A. K. Nayak *et al.*, Sci. Adv. **5**, eaax6996 (2019).

"Selective Trapping of Hexagonally Warped Topological Surface States in a Triangular Quantum Corral"
M. Chen *et al.*, Sci. Adv. **5**, eaaw3988 (2019).

"Atomic-Scale Interface Engineering of Majorana Edge Modes in a 2D Magnet-Superconductor Hybrid System"
A. Palacio-Morales *et al.*, Sci. Adv. **5**, eaav6600 (2019).

"Quantum Vortex Core and Missing Pseudogap in the Multiband BCS-BEC Crossover Superconductor FeSe"
T. Hanaguri *et al.*, Phys. Rev. Lett. **122**, 077001 (2019).

"High-Magnetic-Field Tunneling Spectra of ABC-Stacked Trilayer Graphene on Graphite"
L. J. Yin *et al.*, Phys. Rev. Lett. **122**, 146802 (2019).

"Quantum Phase Transition of Correlated Iron-Based Superconductivity in $LiFe_{1-x}Co_xAs$"
J. X. Yin *et al.*, Phys. Rev. Lett. **123**, 217004 (2019).

"Vanadyl Phthalocyanines on Graphene/SiC(0001): Toward a Hybrid Architecture for Molecular Spin Qubits"
I. Cimatti *et al.*, Nanoscale Horiz. **4**, 1202 (2019).

Ultra High Vacuum Low Temperature SPM System

USM1400 超高真空低温走査型プローブ顕微鏡システム

Ideal system for combining SPM with optical spectroscopies such as tip-enhanced Raman spectroscopy (TERS)

- Base temperature: 3.5 K
- Focusing lenses with NA ~ 0.35 with 3D piezo positioners
- Single molecule resolution in TERS mode
- Compatible with SPECS sample holder
- Lens stage motion at low temperatures improved

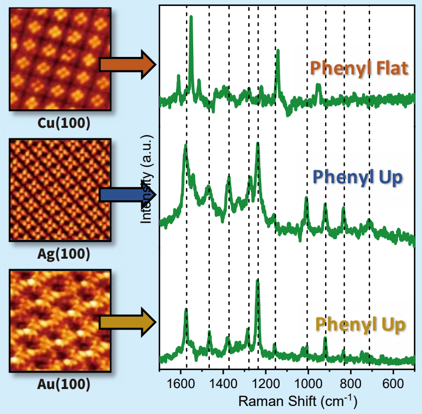
Nan Jiang

University of Illinois at Chicago, U.S.A.

Research Interests

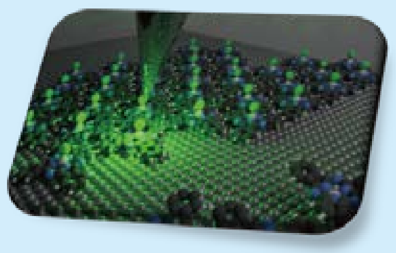
- Tip-enhanced Raman spectroscopy (TERS)
- Surface-supported nanostructures
- Photon-induced chemical reactions
- Functionalization of new 2D materials

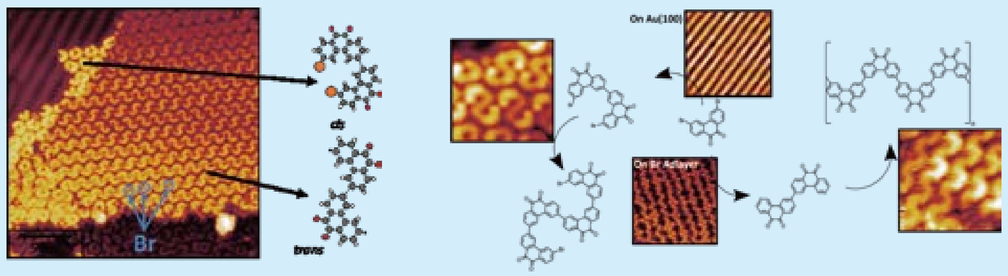
Probing Configuration on Different Substrates



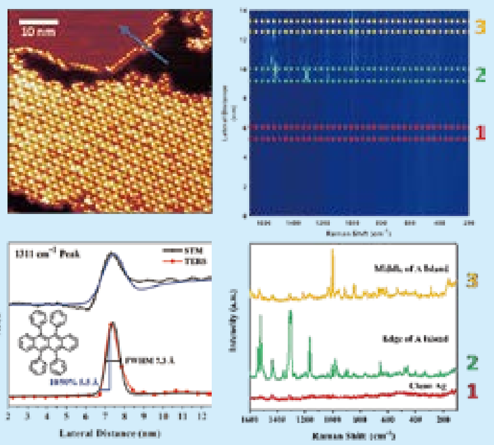
The corresponding TERS spectra for trans isomers directly describe the adsorbed configuration i.e. "Phenyl Up" configurations on Ag(100) and Au(100) while the "Phenyl Flat" configuration appears on Cu(100). Nanoscale **11**, 19877 (2019).

Reaction Stereoselectivity via Surface Functionalization





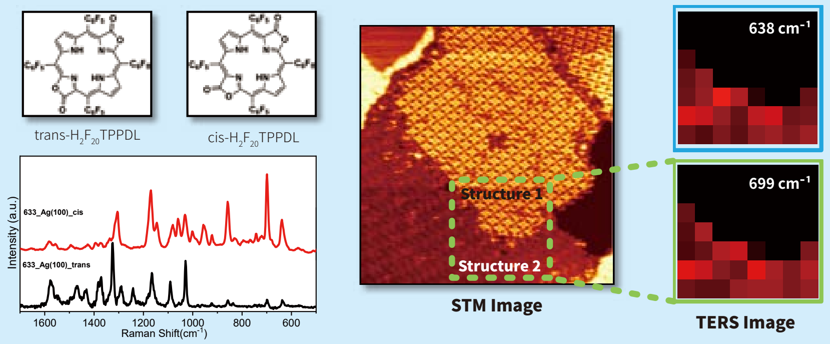
Self-Assembly and Binding Configurations



Three types of self-assemblies of rubrene on Ag(100) were characterized with STM-TERS to yield vibrational fingerprints of two possible adsorption configurations. With 5 Ångström resolution, adjacent configurations were identified.
J. Phys. Chem. C **124**, 2420 (2020).[Cover]

On Au(100), the leaving bromine atoms in the Ullmann-like coupling reaction of 3, 6-dibromo-9,10-phenanthrenequinone (DBPQ) were found to remain adsorbed on the surface. This creates a stereoselective surface resulting in trans dimers compared to the bare substrate which results in cis dimers and bowl trimers.
Nanoscale **12**, 2726 (2020).

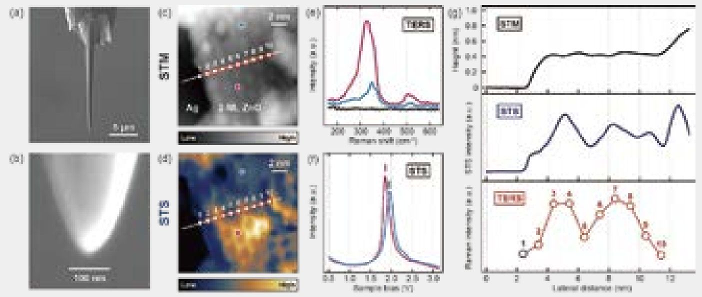
Chemically Identifying Regioisomeric Adsorbates on Ag(100)



The corresponding TERS spectra for trans/cis isomers and TERS imaging confirm that it is possible to precisely distinguish these two co-existing regioisomers.
Nano Lett. **19**, 3267 (2019).

"Resolving the Correlation between Tip-Enhanced Resonance Raman Scattering and Local Electronic States with 1 nm Resolution" S. Liu *et al.*,. Nano Lett. **19,** 5725 (2019).

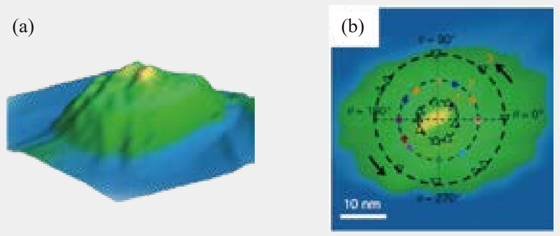
Tip-enhanced Raman spectroscopy, combining the chemical sensitivity of surface-enhanced Raman scattering with the high-spatial resolution of STM, is an emerging powerful tool for nanoscale science and technology. However, understanding the interaction between a confined electromagnetic field and local electronic states of the sample surface has remained elusive because of experimental challenges. Liu et al. (Takashi Kumagai group, Fritz-Haber Institute of the Max-Planck Society) performed tip-enhanced resonance Raman scattering (TERRS) and STS measurements for ultrathin ZnO films on Ag(111) which possess modified electronic band structures depending on the layer thickness. By using Au or Ag tips sharpened by field ion beam (FIB) milling reported by this group before [Nano Lett. **19**, 3597 (2019)], they realized the TERRS spatial resolution of ~1 nm at T = 78 K, allowing to discuss the correlation between TERRS signals and the local DOS with near-atomic resolution. Their results show a direct evidence of the (sub)nanometer-scale interaction between a confined electromagnetic field and local electronic structures of ZnO films.



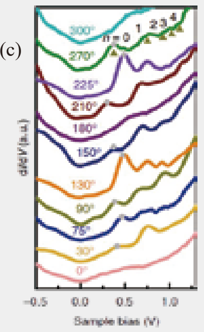
(a, b) SEM micrographs of an Au tip fabricated by FIB.
(c) STM image of a two-monolayer-thick ZnO film on Ag(111).
(d) STS map at V_s = +1.8 V taken at the same field of view as (c).
(e, f) TERRS and dI/dV spectra taken at locations shown as the same colors in (c, d), respectively.
(g) Profiles of the topographic height, STS map and TERRS intensity along the line in (c, d).

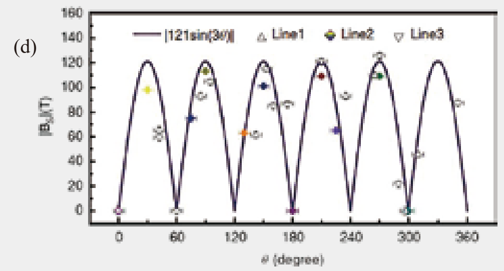
"Programmable Graphene Nanobubbles with Three-Fold Symmetric Pseudo-Magnetic Fields" P. Jia *et al.*, Nat. Commun. **10,** 3127 (2019).

Graphene nanobubbles (GNBs) are known to generate large pseudo-magnetic fields by local strain which are unavailable by ordinary laboratory magnets. However, the size and location of GNBs are generally difficult to control so that their potential applications are limited. Jia *et al.* (Xi Wang group, Chinese Academy of Sciences and Lin He group, Beijing Normal Univ.) demonstrated the ability to manipulate the location, size and shape of GNBs on hydrogen-terminated Ge(110) by tuning the tip voltage. They observed clear peaks in dI/dV spectra on a GNB that are attributed to Landau levels caused by strain-induced pseudo-magnetic fields. Interestingly, they also found such peak structures are unevenly observed in the GNB at specific rotational angles, indicating the existence of three-fold symmetric pseudo-magnetic fields ranging from 0 to 125.7 T. The programmable GNBs with enormous pseudo-magnetic fields would represent a unique platform for various low dimensional phenomena under extremely high magnetic fields.



(a) STM image of a graphene nanobubble (GNB) on Ge(110).
(b) 2D projection of the GNB shown in (a).





(c) dI/dV spectra taken on the colored markers in (b).
(d) Pseudo-magnetic fields as a function of rotational angles.

USM1400 Publication List in 2019 (Selected) 論文リスト

"Tuning Thermal Transport Through Atomically Thin $Ti_3C_2T_z$ MXene by Current Annealing in Vacuum"
Z. Hemmat *et al.*, Adv. Func. Mater. **29**, 1805693 (2019).

"Thinnest Nonvolatile Memory Based on Monolayer h-BN"
X. Wu *et al.*, Adv. Mater. **31**, 1806790 (2019).

"Chemical Vapor Deposition Grown Large-Scale Atomically Thin Platinum Diselenide with Semimetal–Semiconductor Transition"
J. Shi *et al.*, ACS Nano **13**, 8442 (2019).

"Near-Field Manipulation in a Scanning Tunneling Microscope Junction with Plasmonic Fabry-Pérot Tips"
H. Bockmann *et al.*, Nano. Lett. **19**, 3597 (2019).

"Realization of Strained Stanene by Interface Engineering"
Y. Liu *et al.*, J. Phys. Chem. Lett. **10**, 1558 (2019).

"Anisotropic Growth and Scanning Tunneling Microscopy Identification of Ultrathin Even-Layered $PdSe_2$ Ribbons"
S. Jiang *et al.*, Small **15**, 1902789 (2019).

"Graphene Acoustic Phonon-Mediated Pseudo-Landau Levels Tailoring Probed by Scanning Tunneling Spectroscopy"
C. Chi *et al.*, Small DOI: 10.1002/smll.201905202

"Bismuth Mediated Defect Engineering of Epitaxial Graphene on SiC(0001)"
T. Hu *et al.*, Carbon **146**, 313 (2019).

"Probing Surface Mediated Configurations of Nonplanar Regioisomeric Adsorbates Using Ultrahigh Vacuum Tip-Enhanced Raman Spectroscopy"
S. Mahapatra *et al.*, Nanoscale **11**, 19877 (2019).

"New Delay-Time Modulation Scheme for Optical Pump–Probe Scanning Tunneling Microscopy (OPP-STM) With Minimized Light-Intensity Modulation"
O. Takeuchi *et al.*, Jpn. J. Appl. Phys. **58**, SIIA12 (2019).

Ultra High Vacuum / Low Temperature / High Magnetic Field SPM System

USM1500 超高真空低温強磁場中走査型プローブ顕微鏡システム

Compact cryogenic high magnetic field SPM system

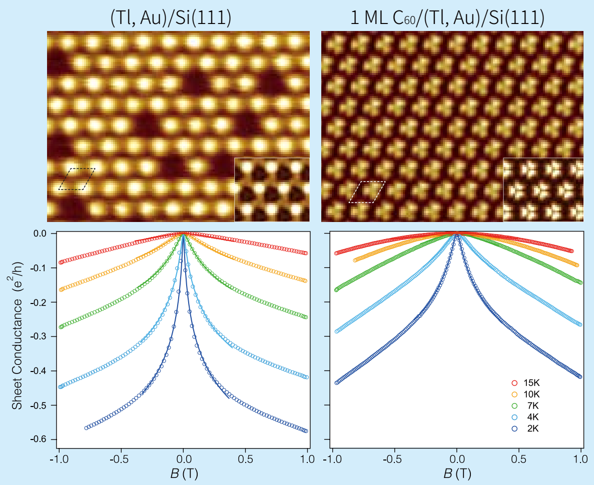
▶ Base temperature: 2.0 K
▶ LHe holding time: 4 days/40 L ~ 7 days/70 L
▶ Magnetic fields: 8 T(standard), 14 T, 2-2-9 T

Alexander Saranin

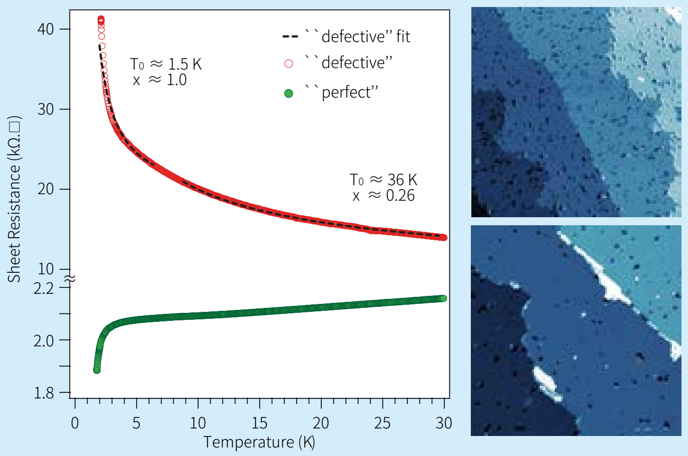
Department of Surface Science,
Russian Academy of Sciences, Russia

Research Interests

- Advanced 2D systems
- Atomic and band structure
- Electron transport
- Quantum and collective transport phenomena
- ARPES, STM/STS



"C_{60} Capping of Metallic 2D Tl-Au Compound with Preservation of Its Basic Properties at the Buried Interface"
D. A. Olyanich *et al.*, Appl. Surf. Sci. **501**, 144253 (2020).
"Weak Antilocalization at the Atomic-Scale Limit of Metal Film Thickness"
A. V. Matetskiy *et al.*, Nano Lett. **19**, 570 (2019).

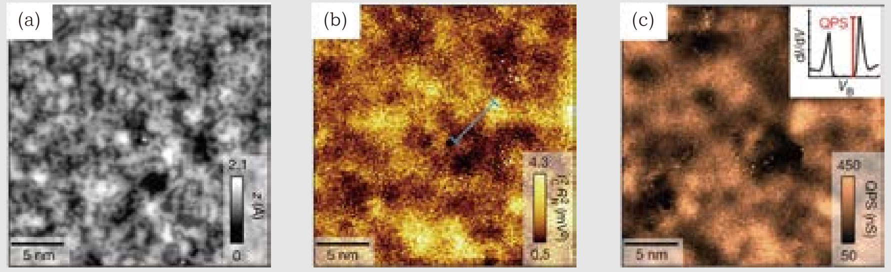


"Superconductor-Insulator Transition in an Anisotropic Two-Dimensional Electron Gas Assisted by One-Dimensional Friedel Oscillations: (Tl , Au)/Si(100)-c(2×2)"
N. V. Denisov *et al.*, Phys. Rev. B **100**, 155412 (2019).

"Observation of the Nesting and Defect- Driven 1D Incommensurate Charge Density Waves Phase in the 2D System"
A. V. Matetskiy *et al.*, J. Phys. Condens. Matter. **31**, 115402 (2019).

"A Strongly Inhomogeneous Superfluid in an Iron-based Superconductor"
D. Cho, K. M. Bastiaans, D. Chatzopoulos *et al.*, Nature **571**, 541 (2019).

The superfluid density governed by the phase coherence of Cooper pairs is a central property for understanding superconductivity. However, spatial variation of the superfluid density in unconventional superconductors has remained largely unknown because of technical challenges. Cho, Bastiaans, Chatzopoulos *et al*. (Milan Allan group, Leiden University) used atomic-resolution Josephson STM to image a superfluid in the iron-based superconductor $FeTe_{0.55}Se_{0.45}$ and simultaneously measured topographic and superconducting gap structures. They found that the superfluid is strongly inhomogeneous and the inhomogeneity is correlated with the coherence of quasiparticle (the height of the coherence peak) rather than structural disorder, quasiparticle scattering and the energy to break Cooper pairs. This unique experimental technique is expected to be applied to other superconductors and also temperature-dependent superfluid density and superconducting gap measurements will further help to reveal the mechanism limiting the superconducting transition temperature in unconventional superconductors.



(a) STM image of $FeTe_{0.55}Se_{0.45}$.
(b) Spatially resolved superfluid density map.
(c) Coherence peak height map.
All images were taken in the same field of view.

USM1500 Publication List in 2019 (Selected) 論文リスト

"Coordination-Controlled C–C Coupling Products via *ortho*-Site C–H Activation"
X. Zhang *et al.,* ACS Nano **13**, 1385 (2019).

"Role of Charge Density Wave in Monatomic Assembly in Transition Metal Dichalcogenides"
H. Feng *et al.,* Adv. Func. Mater. **29**, 1900367 (2019).

"Polar and Phase Domain Walls with Conducting Interfacial States in a Weyl Semimetal $MoTe_2$"
F. T. Huang *et al.,* Nat. Commun. **10**, 4211 (2019).

"Quasiparticle interference evidence of the topological Fermi arc states in chiral fermionic semimetal CoSi"
Q. Yuan *et al.,* Sci. Adv. **5**, eaaw9485 (2019).

"Real-Space Imaging of Orbital Selectivity on $SrTiO_3$(001) Surface"
C. Song *et al.,* ACS Appl. Mater. Interfaces **11**, 37279 (2019).

"Super Large $Sn_{1-x}Se$ Single Crystals with Excellent Thermoelectric Performance"
M. Jin *et al.,* ACS Appl. Mater. Interfaces **11**, 8051 (2019).

"Nitrogen-Doped Graphene on Copper: Edge-Guided Doping Process and Doping-Induced Variation of Local Work Function"
J. Neilson *et al.,* J. Phys. Chem. C **123**, 8802 (2019).

"A Two-Dimensional Crystal Formed by Pentamers on Au(111)"
C. Yuan *et al.,* Chem. Commun. **55**, 5427 (2019).

"Nanofabricated Tips for Device-Based Scanning Tunneling Microscopy"
M. Leeuenhoek *et al.,* Nanotechnology **30**, 335702 (2019).

"Flat AgTe Honeycomb Monolayer with Topologically Nontrivial States"
B. Liu *et al.,* J. Phys. Chem. Lett. **10**, 1866 (2019).

"Imaging Doubled Shot Noise in a Josephson Scanning Tunneling Microscope"
K. M. Bastiaans *et al.,* Phys. Rev. B **100**, 104506 (2019).

"C60 Capping of Metallic 2D Tl-Au Compound with Preservation of Its Basic Properties at The Buried Interface"
D. A. Olyanich *et al.,* Appl. Surf. Sci. **501**, 144253 (2020).

"Superconductor-Insulator Transition in an Anisotropic Two-Dimensional Electron Gas Assisted by One-Dimensional Friedel Oscillations: (Tl,Au)/Si(100)−c(2×2)"
N. V. Denisov *et al.,* Phys. Rev. B **100**, 155412 (2019).

"Multifarious Interfaces, Band Alignments, and Formation Asymmetry of WSe_2–$MoSe_2$ Heterojunction Grown by Molecular-Beam Epitaxy"
Y. Dai *et al.,* ACS Appl. Mater. Interfaces **11**, 43766 (2019).

"A Shallow Acceptor of Phosphorous Doped in $MoSe_2$ Monolayer"
Y. Xia *et al.,* Adv. Electron. Mater. DOI: 10.1002/aelm.201900830

"Local Superconductivity in Vanadium Iron Arsenide"
S. Sefat *et al.,* Phys. Rev. B **100**, 104525 (2019).

"Atomic, Electronic and Transport Properties of In-Au 2D Compound on Si(100)"
D. V. Gruznev *et al.,* J. Phys. Condens. Matter DOI: 10.1088/1361-648X/ab5f28

"Tunable Magnetism of a Single-Carbon Vacancy in Graphene"
Y. Zhang *et al.,* Sci. Bull. DOI: 10.1016/j.scib.2019.11.023

Dilution-Refrigerator Based UHV/Ultra Low Temperature/High Magnetic Field STM System

USM1600 希釈冷凍方式超高真空超低温強磁場中走査型トンネル顕微鏡システム

Dilution-refrigerator based STM system

- Base temperature: 40 mK
- Magnetic fields: 11 T(standard), 15 T, 2-2-9 T

USM1600 Publication List in 2019 論文リスト

"Directional Massless Dirac Fermions in a Layered van der Waals material with one-Dimensional Long-Range Order"
T. Y. Yang *et al.*, Nat. Mater. DOI: 10.1038/s41563-019-0494-1

"Superconductivity of Topological Surface States and Strong Proximity Effect in $Sn_{1-x}Pb_xTe$–Pb Heterostructures"
H. Yang *et al.*, Adv. Mater. **31**, 1905582 (2019).

"Standing Waves Induced by Valley-Mismatched Domains in Ferroelectric SnTe Monolayers"
K. Chang *et al.*, Phys. Rev. Lett. **122**, 206402 (2019).

"Realization of metallic state in 1T-TaS_2 with persisting long-range order of charge density wave"
X. Y. Zhu *et al.*, Phys. Rev. Lett. **123**, 206405 (2019).

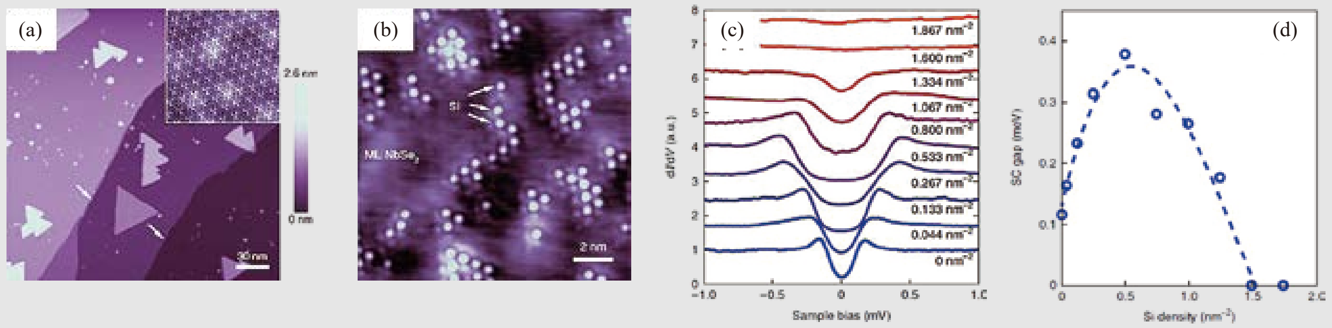
"From atomic layer to the bulk: low-temperature atomistic structure, ferroelectric and electronic properties of SnTe films"
T. P. Kaloni *et al.*, Phys. Rev. B **99**, 134108 (2019).

"The Unusual Suppression of Superconducting Transition Temperature in Double-Doping 2H-$NbSe_2$"
D. Yang *et al.*, Supercond. Sci. Technol. **32**, 085008 (2019).

"Quantized Conductance of Majorana Zero Mode in the Vortex of the Topological Superconductor $(Li_{0.84}Fe_{0.16})OHFeSe$"
C. Chen *et al.*, Chin. Phys. Lett. **36**, 057403 (2019).

"Disorder-Induced Multifractal Superconductivity in Monolayer Niobium Dichalcogenides"
K. Zhao *et al.,* Nat. Phys. **15**, 904 (2019).

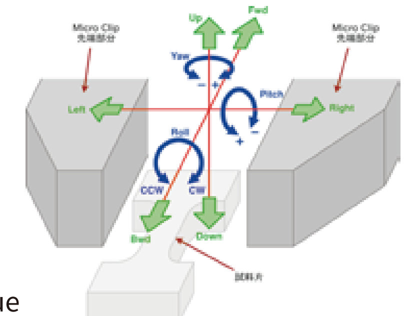
The interplay between disorder and superconductivity as represented by disorder-enhanced superconductivity is an intriguing phenomenon in quantum many-body physics but experimental observation has remained elusive. Zhao *et al*. (Shuai-Hua Ji, Xi Chen, Qi-kun Xue group, Tsinghua Univ.) reported a well-controlled disorder effect on superconductivity in monolayer $NbSe_2$ (T_c ~ 0.9 K) using the dilution-refrigerator-based STM (the electron temperature of 228 mK). They introduced disorder *in situ* by depositing silicon atoms on the surface and also by substituting Se by isovalent S atoms during the sample growth. They found that with increasing disorder by Si adatoms, the superconducting gap reaches a maximum (more than three times larger than that for a pristine sample) and subsequently decreases. By the isovalent substitution, the superconducting gap is similarly enhanced and shows the maximum at x = 0.49 in $NbSe_{2-x}S_x$. At this optimal substitution, T_c is found to be as high as 2.9 K. They claim that these results are attributed to multifractal superconducting states.



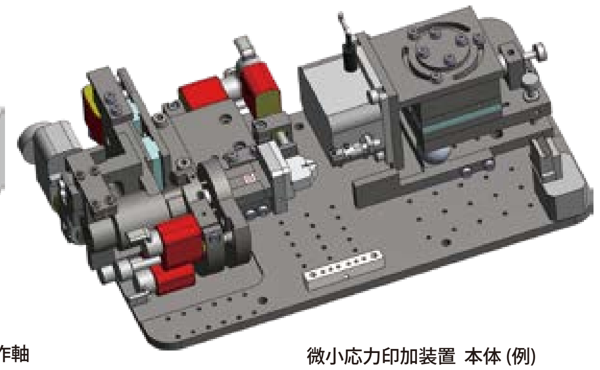
(a,b) STM image of $NbSe_2$ monolayer on graphene/SiC before and after silicon deposition, respectively.
(c) *dI/dV* spectrum near the Fermi level as a function of the Si adatom density.
(d) The superconducting gap as a function of the Si adatom density.

Micro-Tensile Testing System 微小応力印加装置

Positioning a sample with sub-micro meter accuracy and material testing under optical microscope are possible



micro clip操作軸

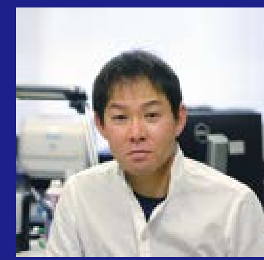


微小応力印加装置 本体 (例)

- Tension, compression, cyclic fatigue tests and four terminal contact resistance measurements can be conducted with this system.
- Those measurements can be performed using your own optical microscope and SEM
- Feel free to ask us about additional optimization such as customized micro-chip and original design
- Measurements while applying extension force of mN order
- Operation from ambient to UHV conditions

Takashi SUMIGAWA

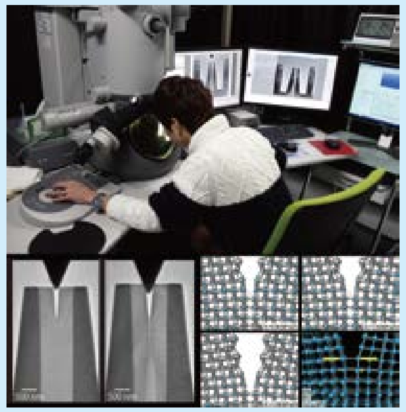
Kyoto University, Japan

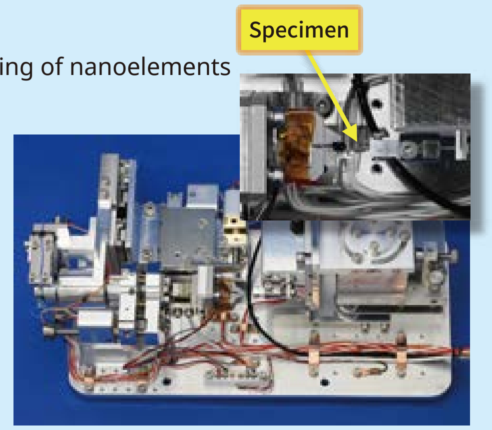


Materials in nanometer or micrometer have unique characteristic mechanical behavior, which is conspicuously different from the counterpart of bulk. Our group possesses special experimental technique for nano-/micro-sized materials and investigates the mechanical behavior, strength and fracture by loading experiments with *in situ* SEM/TEM observations.

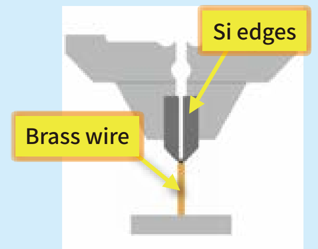
Recent Results

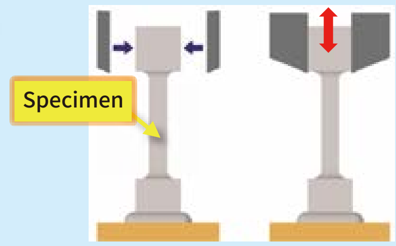
- Fracture mechanics in nanoscale
- Fatigue of nano-/micro-sized metals
- Mechanical behavior of thin films comprising of nanoelements
- Ferroelectricity of nano-sized materials

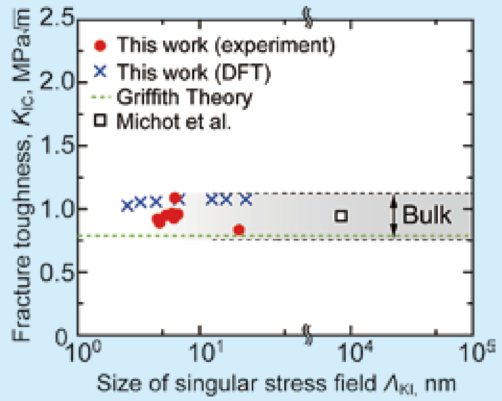




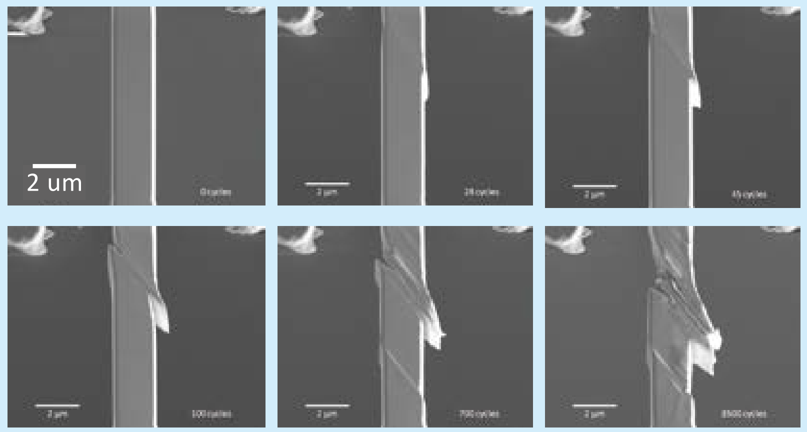
Tension–compression loading device originally developed by our group.







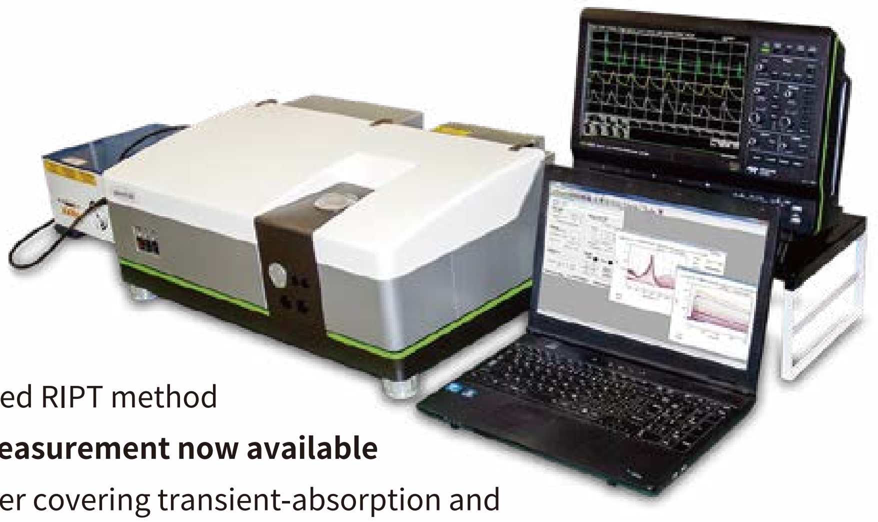
*T. Sumigawa *et al.*, ACS Nano **11**, 6271 (2017).



*T. Sumigawa *et al.*, Acta Materialia **153**, 270 (2018).
*T. Sumigawa *et al.*, Mater. Sci. Eng. A **764**, 138218 (2019).

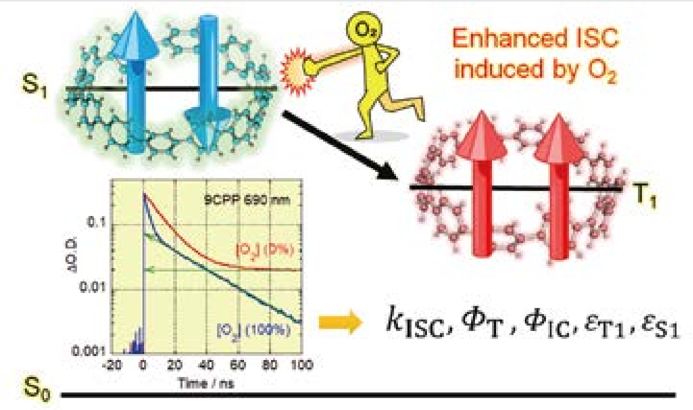
Picosecond Transient Absorption Spectroscopy System

picoTAS ピコ秒過渡吸収分光システム



- ▶ Innovative system based on the patented RIPT method
- ▶ **New option, fluorescence-lifetime measurement now available**
- ▶ The world's first-ever spectrophotometer covering transient-absorption and fluorescence-lifetime measurements in one instrument
- ▶ Variable excitation and detection wavelengths for the fluorescence
- ▶ Low temperature measurements available by combining with a thin-profile CoolSpeK
- ▶ YouTube channel launched to introduce the RIPT method

"Reaction of Oxygen with the Singlet Excited State of [n]Cycloparaphenylenes (n = 9, 12, and 15): A Time-Resolved Transient Absorption Study Seamlessly Covering Time Ranges from Sub-Nanoseconds to Microseconds by the Randomly-Interleaved-Pulse-Train Method"
T. Suenobu *et al.*, J. Phys. Chem. A **124**, 46 (2020).



After light absorption, many photofunctional organic molecules transfer from singlet excited state to triplet excited state by intersystem crossing (ISC) in nanoseconds then return to the ground state in microseconds. It has been difficult so far to observe this series of processes with a single instrument, therefore, integrated analysis has almost not been performed. Suenobu (Osaka Univ.), Katoh (Nihon Univ.) and UNISOKU collaboratively found unanticipated enhancement of ISC by oxygen in cycloparaphenylenes (known as 'Nanohoop') by using our picoTAS based on the RIPT method and succeeded in detailed analysis. This result has proved that picoTAS provides important information hidden in unexplored observation areas.

picoTAS Publication List in 2019 (Selected) 論文リスト

"Suppressed Triplet Exciton Diffusion Due to Small Orbital Overlap as a Key Design Factor for Ultralong-Lived Room-Temperature Phosphorescence in Molecular Crystals"
K. Narushima *et al.,* Adv. Mater. **31**, 1807268 (2019).

"Carrier-Selective Blocking Layer Synergistically Improves the Plasmonic Enhancement Effect"
T. Kawawaki *et al.,* J. Am. Chem. Soc. **141**, 8402 (2019).

"Photocatalytic Oxygenation Reactions with a Cobalt Porphyrin Complex Using Water as an Oxygen Source and Dioxygen as an Oxidant"
Y. H. Hong *et al.,* J. Am. Chem. Soc. **141**, 9155 (2019).

"Pyrrole-Based π-System–PtII Complexes: Chiroptical Properties and Excited-State Dynamics with Microsecond Triplet Lifetimes"
G. Hirata *et al.,* Chem. Eur. J. **25**, 8797 (2019).

"Size-Dependent Relaxation Processes of Photoexcited [*n*]Cycloparaphenylenes (*n* = 5–12): Significant Contribution of Internal Conversion in Smaller Rings"
M. Fujitsuka *et al.,* J. Phys. Chem. A **123**, 4737 (2019).

"Effect of Reabsorption of Fluorescence on Transient Absorption Measurements"
Y. Shibasaki *et al.,* Spectrochimica Acta Part A: Mol and Biom Spect. **220**, 117127 (2019).

"Exergonic Intramolecular Singlet Fission of an Adamantane-Linked Tetracene Dyad via Twin Quintet Multiexcitons"
Y. Matsui *et al.,* J. Phys. Chem. C **123**, 18813 (2019).

Cryostat for Spectrophotometer USP-203 Series

CoolSpeK UV/CD/IR 分光用クライオスタット

Compact cryostat that requires no vacuum pump

- ▶ Temperature range: -80 °C ~ +100 °C
- ▶ Total number of shipments since released > 420
- ▶ Newly compatible with J-1500 (JASCO) and IRSprit (SHIMADZU)
- ▶ Appeared in 14 J. Am. Chem. Soc. papers in 2019
- ▶ Strengthening international sales and marketing partnership
- ▶ New version with CE mark to be released soon

Stopped-Flow Rapid Scan Spectrometer

RSP-2000 ストップトフローラピッドスキャン分光測定装置

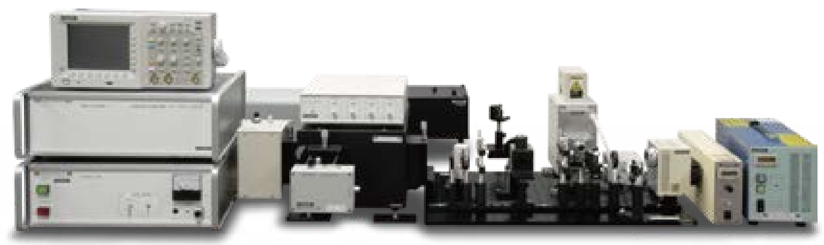
Latest stopped flow platform

- ▶ Fully USB supported version now available
- ▶ Data memory doubled, transfer speed tripled
- ▶ Near-infrared measurement both for single-channel and multichannel
- ▶ Customized flow control system for lab-based SAX-HPLC reported in Sci. Rep.

"Newly developed Laboratory-based Size exclusion chromatography Small-angle x-ray scattering System (La-SSS)"
R. Inoue *et al.,* Sci. Rep. **9**, 12610 (2019).

Nanosecond Transient Absorption Spectroscopy System

TSP-1000/2000 ナノ秒時間分解分光測定装置 (レーザーフラッシュフォトリシス装置)



- ▶ Conventional laser flash photolysis
- ▶ Time resolution: 10 ns
- ▶ Single click measurements from UV to NIR
- ▶ Ultra-sensitive TA measurement (ΔOD ~ 10^{-5}) under development
  - · Amplifier and optics optimized for high-sensitivity measurements
  - · Adopted a high resolution oscilloscope
- ▶ Option for emission lifetime measurements of singlet oxygen available

TSP-1000/2000 Publication List in 2019 (Selected) 論文リスト

"Solid-State, Near-Infrared to Visible Photon Upconversion via Triplet–Triplet Annihilation of a Binary System Fabricated by Solution Casting"
A. Abulikemu *et al.,* ACS Appl. Mater. Inrefaces **11**, 20812 (2019).

"Liquid Crystallinity as a Self-Assembly Motif for High-Efficiency, Solution-Processed, Solid-State Singlet Fission Materials"
S. Masoomi-Godarzi *et al.,* Adv. Energy Mater. **9**, 1901069 (2019).

"Photochromic Reaction by Red Light via Triplet Fusion Upconversion"
A. Tokunaga *et al.,* J. Am. Chem. Soc. **141**, 17744 (2019).

枚方(ひらかた)周辺の歴史・観光や地域の紹介

Introduction of history, sightseeing area around Hirakata

1st-C 弥生

① 田口山遺跡　Taguchiyama ruins　(田口山2-2010-3)
弥生時代中期後半に成立した高地性集落。竪穴住居跡や土器、石器が出土している。
The ancient village established in the late Yayoi period.

② 禁野車塚古墳　Kinya-kurumazuka mound tomb　(宮之阪5-381-3)
古墳時代前期前半(4世紀前半)に築造されたと考えられる前方後円墳で大阪府内でも最古クラス。
全長120メートル。　One of the oldest imperial tombs in Osaka.

Mid 3rd ~ 7th Century 古墳

③ 牧野車塚古墳　(車塚1-369)
Makino-kurumazuka mound tomb
古墳時代前期中頃(4世紀後半)に築造されたと考えられる前方後円墳。全長107.5メートル。
The ancient tomb built in the late 4th century.

④ 樟葉宮跡の杜 (継体天皇 樟葉宮跡伝承地)
Kuzuha no miya ruins　(楠葉丘2-19-1)
第26代 継体天皇が即位し、5年にわたり宮を営んだとされる。
The 26th emperor Keitai was enthroned at this place in 507.

710 ~ 794 奈良

⑤ 百済寺跡　(中宮西之町4340)
Baekje temple ruin
百済滅亡後、日本に在留した百済王族の子孫 百済王 敬福が建立。
Built in ~750 by descendants of Baekje royal family who originally lived in the Korean Peninsula.

794 ~ 1185 平安

⑥ 阿弖流為・母禮の塚　(牧野阪2丁目)
Monument of Aterui and More
征夷大将軍 坂上田村麻呂によって東北地方の平定がなされ、蝦夷の首長 阿弖流為(アテルイ)と副将 母禮(モレ)を伴って帰京した。
The chiefs of Emishi (living in the north east area of Japan) were executed after loss in the war against Yamato dynasty.

1336 ~ 1573 室町

⑦ 交野天神社本殿　Katano-ten shrine　(楠葉丘2-19-1)
室町時代中期に遡る枚方市内の古建築としては最古のもの。
One of the oldest buildings in Hirakata.

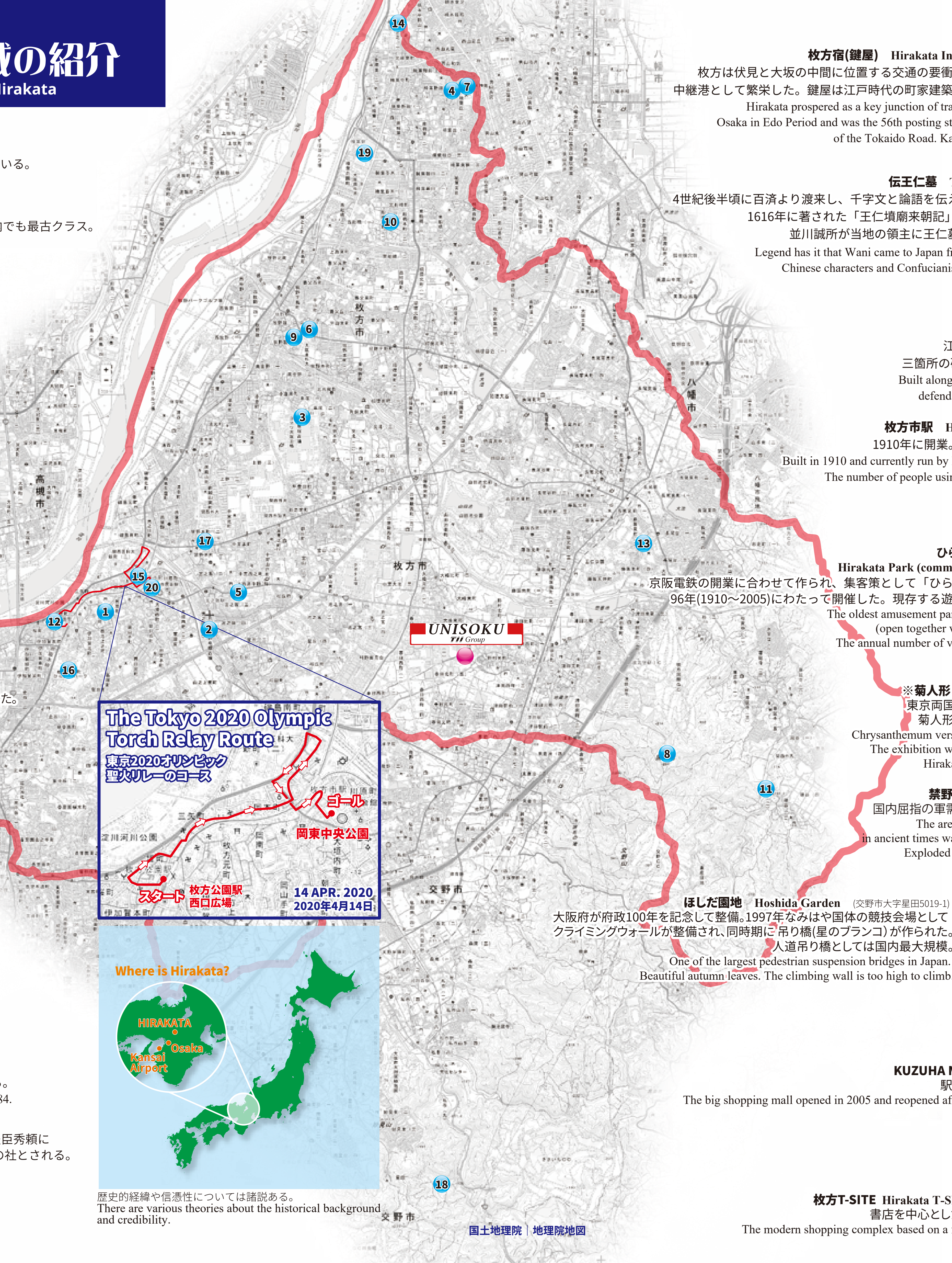
⑧ 津田城　Tsuda castle　(津田山手2-11-1)
1490年 津田正信が国見山に築城し、1575年 織田信長によって落城された。
Built by the lord, Masanobu Tsuda in 1490 and destroyed by Nobunaga Oda in 1575.

⑨ 片埜神社　Katano shrine　(牧野阪2-21-15)
創建は約2000年前 (第11代 垂仁天皇 BC29-70)
豊臣秀頼によって再建、
交野郡一宮・大坂城の鬼門鎮護の社とされる。
Believed to be built ~2000 years ago, and rebuilt by Hideyori Toyotomi in 1602.

⑩ 二宮神社　Ninomiya shrine　(船橋本町1-707)
創建は313～399年(第16代仁徳天皇)の説と738年(第45代聖武天皇)の説がある。
1584年に豊臣秀頼によって再建、交野郡二宮・大坂城の鬼門鎮護の社とされる。
Built in 313-399 or 738 and called Ninomiya since rebuilt by Hideyori Toyotomi in 1584.

1573 ~ 1603 安土桃山

⑪ 三之宮神社　Sannomiya shrine　(穂谷2-7-1)
創建は341年 (第16代 仁徳天皇) 1600年頃に豊臣秀頼によって再建、交野郡三宮・大坂城の鬼門鎮護の社とされる。
Built in 341 and called Sannomiya since rebuilt by Hideyori Toyotomi around 1600 together with Katano and Ninomiya shrines to guard Osaka Castle from demons.



歴史的経緯や信憑性については諸説ある。
There are various theories about the historical background and credibility.

国土地理院｜地理院地図

枚方宿(鍵屋)　Hirakata Inn (Kagiya)　(堤町10-27) ⑫
枚方は伏見と大坂の中間に位置する交通の要衝であり、水上交通の中継港として繁栄した。鍵屋は江戸時代の町家建築の構造を残している。
Hirakata prospered as a key junction of trade between Kyoto and Osaka in Edo Period and was the 56th posting station in the 57 stations of the Tokaido Road. Kagiya was a typical inn.

伝王仁墓　Tomb of Wani　(藤阪東町2-2220-2) ⑬
4世紀後半頃に百済より渡来し、千字文と論語を伝えたとされる伝承上の人物の墓。
1616年に著された「王仁墳廟来朝記」をもとに、1731年京都の儒者並川誠所が当地の領主に王仁墓として崇敬するよう進言した
Legend has it that Wani came to Japan from Baekje (Korea) and conveyed Chinese characters and Confucianism to Japan in the late 4th century.

1603 ~ 1868 江戸

樟葉台場跡　Kuzuha fort ruins　(中之芝2丁目) ⑭
江戸幕府により京都防衛のために築造された河川台場。
三箇所の砲座と番所、火薬庫を備える大規模の施設(38,000㎡)
Built along Yodo River by Edo Shogunate at the end of Edo Period to defend Kyoto from the group aiming to overthrow the Shogunate.

枚方市駅　Hirakata-shi station　(岡東町19-14) ⑮
1910年に開業。現在の利用者は1日約10万人。
Built in 1910 and currently run by Keihan Electric Railway Co., Ltd.
The number of people using the station is ~100,000 per day.

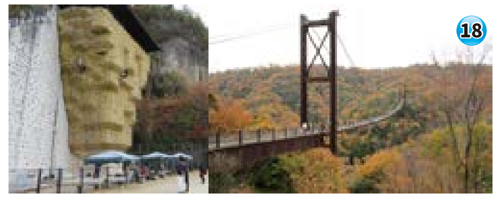
ひらかたパーク(公園町1-1) ⑯
Hirakata Park (commonly called Hira-Par)
京阪電鉄の開業に合わせて作られ、集客策として「ひらかた大菊人形展」を96年(1910～2005)にわたって開催した。現存する遊園地では日本最古。
The oldest amusement park in Japan since 1910 (open together with Keihan Railway).
The annual number of visitors is ~1.2 million.

※菊人形　Chrysanthemum dolls
東京両国国技館で開催されていた菊人形に着目し、成功を収めた。
Chrysanthemum version of Madame Tussauds.
The exhibition was held to attract people to Hirakata Park during 1910-2005.

1868 ~ 1912 明治

禁野火薬庫　Kinya gunpowder factory site　(禁野本町) ⑰
国内屈指の軍需施設だったが1939年に大規模な爆発事故が起きた。
The area where the imperial families exclusively enjoyed hunting in ancient times was used for the gunpowder factory in the late 19th century.
Exploded twice (1909, 1939). The second explosion was disastrous.

1926 ~ 1989 昭和



ほしだ園地　Hoshida Garden　(交野市大字星田5019-1) ⑱
大阪府が府政100年を記念して整備。1997年なみはや国体の競技会場としてクライミングウォールが整備され、同時期に吊り橋(星のブランコ)が作られた。人道吊り橋としては国内最大規模。
One of the largest pedestrian suspension bridges in Japan.
Beautiful autumn leaves. The climbing wall is too high to climb.

KUZUHA MALL　(楠葉花園町15-1) ⑲
駅前ショッピングモール
The big shopping mall opened in 2005 and reopened after renovating in 2014.

1989 ~ 2019 平成

枚方T-SITE　Hirakata T-SITE　(岡東町12-2) ⑳
書店を中心とした複合商業施設
The modern shopping complex based on a fancy bookstore.

Where to Contact in Your Area 代理店紹介

For customers outside those areas, contact UNISOKU directly. Mail：info@unisoku.co.jp

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New Office
The office has been relocated in Jan. 2020

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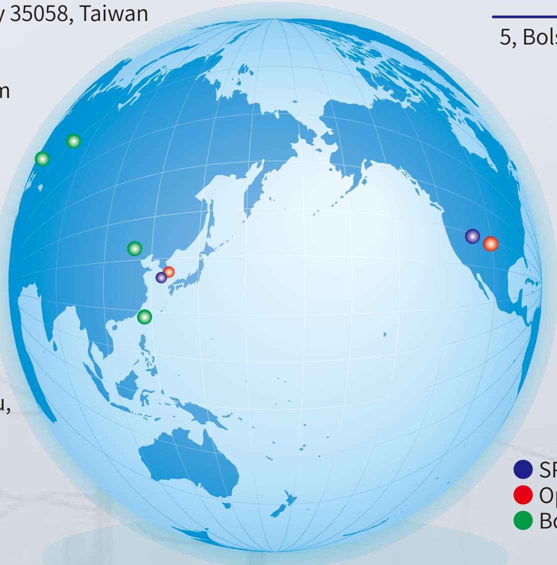

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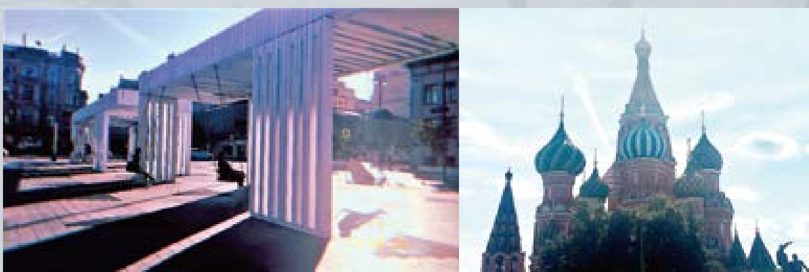
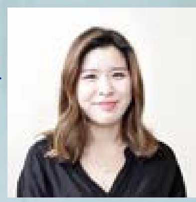
● SPM
● Optics
● Both



UNISOKU Sawada's Business Journey to Russia

In Aug, 2019, at Sheremetyevo airport, the President of the distributor in Russia welcomed me with a word, "Here is a place to enjoy a life." What came into my sight was Cyrillic letters that looked like left-and-right-reversed alphabets. I tried to read aloud in English pronunciation but it soon failed because the letters got left and right reversed. (I wondered if Russian people did not mix up when they spoke English…) After I got out of the nearest station to the distributor office, there were some huge swings (shown in the photo) and those enjoying the swings were grown-ups!? I did a double take. In Russia, it seems that swings are not only for kids but also for grown-ups. It is still humorous when I remember that scene. I felt that there are many places where people can enjoy sunshine and relax in Moscow and the town itself is designed to enjoy their lives.



ユニソク澤田のロシア紀行

2019年8月、シェレメチェボ空港にて「ここは生活を楽しむところだから」と現地代理店社長が出迎えてくれた。目に入るものはアルファベットを左右ひっくり返したようなキリル文字、英語の発音で読もうとするがすぐに文字がひっくり返り断念。(英語も話せるロシア人は発音が混同しないのだろうか。) 空港から鉄道に乗って代理店オフィス最寄り駅から出てすぐ広場に大きなブランコがあり、乗っているのは子どもではなく立派な大人…!? 思わず二度見してしまう。ここではブランコは子どもだけの乗り物ではないようだ。大人がブランコを漕ぐ姿が今思い出してみても何とも珍しい光景だった。このように街の至る所に何をするでもなく日光に当たりながら座ってゆっくりできる場所が沢山あり、町全体が暮らしを楽しむようにデザインされていると感じた。

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