[009]グリーンアジア国際戦略プログラムNEWSLETTER

九州大学　博士課程教育リーディングプログラム

グリーンアジア国際戦略プログラム

Kyushu University　Program for Leading Graduate Schools

Advanced Graduate Program in Global Strategy for **Green Asia**

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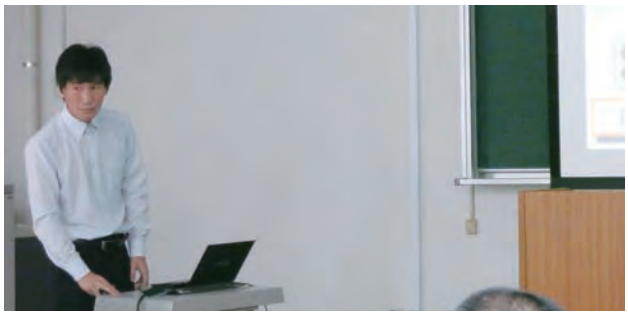
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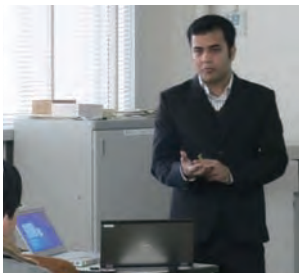
ANIMESH PAL


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松本 親樹


正木 悠聖

■GA 新任教員 研究等紹介

九州大学
グリーンアジア国際リーダー教育センター
助教
船津　貴弘

2017年1月1日付きで九州大学グリーンアジア国際リーダー教育センター助教に着任しました船津貴弘と申します。簡単な経歴を紹介しますと、2003年3月に九州大学大学院工学府地球資源システム工学専攻博士後期課程を修了し、その後は2005年2月までオーストラリアのカーティン工科大学、2005年4月から2008年3月までは山口大学工学部社会建設工学科、2008年4月から2014年10月までは独立行政法人産業技術総合研究所、2014年11月からは再びオーストラリア、カーディン大学と経てきました。

研究における専門は岩盤工学、岩石力学で、これまでに一貫して地下の安全で経済的な活用を研究の主題とし、そのための岩石中の亀裂の進展問題を取り扱ってきました。研究対象として、九州大学在学中、修士課程、博士後期課程では高レベル放射性廃棄物の地層処分における岩盤構造物の健全性評価を、Curtin大学では大深度地下鉱山開発のための地下応力測定や亀裂のコントロール、山口大学では浅部トンネルの地盤の安定性を確保するための支保の効果の解明について取り組んできました。産総研では主に二酸化炭素地中貯留に関して、二酸化炭素圧入に伴う貯留層の力学的安定性の評価や力学・流体流動連成解析手法、断層を含む複雑な地層のモデリング手法の開発に取り組んできました。これまでに亀裂進展評価手法としてSCB試験と呼ばれる室内試験手法の確立を目指し、その成果はISRM(International Society for Rock Mechanics) suggested methodとして取りまとめています。

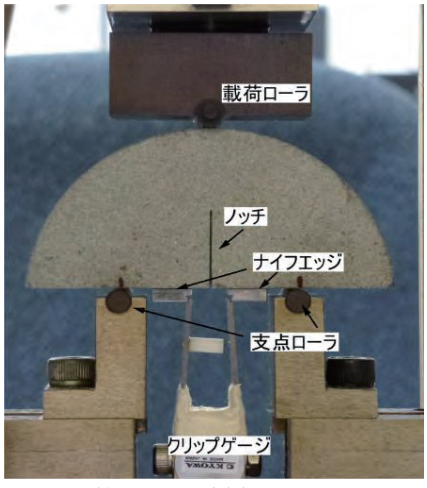

図１. ISRMに採用されたSCB試験法

研究の詳細につきましては、ResearchGate（https://www.researchgate.net/profile/Takahiro_Funatsu）に紹介していますので、そちらを参照してください。

自らの大学院生時代を振り返りますと、大学へ通ったのは最初の1年間だけで、それ以降は指導教授の勧めもあり博士号を取得するまでほぼ学外で研究生活を送っておりました。その間、外国人を含め多くの研究者と知り合えたことや海外のフィールドに出ることができたことに大きな影響を受け、その後の海外生活につながったものと思います。一方で、当時は現在のようにインターンシップの制度が充実しておらず、学外での研究については資金的な援助はありませんでしたので、ほぼ私費で賄っておりました。幸いなことに受け入れ先のご厚意で最後の1年間は技術職員として採用していただき、給与をいただきながら研究をすることができました。それを考えると当時GAのようなプログラムがあれば思うと同時に現在の学生には使える制度は最大限活用するように指導していきたいと思います。

また、海外での生活を通して、海外の研究者や企業人から常々日本社会の閉鎖性について苦言をいただいておりました。実際に、国外から日本を見てみると封建的な面はまだまだ強いようです。そのことが日本企業の海外進出や日本製品の売り込みにおいてマイナスに作用していることがあります。マイニングの分野では資源ナショナリズムなどと言われますように、各国が天然資源をいかに確保するかが問題となっています。天然資源に乏しい日本は必要な量を適正な価格で取得することが求められ、そのためには海外の国や企業と交渉するための能力が必要であると思います。特に資源工学を学ぶ学生には、資源メジャーといわれる企業にインターンシップに行き、現状を理解してもらいたいと思います。そしてできたら、資源メジャーに職を得てもらえたらと思います。そのためにもこれまでの経験や人脈を活用して、海外に行く学生のサポートをしていきたいと思います。

これまで2回、計4年の海外経験から、国際社会で通用する人材の育成について、日本人学生には国際的に活躍するためのコミュニケーション能力や問題解決能力を身に付けされるための教育に積極的に携わりたいと思っています。一方、外国人留学生には、日本が有する長所であるものづくりに対する真摯な態度、精巧さや品質管理などを、また先進国からの援助に頼らない自立精神を、本プログラムを通して身に着けることを期待し微力ながらお手伝いさせていただきたいと思います。どうぞよろしくお願いします。

■GA 担当教員 研究等紹介①

九州大学
先導物質化学研究所 教授
岡田　重人

ポストLiイオン電池のシナリオ

我々の生活になくてはならない携帯電話やノートPCなどの携帯情報端末の魅力を決めるキーワードはインテリジェント(頭脳)、インターフェース(顔)、そしてパーソナル(心臓)です。そして、それらの機能を支えるキーデバイスは高集積密度LSIやOS、超精細液晶や有機EL、そして高エネルギー密度のLiイオン電池です。電子立国日本と喧伝されていた1990年代には、これらの日本生まれのキーデバイスが、世界市場の携帯情報端末軽薄短小競争において大きなアドバンテージを維持していました。ところが、失われた20年ともいわれるIT不況の長いトンネルを経て、かつてDRAM市場を席巻してきたNECや日立、液晶パネルを独占してきたシャープやソニー、松下や東芝が次々に事業撤退を余儀なくされ、2012年には、キーデバイスの最後の砦だったLiイオン電池においても松下が首位の座をサムソンに奪われ、三洋、ソニー、三菱重工がLiイオン電池事業を手放さざるを得ない状況に陥りました。

このような閉塞状況を打破するべく、経産省は電子立国に代わる新産業として蓄電立国を標榜した蓄電池戦略2012を策定し、2020年に想定される蓄電池世界市場20兆円のシェアの半分を国産蓄電池が奪還する数値目標を掲げています。その具体策として、SPRING-8等の高強度線源オペランド解析技術を使ったNEDO　RISINGとその後継RISING2、スパコン京によるJST元素戦略やマテリアルインフォマティクスを駆使したALCA-SPRING等、異なる省庁、異なるアプローチの蓄電池国家プロジェクトが同時進行していますが、これらのプロジェクトの見定める次世代蓄電池の主戦場は、いずれも電気自動車やグリッドストレージ用大型蓄電池市場です。かつての携帯端末用小型蓄電池の最優先ファクターは、高いエネルギー密度でしたが、大型蓄電池になるほど、経済性安全性の重要度が高まり、レアメタルを多用した既存のLiイオン電池は大型蓄電池の最適解にはなりえないというゲームチェンジングが今まさに起こっています。

ポストLiイオン電池として我々がイメージしている技術進化のシナリオ(図1)に沿ったこれまでの研究経緯を示します。現在市場で広く使われている蓄電池の典型例として、国産電池メーカーが世界で初めて市販化に成功してきたNi水素電池、Liイオン電池、Na硫黄電池があります。これらの蓄電池の最大の相違点は電解液にあり、水系電解液を使ったNi水素電池はパワー密度に優れ、非水溶媒系電解液を使ったLiイオン電池はエネルギー密度に優れ、固体電解質(βアルミナ)を用いたレアメタルフリーのNa硫黄電池は安全性とコストパフォーマンスに優れるというそれぞれの特徴をもっています。

これらを起点に、ポストLiイオン電池の第一歩として、遷移金属の中で最も安価な鉄からなる正極(オリビン型$LiFePO_4$正極)と二番目に安価なチタンからなる負極(ナシコン型$LiTi_2(PO_4)_3$負極)の組合せによる水系Liイオン電池[1]を見いだしました。これは水系Ni水素電池とLiイオン電池のいいとこどりを狙ったハイブリッド電池とみなすことができます。一方、もう1つのポストLiイオン電池として、Liイオン電池とNa硫黄電池のハイブリッド、Naイオン電池が考えられます。現行のLiイオン電池にはLiを始め、稀少金属であるCoやNi等の遷移金属が正極に多用されていますが、それら稀少金属を安価なNaや鉄に置き換えることで低環境負荷のレアメタルフリーNaイオン電池が可能です。さらに表1のような特徴をもつロジゾン酸2ナトリウム正極を採用することで、メタルフリーのNaイオン電池も実現しました[2]。その次に、3つの現行蓄電池の利点を併せ持つハイブリッド電池として、水系Naイオン電池[3]があります。そして容量倍増を狙った二価カチオンによる水系Mgイオン電池がさらにその次のターゲットなのですが、Mgイオン電池用負極はこれまで見つかっていませんでした。

ところが最近のトピックスとして、伊藤正人准教授、永島英夫教授ら有機化学の専門家の協力を得てMgイオン電池用有機負極活物質群ポリアザアセンジオン類(図2)が見いだされました。ポリアザアセンジオン類とはロジゾン酸の二電子酸化体であるトリキノイルの6個のC=O二重結合のうち2～4個を疎水性C=N二重結合に置き換えたものの総称で、中でも1,4-ジアザアントラキノン(図3左)がもっとも優れた負極特性を水系電解液中においても示すことができました。この有機系負極の発見によって、水系Mgイオン電池の大容量室温可逆動作が初めて可能になった次第です[4]。

さらにもっと先、ポストLi電池へのシナリオが導く蓄電池の進化系統樹の延長上には、究極のバイオミメティック蓄電池として、生理溶液中のNa^+やCa^{2+}のイオン伝導からなる神経系、ヘモグロビンの有機鉄レドックス系を素反応とする生体エネルギー代謝系がほの見える点に学術的興味と実用的可能性を感じていただければ幸甚です。

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[1] 岡田、劉、趙、斉藤、土井、山木、岡部、稲益、温田、特許第5154885号.
[2] 岡田、中條、智原、久世、特開2013-229321、日刊工業新聞(2012年10月9日).
[3] 岡田、朴、喜多條、小林、山木、特願2011-070784、日刊工業新聞(2011年11月10日).
[4] 伊藤、智原、中本、加納、岡田、永島、特願2014-70550.

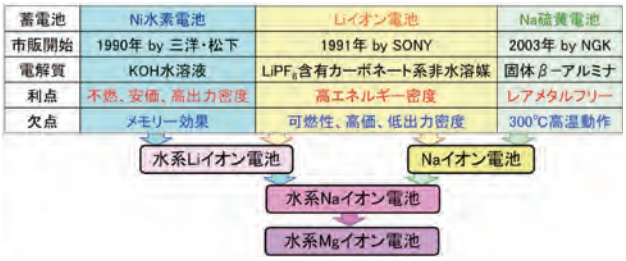


図1. 現行蓄電池からポストLiイオン電池への技術進化

表1. ロジゾン酸2ナトリウムへの対Na正極としての期待

物性	期待
メタルフリー	低コスト
	低環境負荷
Na塩	Naイオン電池のNa源
水素フリー	少ない副反応
分子性結晶	高いサイクル耐性
1分子当り4つのC=O活性中心	高容量密度(501 mAh/g)
π電子系	高電子伝導性
層状積層構造	高Na拡散性
強固なC=O結合	酸素脱離しにくい

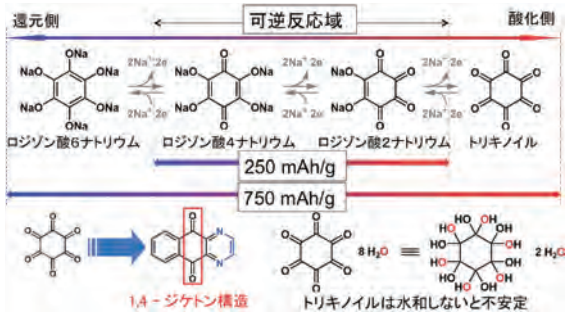


図2. ロジゾン酸2ナトリウムからポリアザアセンジオンへの設計思想

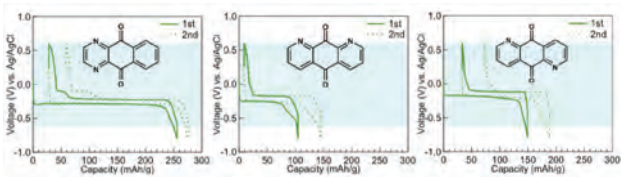


図3. ジアザアントラキノンの水溶液中の充放電特性の窒素元素位置依存性
(0.2mA/cm²定電流試験@25 ℃、2 M $MgSO_4$水系電解液、Zn対極、有機正極:炭素導電材:PTFEバインダー ＝ 70:25:5重量比)

■GA 担当教員 研究等紹介②

九州大学
カーボンニュートラル・エネルギー国際研究所
教授
松本　広重

電気化学的エネルギー変換の研究

日本では今、エネルギーの転換が起きています。化石燃料から再生可能エネルギーへのエネルギー源のシフトが始まっていますし、これまでガソリンで走っていた自動車が、電気や水素でも走る時代となりました。このようなエネルギーの変化に応じて、これまでになかったエネルギー変換の仕組みと社会的なエネルギーシステムが必要となります（図１）。私の研究室では、イオン伝導性固体材料、特にプロトン伝導性固体材料を基軸とした機能性材料の開発とその応用研究に取り組んでいます。特に、電気エネルギーを水素エネルギーに変換する方法である「水・水蒸気電解」の研究に注力しています。

水・水蒸気電解の手法として、アルカリ水溶液や高分子固体電解質を用いたものが実用化されています。固体電解質を使った水蒸気電解はまだ研究段階ですが、変換効率が高いという特徴を持ち、作動温度（800℃前後）を下げることができればさらに実用化に近づきます。プロトン伝導体は、作動温度が低いタイプの電解質材料であり、これを用いた水蒸気電解を研究しています。原理を図2に示します。外部電源により電気を流すと、左の電極室（アノード）において水から水素がプロトンの形で引き離され、右側の電極室（カソード）において水素として分離されます。電極過電圧や電解質の抵抗を抑えることでエネルギー効率をいかに高くするかがポイントです。これまでに、電極材料の改良と電解質の薄膜化により、600℃での作動時に、エネルギー効率90%（HHV）を超える高効率水蒸気電解の実験に成功しています。

有用な材料は、既存の材料の延長線上とは全く違う別なところに存在しているかもしれません。エネルギー変換デバイスへの応用を念頭に、固体のイオニクスに潜む新しい現象、材料開発指針につながるような学理の探求を目指して研究を行っています。その中の一つとして、固体中のイオン伝導性はこれまで、もっぱらバルク的性質として扱われ、その材料設計が行われてきました（すなわち、電荷担体としての格子欠陥の導入）。これに対して、酸化物ナノ粒子の表面をイオン伝導場とした新しい電解質材料を開発しています。また、これを水電解に応用する研究も行っています（図３）。原理的に発生した水素や酸素の水からの分離が必要ないことから、宇宙用途への応用を期待しています。

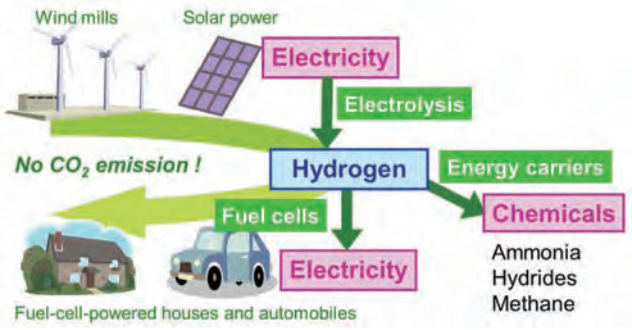


図１. 再生可能エネルギー、水素を用いるエネルギーシステム

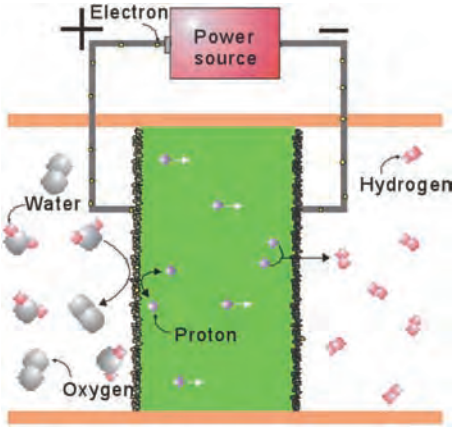


図２. プロトン伝導体を用いた水蒸気電解の模式図

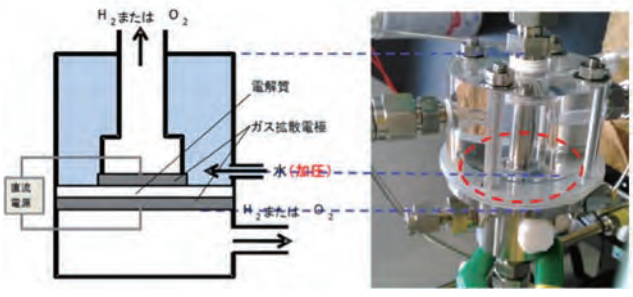


図３. 界面プロトン伝導を利用した新しい水電解の模式図と実験セル

■GA 担当教員 研究等紹介③

九州大学
大学院総合理工学研究院融合創造理工学部門
（大学院総合理工学府量子プロセス理工学専攻）
教授
西田　稔

機能性金属材料の組織解析:
金属組織の中の“ささやかな真実”を求めて

金属組織学は古くは金相学と呼ばれ、手相や人相と同じく表面や内部組織の特徴から金属材料の製造履歴、熱履歴、さらには物性との関係を理解し、それを基に組織制御を通して特性の向上や新機能の創出を図る学問分野です。総合理工学研究院において金属・合金の組織・構造を対象とする研究は、融合創造理工学部門固体材料物性学講座の構造材料物性学分野（中島・光原研究室）、ナノ構造解析学分野（波多研究室）、結晶物性工学分野（西田・板倉研究室）で行われています。すでにこの担当教員紹介において、波多教授が組織・構造解析の強力な手段となる電子顕微鏡について、光原准教授が構造用金属材料について寄稿されています。私たちの研究室では強度以外の特性を主たる機能とする形状記憶・超弾性合金、強磁性合金などの機能性金属材料の組織・構造と特性の関係を調べています。本稿では最近の研究成果を2つ紹介します。

形状記憶・超弾性合金は、冷却・加熱や応力負荷・除荷などにより形状記憶効果や超弾性効果を発現し、眼鏡のフレーム等の日用品から歯列矯正ワイヤーやステント等の医療器具に至るまで様々な用途で利用されています。機能発現の素過程は熱弾性マルテンサイト（M）変態と、M変態によって形成される自己調整構造の外部応力による再配列です。自己調整構造とは、晶癖面バリアントと呼ばれる構造は同じだが方位（向き）の異なる結晶同士が互いの変態ひずみを効率的に緩和できるように結合しあって構築される組織であり、それぞれの合金に特有な原子レベルから結晶粒径程度のスケールにわたる階層構造を持っています。私たちが研究している形状記憶合金はほぼ等量のチタン（Ti）とニッケル（Ni）からなるTi-Ni合金で、冷却に伴い高温相（B2構造）からM相（単斜晶）に変態します。この合金は1960年代に発見されましたが、形状記憶合金の素顔ともいえる自己調整構造は50年以上不明なままでした。この問題に対して私たちは図1に示す(a)、(b) 走査電子顕微鏡、(c) 透過電子顕微鏡、(d) 走査透過電子顕微鏡を駆使した階層的顕微技術と結晶学的理論解析によって、自己調整構造が上述した変態ひずみを緩和する最も理想的な形であることを突き止めました[1]。この形は双対半正6角形と呼ばれており、辺の長さは一定で内角はそれらの和が240°となる2種類で内接円だけを持っています。私たちが知る限り、金属材料においてこのような結晶の配列が報告された例はありません。

磁性体（磁力を持ちうる物質の総称）はモーター、ハードディスク、変圧器など様々な機器に利用される、工学的に重要な材料です。一般的に、磁性体は自分自身のエネルギーを下げるために「磁区」という、いわば小さな磁石に分割されています。磁性体の研究では、磁区の構造を詳しく調べることが極めて重要です。身近な装置である走査電子顕微鏡（SEM）を使って（電子が磁性体から受けるローレンツ力を利用して）簡便に磁区構造を観察できることは以前から知られていましたが、原理的に磁区構造の一部（磁気情報の限られた成分）のみしか可視化できないなどの理由から、磁気イメージングの主要な手段には至りませんでした。私たちは最近、従来のSEMで利用していたものとは形状が異なる「環状電子検出器」を用いて、ローレンツ力で偏向された電子を効率よく収集することで、試料表面に現れる磁区構造の全貌を、ごく簡単な操作・観察で明らかにできることを示しました[2]。図2は強磁性Co-Pt合金の表面を観察したSEM像です。(a)-(c)はそれぞれ異なる電子検出器で取得しました。(a)が今回提案した手法で撮影した磁区構造を示す像です。興味深い迷路状の構造が広い範囲にわたって観察されています。(b)に見られるコントラストは結晶方位の違いを示しています。(c)は表面形状に対応したコントラストを示しています。これらから明らかなように、本手法では磁区構造全体を一度に可視化でき、さらに表面形状などの情報ともよく切り分けられた像が得られることから、磁性体表面の磁区構造を様々な組織因子（形態，結晶方位、化学組成など）と関連付けて迅速に評価できる手法として、磁石材料や磁気記録媒体等に関わる学術・工業分野への展開が期待されます。この成果はGA1期生の赤嶺大志君の研究によるものです。

以上のように、金属材料の組織・構造の中にはその材料が示す特性や機能を反映した素顔を観ることができます。私たちの研究室では観察者のみが体験できる“ささやかな真実”の発見を通して、新たな機能性金属材料の開発に取り組んでいます。

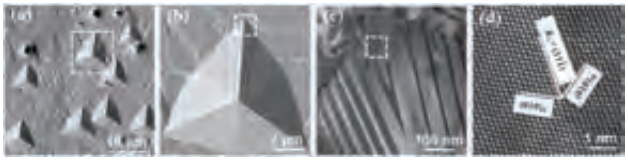


図１. Ti-Ni形状記憶合金M相の双対半正6角形状自己調整構造の階層的顕微解析
(a), (b) 走査電子顕微鏡像　(b) 透過電子顕微鏡像　(c) 高分解能走査透過電子顕微鏡像

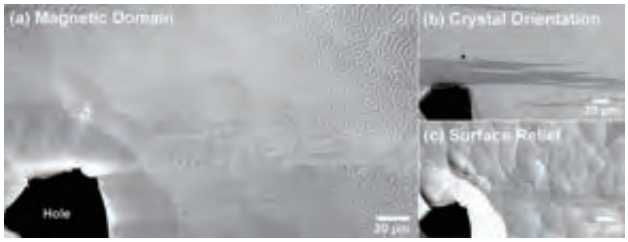


図２. 異なる電子検出器で取得したCo-Pt強磁性合金の (a) 迷路状磁区構造を示すSEM像
(b) 結晶方位の違いを示すSEM像　(c) 表面形状を示すSEM像

[1] M. Nishida, T. Nishiura, H. Kawano, T. Inamura, Philos. Mag., Vol. 92, pp. 2215-2233 (2012).
[2] H. Akamine, S. Okumura, S. Farjami, Y. Murakami, M. Nishida, Scientific Reports, Vol. 6, 37265:1-6 (2016)

■コース生（第５期生）自己紹介

小島　信一郎

総合理工学府
量子プロセス理工学
一貫制博士１年（修士１年）

量子プロセス理工学専攻内野・山形研究室所属修士1年の小島信一郎です。私はGAコースに入る前には先端エネルギー理工学専攻花田研究室に所属しており、研究活動は今でも花田研究室で行っています。研究内容は核融合の実現を目指して高周波の電磁波によって生成された高温プラズマの軟X線計測です。基本的には核融合に関する基礎研究をしています。

GAコース生になり3ヶ月が経とうしていますが、自分自身の英語力不足を痛感しています。もとより最も苦手な教科が英語でしたので、これまで逃げていた分かなり苦労しています。しかし、これからは苦手と逃げるのではなく、どんどん成長していきたいですね。抱負としてですが、GAコース生としては、まずは最低限自分の意思を相手に理解してもらえるよう、相手の意思を把握できるようになることを第一目標として、また修了後には核融合に関わることで世界的に活躍できることを目指して研究活動と両立させながら励んでいきたいと思います。よろしくお願いします。

久我　一喜

総合理工学府
環境エネルギー工学
一貫制博士１年（修士１年）

私は現在、電子タバコ使用による呼吸器系スケールから室内環境スケールまでの健康影響を包括的に評価するため、計算流体力学（CFD）を使い研究を行っています。近年では、CT画像を基に作られた気道モデルでのCFD解析が環境煙草煙などの汚染物質吸引による定量的定性的な健康影響評価において有用的であり、動物実験を代替するものとして期待されています。今後は、気道モデルの解析制度の向上と共に、室内環境への相互影響を検討していく予定です。

昨年10月からGAコース生となった私はまだ3か月間であるものの数々の貴重な経験を得ることができました。GAコースでは自分の研究分野のみならず、幅広い知識を身につけるために他分野の先生からの英語で講義を受けるなど通常のカリキュラムとは異なるスケジュールで進んでいきます。また、コース生のほとんどが東南アジアや中東からの留学生であるため、彼らと交流することで自然と英語を話すようになりました。このようないい刺激により単純作業になりがちな大学院での研究活動は自身の分野だけでなく幅広い分野において私を成長させてくれると思います。今後も世界の第1線で活躍できる研究者になるべく精進したいを思います。

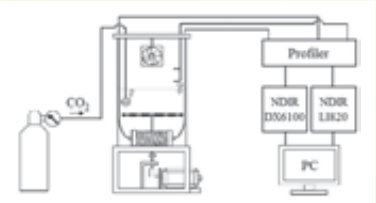
金　晟眞

総合理工学府
環境エネルギー工学
一貫制博士１年（修士１年）

韓国の水原市（Suwon-city）で生まれ育った韓国からの留学生です。名前は金晟眞（キムソンジン）です。九州大学総合理工学府環境エネルギー工学で大気と海の間のガス交換速度について研究を行っています。趣味はテニスと読書です。

あらゆる物事に対して長所と短所を見出し、長所の活用と、短所に対しての問題設定ができる人材となるために、自分の専門分野だけではなく、現在世界で問題となっている環境問題に関しても勉強をしています。

私は世界でもっとも重大な問題は資源問題と環境問題であると考えています。資源は私たちが生活する中で必ず必要となるものであり。環境は私たちが生活する場所そのものです。しかし、資源を費やせば費やすほど環境問題は悪化します。そこで、私の抱負はこれ以上環境が悪化することを防ぐことです。地球は球体であり、すべての場所はつながっています。そのため、自分自身の周りの環境問題だけではなく、世界全体の環境問題を解決できる人になることです。



澤山　和貴

工学府
地球資源システム工学
一貫制博士１年（修士１年）

私は、昨年の4月からこの九州大学に入学し、10月から5期生としてGreen　Asiaに入りました。私が大学院から本学に来たのは、日本で数少ない地熱を専門とした研究室があるからです。私の研究テーマは、枯渇してしまった地熱資源を回復させる手法を確立することです。人工的に河川水などを地下へと注入することで地熱資源の回復を目指すEGSという手法があるのですが、地中に入った水をどうモニタリングするかが課題となっています。現在、電磁波を使って地中の水の状態を調べようという研究が進められていますが、この探査で得られる結果が、実際にどのくらいの水の量を反映しているかを調べた研究例は多くありません。そこで私は、実際の地熱地域の岩石を用いて、高温高圧容器を使った室内実験からその関係を詳しく調べ、最終的には、探査の結果と比較することで地中の水の状態を評価する手法を確立しようと考えています。

GAの授業はまだ始まったばかりですが、英語のプレゼンや論文執筆の練習、専門外の勉強など普段の授業では学べないことが学べるため、とても充実しています。将来は、GAで多角的な視点を見につけ、新たな地熱資源の開発に携わる研究員になりたいと考えています。

■コース生（第５期生）自己紹介

Khan MD Rauf UL Karim

総合理工学府
量子プロセス理工学
一貫制博士１年（修士１年）

I am Md Rauf Ul Karim Khan from Bangladesh. I completed my bachelor degree from American International University-Bangladesh on 2012 and my major was Electrical and Electronic Engineering. I always want to learn more on my subjects. So, I did some training apart from academic lessons. I did Microcontroller and PLC base industrial training from IEB, Bangladesh. I also did a training on Bio-medical instrumentation which are based on electronic device from KARL STORZ, Germany. I worked RAHIMAFROOZ Group for three years which helped me to learn more about electronic device and industrial automation.

I have been pursuing my master degree belongs to Advanced Graduate Program in Global Strategy for Green Asia, Kyushu University since October, 2016. My Major is Applied Science for Electronics and Materials. I feel blessed to get an opportunity to do research in Hattori Lab under supervision of Prof Reiji HATTORI. My research is about Electronic Skin.

Green Asia has helped me to learn not only on my specialized subjects but also philosophy, economic, social and environment issues. I believe, this learning will help me to serve the best to my society.

Mahmoud Mohamed Mahmoud Nasef

総合理工学府
量子プロセス理工学
一貫制博士１年（修士１年）

My name is Mahmoud Nasef and I am from Egypt. I am a graduate student of Malaysia Japan International Institute of Technology (MJIIT) under University Technology Malaysia (UTM) with a bachelor's degree in Electronic Systems Engineering. I graduated in the year 2015 with Dean's List Honors which is a prestigious award.

I am currently pursuing my post graduate studies as a master's student (M1) at the Advanced Graduate Program in Global Strategy for Green Asia in Kyushu University. I belong to the department of Applied Science for Electronics and Materials (ASEM) which is under the faculty of Interdisciplinary Graduate School of Engineering Science (IGSES). I am grateful to be a student here in Kyushu University and in Japan in general. I like the overall Japanese culture and work ethics, as I have gained some experience studying in a Japanese institute and working in a Japanese based company (Toyota) before.

My research theme here in Kyushu University is about Optoelectronic Communication Systems, MMI and AWG Technologies. I find this research field very fascinating and interesting to work in and to add to its discoveries and continuous technological improvements. There are a lot of different fronts of exploration when it comes to optoelectronics, and it's hard to say where the future really is for it. I think that Optoelectronics has rapidly become a very important field on its own. Harvesting the benefits of the interactions between light and electric fields, such as where electronic devices generate, detect and control light, has applications in so many industries. A knowledge of physics, the way light operates and electronics is crucial to grasping the potential of optoelectronics. Displays, communications, lasers and detectors are just a few examples where optoelectronic devices come into play. There has to be a continuous innovation and development in order to coup with future demands.

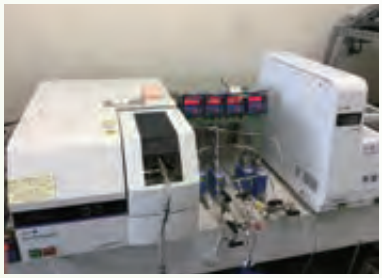
My main aim in joining the Green Asia Program is that it provides the stepping stones for my future career as a researcher in the field of electronics and materials and with regards to building a sustainable and green environment. The wide range of courses provided by the GA program will help improve my technical, social and soft skills. I am looking forward to that and to accomplish great things. I am here to experience firsthand the level of educational system in Japan and to adopt their style in order to learn and grow. I hope to complete my studies and graduate from Kyushu University as a PhD student. My plans after graduating from Kyushu University, to pursue further studies in my field of research here in Japan or hopefully to work and gain a couple of years of working experience in a Japanese company.

Aditya Wibawa

総合理工学府
量子プロセス理工学
一貫制博士１年（修士１年）

My name is Aditya Wibawa from Indonesia, the first year of a master's course student in Green Asia program. I am in the department of Applied Science for Electronics and Materials (ASEM) under Professor Jun-Ichiro Hayashi. Previously, I have been working at Indonesian Institute of Science in RC Geotechnology for 3 years. My research focuses on the conversion of coal as an energy alternative that is environmentally friendly, using the coal gasification process. My research is the gasification of low rank coals.

In Asia Green program not only serves scientific field, but also economic, social, environmental and industry. I have a lot of activity in GA, such as lectures, research laboratory, collocium, domestic and international industrial visit. On the other hand, I was getting a lot of knowledge in GA. I hope to improve myself, so that the future can make me high quality researchers and good for society.



Muhamad Affiq Bin Misran

総合理工学府
量子プロセス理工学
一貫制博士１年（修士１年）

My name is Muhamad Affiq Bin Misran from Malaysia. I have obtained my diploma and bachelor degree from Universiti Malaysia Perlis (UniMAP) in Microelectronic Engineering. After graduating, I have been working at ON Semiconductor (Malaysia) Sdn. Bhd. as a Failure Analysis (FA) engineer for 3 years. Right now, I am belonging to Applied Science for Electronics and Materials (ASEM) department in Hattori's Laboratory. My research will be focusing on the medical devices sensor with application of Internet of Things (IoT).

I enrolled in Green Asia (GA) program in October 2016. GA is a program which offers not only in scientific field but also applying the socials, economies and environmental concept in our study. These factors have attracted me to join this program which I think have a complete component in order to produce a very high quality researcher. Under this program, I hope that I will improve myself not only as a researcher but also as one of the community who can contribute and bring benefits to the whole society and community in the world.

Ali Mohamed Ali Ebrahim Abdelgawad

総合理工学府
量子プロセス理工学
一貫制博士１年（修士１年）

One of my objectives was to find a chance for better understanding and applications of intersecting modern concepts in physics and material science. That is why I concentrated in my studies to get suitable academic scores to help me find a chance to continue my study abroad.

Obtaining my Master degree from the Kyushu University under GA program is a great opportunity for me to get more research experience, interacting with high professionals in the international medium, dealing with high technological devices and Participation in conferences and business trips and scientific workshops which organized by GA program. This provides me with a broad knowledge in this field by promoting a close interaction with renowned specialists, and to allow an in-depth expertise, in a friendly and collaborative international environment.

Currently, I am studying some courses related to my research field in addition, I am working in my laboratory in production of ultra-nano-crystalline diamond (UNCD)by coaxial arc plasma system and related application in hard coating for cutting tools. where Diamond has many excellent properties such as the highest hardness, high chemical inertness, low friction coefficient and high optical transparency and thus it is expected for a variety of applications. In addition, it overcomes ecological and resources problems. UNCD is also expected as a candidate for coating and heat sink, because it is easy to be grown and it has a smooth surface like DLC, and because it is stable for temperature and has high heat conductivity similarly to diamond.

After this, I will learn some techniques to obtain information about the structures, surface morphology and mechanical properties of the produced UNCD thin film and finding the relation between plasma system conditions and mechanism of thin film growth.

I hope to finish my master and have a chance to get PHD also from Kyushu University to realize my dream and retrain back to my country to bring learned benefits to others.

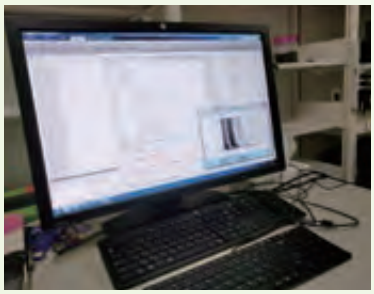
Rezkia Dewi Andajani

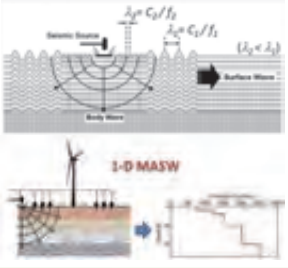
工学府
地球資源システム工学
一貫制博士１年（修士１年）

My name is Rezkia Dewi Andajani and I come from Indonesia. It has been three months since I arrived here. Now, I am studying in the Department of Earth Resource Engineering under supervision of Professor Takeshi Tsuji. I am focusing on studies about seismic wave, currently the application of seismic surface wave. The reason why I decided to continue studies in seismic is because I have always been interested with what kind of 'face' our earth has. Additionally, my previous experience of working on seismic data makes me want to sharpen my skills in this kind of field. I have always wanted that the knowledge I have, one day, will become a fruitful and useful for our future generation. I take a pride in what I do and I don't want to let it become useless. Back to time before I become a graduate student, I always asked myself, how will I direct my study?

I found Green Asia program as the answer to my question. I was attracted to the vision and the mission has this program, and I am positive that I share the same objective. As I started my life as a new member of this program, I realized there are many things that I still need to learn. Despite the fact that I am still new, Green Asia program had already given me opportunities that I did not expect I would experience it before, for example an afternoon colloquium, international symposium, domestic tour to Japan's factories and museum in Kyushu. Other than that, I also got a chance to lean a few basic skills which is truly necessary for scientist, for example; the art of scientific writing, problem optimization, and issues related to technology and earth.

I am sure the participation in Green Asia Program, will enrich our experience and advance our skills in our respective fields, without neglecting our environment. In the end, our goal is to develop a clean and friendly technology. Finally, it is my most pleasure to become a part of Green Asia Part, Kyushu University.

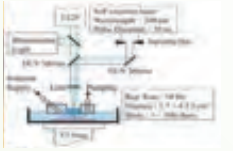




■コース生（第５期生）自己紹介

Eslam Naeim Hussien Abubakr

総合理工学府
量子プロセス理工学
一貫制博士１年（修士１年）

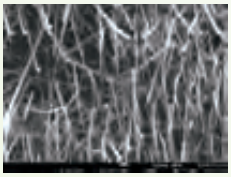


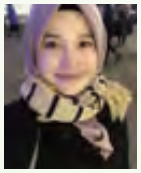
My name is Eslam Naeim Hussien Abubakr, I was graduated from Aswan University in Egypt, and since my graduation I was interested in Solar Cells and Semiconductor device in general as well as the solid state physics behind it and how to connect between the material science principles and its electronic application. Green Asia (GA) Program gave me that chance to join a strong research environment at Interdisciplinary Graduate school of engineering Sciences, Kyushu University in the department of Applied Science for Electronics and Materials. My current research is on materials for optoelectronics, in particular, photovoltaics comprising ecologically friendly materials. The research is mainly experimentally conducted and the experiment covers the growth of new materials in thin film by physical vapor depositions as well as pulsed laser deposition, the structural and optoelectrical evaluations of films, and the fabrication of optoelectrical devices on the basis of the film preparation so here I'm investigating a new way for manufacturing phosphorus doped Ultra Nano Crystalline Diamond by doping phosphorus using Pulsed laser deposition technique to benefit from it's amazing electrical, thermal and optical properties for semiconductor devices. After Graduation from GA and getting my PHD degree I'm planning to go back to my home country and transfer everything I learned to new student besides that since we are at a sunny country I want to make a large solar cell power plant system and do farther investigation to enhance system efficiency, knowledge has no limits and one can spend all his life learning.

Sameh Ahmed Okasha Zaki Mohamed

総合理工学府
物質理工学
一貫制博士１年（修士１年）

Nano-science, Nano-Technology or Nano-scale; We all of us heard several times about such kind of Word "Nano". It is equal = 10 ^-9 of meter. In another words, in Nano-scale world; Human hair becomes a huge building and hydrogen atom becomes ping-pong ball by size. It is really exciting that researching in material science in Japan under Green Asia Program (GA) in particular. This Program provides what would student need to achieve a good research through several activities like Field trips, Colloquiums, varies subjects and active participations in different forums, in addition to ability to make Phd directly after obtaining master degree. Furthermore, Green Asia staff are very supportive to overcome any kind of obstacle would face. My research part in nanoscience is Nanowires. I fabricate Nano-wires by using pulsed laser deposition technique. My research is testing different catalysts to fabricate and grow varies nanowires and to check their ability to decrease the temperature of growth. I am enjoying my research in Japan under GA program hoping achieving some contributions on my field. The only issue about the GA program is that the program will be ended soon. I really wish to extend that program or lunch several programs like it.

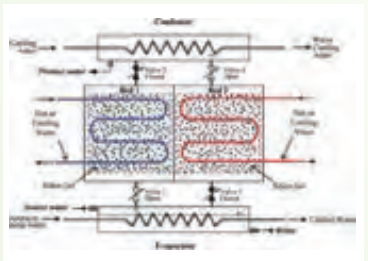




Fatin Hazwani Binti Mohamad Azahar

総合理工学府
物質理工学
一貫制博士１年（修士１年）

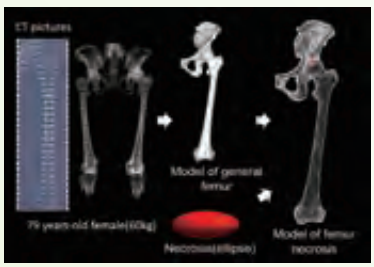
Hi, I am Fatin Hazwani from Malaysia. It has been three months since I was belonged to Green Asia 5th Batch Students, Kyushu University. Since coming to Japan and joining Green Asia program, I have gained a lot of wonderful experience and knowledge. One of it was the industrial tour to Saga and Nagasaki prefecture. This tour has given me a good impression on how Japan became one of the developed countries with advance technology. I am now first year master student and working under Professor Akira Harata laboratory with supervision of Professor Kyaw Thu. My research field is mechanical engineering, where I am studying on the adsorption of gas and liquid to an adsorbent for energy storage and mechanical systems. Personally, I really think that Green Asia program has helped me to be an expert not only in engineering field, but in economy and environmental field as well. Being in Green Asia program is a great privilege to acquire knowledge in every aspect and I am so proud for being selected to join this program.



Wu Shun

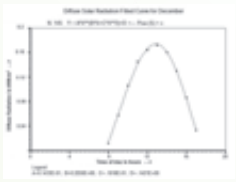
総合理工学府
物質理工学
一貫制博士１年（修士１年）

Hi, guys, I am Wu Shun, a Chinese student. I major in biomedical material in Prof. Todo's group. This is my first time to study and live abroad. But instead of sense of unfamiliarity, the GA program of Kyushu University really impress me and make me feel fulfillment. There are many optional activities for us to participate in. In Afternoon Colloquiums, you can know various extra knowledge from presetations given by professors in other fields. It can help you expand you vision and scopes of knowledge. You can also learn how to improve you presentation skills from those professors. In Youth Forum, you have chances to get many employment information from those very famous cooperation. Every year, we can go to visit abroad schools and interact with foreign students. Actually, I am looking forward to the travel to Taiwan very well this year. The destination is changed year by year. In the future, after graduation, I also plan to get a job in Japan. Asahi Kasei company is my target.



Hasan Muhammad Faisal

総合理工学府
環境エネルギー工学
一貫制博士１年（修士１年）



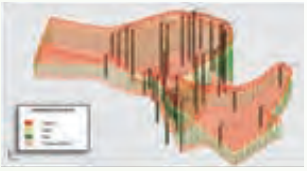
I have started my masters program as a Green Asia student in October 2016. I am currently concentrating on theory courses which are related with my research and other relevant fields. My research is on solar air heating system. Utilization of solar thermal energy for space heating can reduce the cost of building heating system and can reduce our dependence of fossil fuels. Enhancement of efficiency, high solar heat gain by solar air collector and effective heat transfer to the air is still a challenge. Development of an efficient solar air heating system which will have better heat gain and higher heat transfer rate - is my research concentration.

In Green Asia program, beside the academic activities we have to participate in various activities like participation in group discussions, presentations, industrial tours, conferences etc. I had the opportunity to visit Yoshinogari mega solar power plant, Nagasaki peace memorial museum, Isahaya land reclamation museum and Mitsubishi Shipyard Museum. Definitely the experience I get from these activities will help me to adapt and work in different environments in future. These activities enhance our skills, confidence and give us opportunity to enhance our knowledge in different field besides our main research. I am confident that the world class research experience and skills will definitely pose a positive impact on my career and it will help me to contribute to the development of my country in near future.

I must say that the GA program is well organized and rich in its class, with some very cooperative staff. I would like to thank the GA team for giving me the opportunity to be a part of it.

Ibrahim Mohamed Abdelhak Maamoun

総合理工学府
環境エネルギー工学
一貫制博士１年
（修士１年）

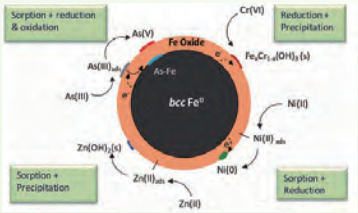


My name is Ibrahim M.A. Maamoun, from Egypt. Currently, I am enrolled in GA master & PhD program at Kyushu University as well as holding my position as a University Demonstrator (Al-Azhar University) in my home country. During my stay here in Japan I intend to complete my academic degrees successfully in my major field that I have been interested in during my whole study years (Environmental Engineering / Groundwater modeling). Groundwater modeling provides a quantitative framework for synthesizing field information and for conceptualizing hydro-geologic processes beside it is the primary quantitative tool available for the groundwater investigation which is considered to be one of the most viable water resources on the earth. For that concern, completing my graduate degrees under supervision of elite professors in this field here in Kyushu University will support my career whether it will be in my home country or abroad through continuing postgraduate researches and maybe joining an international organization or research association in my field. I have found that GA program is the perfect program to achieve my main goals; having a kind and helpful staff that can always support you in different situations, as well as field trips and the domestic / overseas internships or conferences that will help me to participate in international scientific events and to gain more knowledge in my field. Finally, I can say GA program represents a great opportunity for each research student who wants to contribute and to put his mark in the research history.

Ramadan M M Aljamal

総合理工学府
環境エネルギー工学
一貫制博士１年（修士１年）

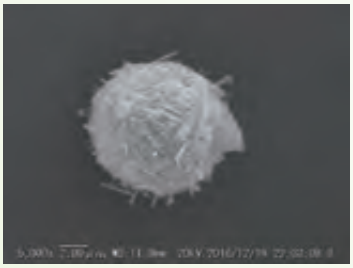
My name is Ramadan Aljamal from Palestine, Green Asia student, faculty of energy and environmental engineering, I work in environmental fluid science laboratory, In our laboratory we are working to improve the efficiency of Nano Scale Zero Valent Iron to remove the contaminants from drinking water and my research about “optimizing synthesis conditions of NZVI for water treatment in my research I want to control the synthesis conditions “reaction variables” to maximize the efficiency of NZVI. In addition, there are several courses under the supervision of green Asia program, working to improve my abilities to move on in my field and there are several activities within green Asia program such as the last industrial tour to saga and Nagasaki and we visited Mitsubishi heavy industries and we recognize the importance of solar panels to generate the electricity and also we visited isahaya bay and ariake sea and we saw isahaya dike and and it is importance in the prevention of disasters and reclamation new agriculture land. and I wait to new trip in next month to Taiwan.



Niko Dian Pahlevi

工学府
地球資源システム工学
一貫制博士１年（修士１年）

Hello everyone!! Cheers up for my brand new life in Japan!! My name is Niko Dian Pahlevi, I come from beautiful country in South East Asia, Indonesia. Before coming to Kyushu University as Green Asia Student, I studied at Institut Teknologi Bandung majored in Metallurgical Engineering. As Metallurgy Engineer I have duty to process ore mineral to pure metal for industrial need. The challenge is to produce pure metal with no environmental damage. Now as Green Asia Student, I want to look a new way to heal the environmental damage caused by human. Nuclear waste, chemical waste and other waste form can be treated by preventive and active treatment to reduce the effect to the environment. Now my research is focusing on immobilizing nuclear radioactive waste using mineral as host. After 5 years of intensive study in Green Asia course, I want to work at industry as researcher to develop best way to process mineral without significant environmental damage. By the way Fukuoka is gorgeous and friendly city! I was very lucky to study here.



第3回統合創･省･基盤技術エネルギー教育研究拠点国際シンポジウム

“Japan-Asia Symposium of Materials, Devices, and Systems Directed Towards Energy and Environmental Sciences”

九州大学先導物質化学研究所･教授
永島 英夫

炭素資源国際教育研究センターは、現実的エネルギーである炭素資源の環境負荷なき高効率利用を目的とする科学技術、エネルギー基盤技術国際教育研究センターは、炭素資源エネルギーと再生可能エネルギーのベストミックス構築に向けて、エネルギー変換･貯蔵（熱電･光電変換、蓄電･蓄熱）、省エネルギー（IT省エネ･住空間省エネ）、創エネルギー（複合自然エネルギー、高密度自然エネルギー、海洋エネルギー）技術等の学際融合によるグリーンイノベーションの実現を目指す科学技術、をミッションとするセンターで、ともに協力してグリーンアジア国際戦略プロジェクト（および、グリーンアジア国際リーダー教育センター）を研究面から支援しています。平成25年度から、3センターで連携拠点を形成し、協力して教育研究を実施しています。これらの3センター連携の一環として、一昨年度の第1回、昨年度の第2回に引き続き、第3回統合創･省･基盤技術エネルギー教育研究拠点国際シンポジウムを、エネルギー基盤技術･炭素資源両センター主催、グリーンアジア共催により、平成28年11月30日（水）に九州大学筑紫キャンパスの筑紫ホールで開催しました。

本シンポジウムには、中国、インド、インドネシア、タイ、ベトナム、モンゴル、日本から講師を招へいし、多数の教員や学生が参加して活発な討論が行われました。成長著しいアジアは、また、エネルギーの効率利用と環境保全技術の普及が強く求められています。3センターはJSTさくらプログラムでも、環境･エネルギーの日本の先端技術を基盤とした人材育成を実施していますが、今回の講師は、これまで3センターと連携して教育、研究、短期人材交流を実施してきた研究機関から招聘しています。シンポジウムでは、エネルギー政策、太陽電池、エネルギー変換･貯蔵、化石燃料、バイオディーゼル、蓄熱、太陽光発電等、多岐に渡った内容の講演が行われ、エネルギー基盤技術を中心に炭素資源技術をリンクさせる内容で開催されました。終日、様々な分野の参加者による多面的で活発な討論が続き、学際融合の観点からも非常に有効な議論が行われました。

最終的に、シンポジウムの参加者は合計102名となり、国際シンポジウムとして成功裏に終了しました。エネルギー基盤技術国際教育研究センターと炭素資源国際教育研究センターは引き続き、密接に国内外の関連研究機関と連携を密にし、九大におけるエネルギー研究の一翼を担うことを目指していく予定です。

2016年度グリーンアジア国際セミナー

International Forum for Green Asia 2016

九州大学グリーンアジア国際リーダー教育センター・准教授
古野 裕史

平成28年12月1日(木)に筑紫キャンパスの総合研究棟(C-Cube)筑紫ホールにおいて、グリーンアジア国際戦略プログラム(グリーンアジアプログラム)の国際セミナーを国内外から128名の参加者を得て開催した。

午前中は谷本潤教授(プログラムコーディネーター)の開会挨拶に続き、国内外の企業・研究所の第一線でご活躍の3名の先生に講演をお願いした。量子科学技術研究開発機構那珂核融合研究所の花田磨砂也先生には核融合エネルギーの基礎から最新の研究までについて解説いただいた。PT Bumi Resources Minerals(インドネシア)のSuseno Kramadibrata先生からは、インドネシアの鉱山開発の状況と岩石力学研究の意義と成果についてのお話を伺った。最後に新日鉄住金エンジニアリングの加藤健次先生には、コークスの製造や石炭のガス化などを例に、炭素利用の最先端についてご紹介いただいた。

午後からはポスターセッションと学生セッションを実施した。ポスターセッションではグリーンアジアプログラムの一貫制博士課程3年生から5年生(博士後期課程に相当)が博士論文研究として実施してきた成果を発表した。発表件数が36と比較的多かったこともあり、1時間のセッション時間を、ポスター番号の奇数と偶数で分けて30分ずつ発表する形式をとった。そのため発表時間に物足りなさがあったものの、その中で活発な質疑応答がなされていた。

その後の学生セッションでは、プログラムコース生全員が8つのグループに分かれ、コース生の担当者が事前に選定した4つのテーマについて議論し、その結果をグループ代表者がまとめて口頭発表した。限られた時間の中で多様な観点からまとめられた発表に対し、様々な意見が出されていた。本セッションについては13～18ページに詳細報告されているので参照されたい。最後に原田明教授(プログラム責任者)からの講評と挨拶で会を閉じた。

本セミナーは一貫制博士課程3年生から5年生のグリーンアジアプログラム独自科目である「国際演習B」の一部としても実施され、特に一貫制博士課程4年生(博士後期課程2年生)は「国際演習B2」として講演者の選定、紀要原稿の取りまとめ、学生セッションの事前のテーマ選定、当日の講演・発表の司会進行など、会の企画、準備、運営全般に携わった。

2016年度グリーンアジア国際セミナー 学生セッション 報告

Group 1 ……Topic 1

Leader : Yuki Uchida
Supporter : Choi Cheolyong , Zayda Faizah Zahara

Shinichiro Kojima , Kim Sung Jin ,
Ibrahim Mohamed Abdelhak Maamoun ,
Choi Cheolyong , Yuki Uchida ,
Hong Bingzhou , Sampad Ghosh ,
Zayda Faizah Zahara , Hiroshi Akamine

Choi Cheolyong

総合理工学府 量子プロセス理工学 一貫制博士4年（博士2年）

During the student session in Green Asia forum, my group discussed about fusion energy, from its definition to fate. Fusion is a way of power generation using deuterium and tritium that are abundant in the ocean. It is highly potential as a future energy source due to environmentally friendliness and huge energy generation. One of the most notable advantages of fusion energy is little amount of radioactive waste as a by-product regarding the fact that radioactive waste is the reason to make nuclear (fission) energy controversial. On the other hand, it requires extremely high energy and temperature to overcome electrostatic repulsion of protons, which leads to expensive operational cost. Though fusion releases energy theoretically three times or even greater (up to 7.4 times) than fission, the cost impedes commercialization of fusion power plant. There have been broad studies on the fusion energy; for instance, International Thermonuclear Experimental Reactor (ITER, collaborative work of 35 countries) project has been in progress since 1985. However, realization of power generation from fusion energy is still uncertain. In this regard, my group had discussed about feasibility and whether or not financial investment should be carried on.

Due to the wide range of discussion in limited time, we divided members into four sub-groups, two members each. From viewpoints of theory, potentiality, security, and feasibility of fusion energy, we derived a common conclusion.
First of all, deuterium and tritium fuse at 150 million degree Celsius and produce helium and neutron which are not radioactive. Second of all, Energy release is equivalent to 1.4×108 cal calculated by Einstein's equation, E=mc2. Compared to the energy from fission, 1.9×107 cal, it reaches 7.4 times higher energy. Third, deuterium and tritium, resources of fusion energy, can be easily provided from ocean due to its abundance. Based on these aspects, we tried to conclude if it is realizable, but we found that more information should be considered.

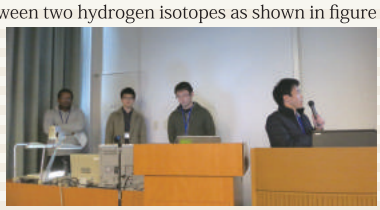
We paid attention to progress and outcome of ITER project since it was launched. Though the ITER is still under experimental research, it is expected to go on to operate a demonstrative reactor within 10 years. It seems some technical obstacles still exist, e.g. generating extremely high temperature plasma sustained by internal heating, but alternative ways are proposed for proof of concept of fusion power generation. Demonstration can be in progress in parallel with technical advancement. Compared to initial stage of ITER project, significant improvement has been achieved by worldwide contributions. In addition, from viewpoint of explosive increase of energy demand and environmental responsibility of human being, it was concluded that fusion energy is feasible and should be invested to accomplish commercialization.

Zayda Faizah Zahara

総合理工学府 量子プロセス理工学 一貫制博士4年（博士2年）

Energy derived from the nuclear fusion, or so called as fusion energy has been developed by several countries in the world. The research in this field had already begun in the early 1920s, however, recently it had just become hot research topic. The leading research groups on this field are gathered in one big organization named ITER. Thousands of engineers and scientists have contributed to the design of ITER since the idea for an international joint experiment in fusion was first launched in 1985. The ITER Members—China, the European Union, India, Japan, Korea, Russia and the United States—are now engaged in a 35-year collaboration to build and operate the ITER experimental device, and together bring fusion to the point where a demonstration fusion reactor can be designed. In this report, the explanation of fusion energy, its advantage, and its economical and practical feasibility will be briefly discussed based on the discussion of our group on the Green Asia forum.

Fusion energy comes from the fusion of light atoms like hydrogen at extremely high temperature and pressure. This reaction is likely occur on the star and sun. At the high temperatures experienced in the sun any gas becomes plasma, the fourth state of matter (solid, liquid and gas being the other three). In order to replicate this process on earth, gases need to be heated to extremely high temperatures of about 150 million°C whereby atoms become completely ionised. The fusion reaction that is easiest to accomplish is the reaction between two hydrogen isotopes as shown in figure 1: deuterium, extracted from water and tritium, produced during the fusion reaction through contact with lithium. When deuterium and tritium nuclei fuse, they form a helium nucleus, a neutron and a lot of energy.



Group 2 ……Topic 2

Leader : Omar Mohamed Ali Mohamed Ibrahim
Supporter : Azizah Intan Pangesty , Yuki Furutani

Kazuki Kuga , Khan Md Rauf Ul Karim , Niko Dian Pahlevi ,
Yuki Furutani , Azizah Intan Pangesty ,
Hatem Omar Amin Mostafa Elserafy ,
Omar Mohamed Ali Mohamed Ibrahim ,
Rezkia Dewi Andajani , Hiroki Gima

Azizah Intan Pangesty

総合理工学府 物質理工学 一貫制博士4年（博士2年）

In this 2016 GA forum, the D2 students were in charge to handle the events. We are also required to present our research result at poster session. In this occasion, I present my result entitled "the behavior of co-culture cell sheet on porous tubular polymer scaffold for blood vessel tissue engineering". I was quite impressed with enthusiasm of some other students who asked me some good questions during the session.

After poster session, we then moved to student session. In this session D2 student were in charge as supporter whose role was to keep discussion keep on track. I was assigned in group 2 in which we discussed about electronic-waste (E-Waste) management system. The term of e-waste is related with all items of electrical and electronic equipment and its part that have been discarded by its owner without the intent of re-use. The fast growing technology is always associated with high consumption of electronic appliances or gadget. When peoples consume more, they tend to discard more. In 2014, the global e-waste volumes had reached to 41.8 million tons which is estimated worth for 52 billion USD.

E-waste is categorized into three types:
•Small appliances, such as microwave, vacuum cleaner and toaster
•Large appliances, such as washing machine and dryer
•Temperature exchanger, such as refrigerator, heater and air conditioner.
•Screens
•Lamps

Since it contains hazardous chemical or metal, the management of e-waste is different with other normal garbage disposal system. E-waste that contains different kind of metal, the separation should be done in order to recover valuable metal. Recovering process of valuable metal using bacteria has been widely used in many countries. Other e-waste which contain only one type of metal are then bring to incinerator to make into steel again.

However, every country has different regulation on e-waste management. 167 countries of United Nations (excluding Afghanistan, Haiti and US) have regulated "no trans boundary movement of hazardous waste". European Countries took initiation to adopt reuse/recycle regulation and urge manufacturer to take back and recycle their products. In Japan, ministry of environment issued home appliance recycling law which means that manufacturer could take back and recycle end-use product.

In conclusion, for the sake of sustainable development, the three concept of reduce-reuse and recycle should be applied in every countries. Reduce means that we will buy new electronics if we need it, not because we want it. Further, once we buy it we need to take a good maintenance of it. The unnecessary appliances that we have yet still well-functioning can be donated to other or sell to second hand shop (re-use). However, the items that cannot be repaired, we need to find an organization that manage this electronics or send back to the manufacturer.

Yuki Furutani 総合理工学府 量子プロセス理工学 一貫制博士4年（博士2年）

I was so impressed the lecture by Kenji Kato. His presentation entitles "Leading Edge of Coal Utilization Technologies". He talked about the lastest coal utilization technologies, such as Carbonization (Cokemaking) and Gasification.

New cokemaking technology SCOPE21 has been attracted. In this technology, low grade coals are blended with coal charge without deteriorating coke strength. SCOPE21 process mainly consists of three units. First is coal rapid preheating unit, second is coal carbonizing unit and third is coke quenching unit. The aim to divide the whole cokemaking process into three parts is to make full use of the function of each process to maximize the total process efficiency. The quality of coke can be improved by upgrading the coking quality of coals. Rapid preheating can improve properties of coal, increasing its bulk density in coke oven chamber. These improvements raise the blending ratio of coking coal up to 50 %, while it is only 20 % in the conventional process.

New coal gasification process using efficient two stage entrained gasifier (ECORPO) was developed by Nippon Steel & Sumkin Engineering Co., Ltd. ECOPRO has the two-stage type gasifier. Firstly, pulverized fine coal is introduced into lower part, and the partial oxidation reaction by oxygen is occurred. The main components of generated gas are CO and H2 etc. Then the generated gas is introduced into upper part of gasifier. Coal pyrolysis reaction occurs by reacting high temperature gas and coal introduced into upper part of gasifier. Thermal efficiency of ECOPRO process is higher than other gasification processes due to two-stage gasification reaction.

During the poster section, I was so impressed the presentation by Cheolyong Choi. His presentation title is "Identification of Molecular Composition of Nascent Tar from Rapid Coal Pyrolysis". His study aims at development of an analytical pyrolysis to identify and quantify aromatic compounds in the tar from rapid coal pyrolysis as much as possible, and then simulate the vapor-phase reactions by a type of DCKM. This abstract reports results of the development of the analytical pyrolysis. He successfully developed the two-stage tubular reactor for the identification.

Additionally, I felt admiration for the poster presentation by Zayda Faizah Zahara. Her presentation entitled "CO2 Gasification of Six Types of Char from Indonesian Sugarcane Bagasse". She performed the kinetic analysis of CO2 gasification of char. She proposed new kinetic model to describe the time-dependent changes in the mass-based char conversion over its range up to 99.99% or even higher by assuming distributed initial activity and deactivation kinetics of the inherent catalytic species.

This GA forum is very useful for me to further my professional study.

Group 3 ····· Topic 3

Leader : Satoshi Takeichi
Supporter : Pennapa Tungjiratthitikan , Ryota Yoneda

Kazuki Sawayama ,
Mahmoud Mohamed Mahmoud Nasef ,
Ryota Yoneda , Pennapa Tungjiratthitikan ,
Satoshi Takeichi , Rezwan Ahmed , Wei-Chen Wen ,
Takanori Hanada

Pennapa Tungjiratthitikan 総合理工学府 物質理工学 一貫制博士4年（博士2年）

1. What is apps economy?

Apps economy refers to the range of economic activity surrounding mobile software applications. It is an ecosystem of enterprises, governments and citizens that use the mobile applications to drive the economy as a whole. This gave way to the creation of new fortunes for developers and entrepreneurs and changed the way business is done around the world. The app economy includes the sale of apps, ad revenue or public relations generated by free apps, and the hardware devices such as smartphones and tablets on which apps are designed to run and provide a new consumer experience.

2. The mobile apps in global scale

The apps economy depends on the area of internet access and their government controlling role. If the economic policy of the country is possible to introduce the digital information and communications technology (ICT) for social and economic reforms in all sectors of the country. With an emphasis on private sector-driven. But the state has a duty to accommodate. Whether by law, regulation, policy or practices. Along with the state to reform the process and use of the information the government has. To provide their services most effectively.

3. The apps economy growth and its effect on the global economy

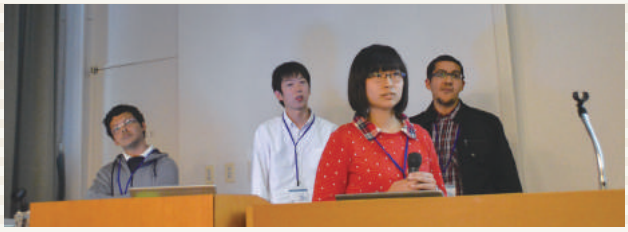
To make the economy growth by applications creating, it needs to be evolved in tandem with other economic sector, and the ecological systems of the society are an important factor to drive the application expansion such as a policy application development. The public politician needs to create an atmosphere of cooperation and competition (Co-petition) to build an infrastructure which perform as a connecting technology to contribute the better life for all population equality especially, poor farmers and local innovators.

Economic applications require the upgrading of technology, for examples improving the messaging (Text-based communication) for more advanced of broadband technology through the cheap smart phones or tablets devices in the near future. If the economic could reach all society sectors; mainly for social entrepreneur, the apps economy will becomes an important key to drive the global economic growth mechanism.

4. The mobile apps affected by society

The highest download in global ranking are the Facebook and Google Earth application, respectively (daily life application), and the apps which providing revenue is games. On average, more than half of people use smart phones are download games in average nine games per person, but the new trending application is about health and business applications on businesses apart from the daily life applications.

Nowadays, the popular and daily life applications keep in the high rank in the global market which makes the difficulty for the new developing application makers to compete in the market. Therefore, the brand or business creators have to study about the society trends and create the applications which supporting for their need. This could make more opportunity for developer to engage with their customers and easier to enter through the application market.



Ryota Yoneda　総合理工学府 物質理工学 一貫制博士4年（博士2年）

INVITED LECTURE

The first speaker, Dr. Hanada from QST talked about current issues on fusion research and technology. His talk included not only technical development toward fusion energy but also international cooperation from the viewpoint of his experience. Since my research involves fusion plasma physics, the talk was highly interesting and meaningful for my study. In a brief summary, ITER (International Thermonuclear Experiment Reactor) project and JT60-SA as BA (Broader Approach) activities were shown and discussed. ITER is an experiment to prove fusion reaction is possible and it's now under construction in France. That means a demonstration of fusion power plant is not included in ITER. A project on practical application of fusion power is also ongoing. As for BA activities, they are governed by Japan and EU to support and complement ITER and demonstration reactor of power generation. Many experiments and computational simulations are planned. In the presentation, JT60-SA and its progress were mainly discussed. JT60-SA will start its operation before ITER initiation. Its main purpose is to obtain data that ITER facility hardly can get regarding safety, reliability and economy of future demonstration reactor. Topics such as fusion energy are often closed to the society even if it is a key issue that might determine future civilization. The lecture gave students and researchers from other fields a good opportunity to learn the progress of fusion energy and current difficulties.

POSTER PRESENTATION

In the presentation session, my theme was 'Particle-loss Control of RF-induced Breakdown in Tokamak Magnetic Structure on QUEST'. Basically it shows my research in general sense that how to start an operation of tokamak plasma reactor for fusion. Since I was the only one at the session who talked about fusion technology, I tried to speak putting an emphasis on why we are pursuing fusion energy as an ultimate solution of energy crisis. The response from the audience was positive against fusion and I could discuss with GA students and faculty members from different fields. Also other presentations were comprehensive in the sense that every student had tried to summarize and generalize their topics.

DISCUSSION SESSION

The topic of our team was 'how to facilitate the apps market'. Before the discussion we separately prepared for the presentation slides. I joined the discussion as an adviser, keeping is right in the track. Most students joined and speak out their opinions. Even though the topic was somewhat abstract, we could make it clear what we should do to promote in the enlarging market of apps. Overall impression on summary presentation at the hall was that every group discussed the topic based on data they found and it was good even though we had a limited time.

Group 4 ……Topic 4

Leader : Shin Sakiyama
Supporter : Marzia Khanam , Tomoaki Hirakawa

Aditya Wibawa , Ali Mohamed Ali Ebrahim Abdelgawad ,
Tomoaki Hirakawa , Marzia Khanam ,
Shin Sakiyama , Konadu Kojo Twum ,
M L Palash , John James Duckworth ,
Tsuyoshi Sato

Marzia Khanam　総合理工学府 環境エネルギー工学 一貫制博士4年（博士2年）

Discussion Summary: In International Forum for Green Asia 2016, I was part of group 4 and our discussion topic was related to energy resources. At first, we discussed different types of energy resources which are divided into two groups- renewable and non-renewable energy. There are various types of non-renewable energies such as fossil fuel oil, coal, natural gas and nuclear. Renewable energies are also different types like solar, biomass, wind, hydropower, geothermal energy. In our discussion, we also classified the energy resources according to cost, CO_2 emission, safety as well as environmental issues. For example, solar and wind have high installation cost but environment friendly. Hydropower needs good location but cost is low. Nuclear has safety problems while cost is also reasonable. On the other hand, fossil fuels have low cost but have environmental concerns. Thus, renewable energy installation cost is high but environmental responsive as well as sustainable while non- renewable energy's cost is low but have environmental concerns. If we look at the current situation of the energy globally, it is clearly visible that fossil fuels are still dominant in energy consumption. Though Renewable energy has many advantages, however, consumption is only 15%. In our discussion, the effect of reduction of oil prices has been also discussed. Oil price reduction has both benefit and drawbacks. As an advantage of oil price reduction, we mentioned that shipping costs of ships, airplanes, etc. will be reduced. Besides, production of petroleum science products will be at low cost and most importantly, thermal power generation cost will be cheap. On the other hand, CO_2 emissions will be increased due to the acceleration of thermal power generation. Regarding potential energy resources to lead the future energy sectors, we tried to focus three Asian countries Japan, Nepal and China as energy situation depends largely on countries. Japan is trying to go towards renewable energy in near future, therefore, they have already set targeted goals. Nepal has huge potential in hydro energy production approximately 43,000 MW though the current production from hydro is 760 MW which is only 2% of their potential hydro energy. Therefore, to meet the future energy demand, they can use hydro energy. There are some constrains in establishment of hydro power plant in Nepal which need to solve such as difficulties in implementation of grid system as well as power plants and poor economic condition. In 2014, China invested more money in renewable energies than either fossil fuels or nuclear for the first time. Total energy from fossil fuels fell by 0.7%, whereas that generated by renewables grew 19%.Huge amount of renewable potential are in China, therefore, renewable energy is growing rapidly.

References:

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•Kansai Electricity 2016.
•Ministry of Economy trade and industry, Japan.

Tomoaki Hirakawa　総合理工学府 環境エネルギー工学 一貫制博士4年（博士2年）

We discussed the topic listed below.

(**Energy Resources**)

1. Different energy resources.
2. The current situation of the energy globally.
3. The effect of reduction of oil prices.
4. Which energy resources are potential to lead the future energy sector and how?

(**Answers**)

•Mainly, energy is divided into two groups which are the renewable energy and the non-renewable energy.

•In current situation, fossil fuels are dominant in energy consumption, and renewable energy is only about 15%.

•The reduction of oil prices will reduce cost of petroleum science products such as synthetic rubbers and polyester used for cloths.

•Because the main question should be the last one and others are leading questions, we spent most of our discussion time to figure out the last question. Since the potential resources are dependent on the location we consider, we decided to select three countries Japan, Nepal and China. I was in charge of the team on Japan. In my team, we decided to make use of a plan presented by the Ministry of Economy, Trade and Industry. According to the plan, as targets of the primary energy supply for 2030, 18% of the energy are going to be supplied by LNG, 25% by coal, 30% by oil, 13-14% by renewables,

and 11-10% by nuclear power. As targets of the electricity mix for 2030, 27% of the energy are going to be supplied by LNG, 26% by coal, 3% by oil, 22-24% by renewables, and 20-22% by nuclear power. The breakdown of renewables is 8.8-9.1% hydropower, 7% solar, 3.7-4.6% bioenergy, 1.7% wind and 1-1.1% geothermal. Summary:

•A renewable rich country, plans to use a mix.
•Increase solar, wind, geothermal, biomass.
•Decrease fossil fuels to only 30% by 2030

(**Nepal**)

2% comes from fact that 762MW used, 43,000MW economically viable under investment and restricted by location. Summary:

•Rich in only one kind of energy – hydroelectricity
•Large untapped energy reserves, requires investment
•Potential to be massive energy exporter

(**China**)

In 2014 China invested more money in renewable energies than either fossil fuels or nuclear, for the first time. Total energy from fossil fuels fell by 0.7%, whereas that generated by renewables grew 19%. Ref: China Electricity Council 2014. Summary:

•Huge amount of renewable potential, rapidly growing
•Focus on solar and wind
•Needs to develop transmission and storage, as energy sources far from population centers

Group 5 ……Topic 1

Leader : Tomy Alvin Rivai
Supporter : Animesh Pal , Masahito Tanaka

Muhamad Affiq Bin Misran ,
Eslam Naeim Hussien Abubakr ,
Masahito Tanaka , Animesh Pal ,
Tomy Alvin Rivai , Yoshiaki Takahashi ,
Cao Cong , Tsubasa Oji , Yusei Masaki

Animesh Pal

総合理工学府 環境エネルギー工学 一貫制博士4年（博士2年）

Green Asia Education Center of Kyushu University organized "International Forum for Green Asia 2016" on 1st December in Chikushi campus. I participated the program and also the student session. I was belong to the group 5 in the student session. Therefore, the assigned discussion topic was fusion energy. During discussion time we were discussed following key points: What is fusion energy? What are the advantages of using fusion energy? Research the feasibility of fusion energy and is it economic to keep investing in fusion energy? In our group, we were nine students from five different countries. As a result we had different opinions regarding the fusion energy. However, all of student in our group finally agreed that fusion energy could be another possible future energy resource. Following is the key points from our discussion. Fusion energy comes from the fusion reaction between two hydrogen isotopes: deuterium, and tritium. Basically, when deuterium and tritium nuclei fuse, they produce a helium nucleus, a neutron and huge amount of energy. Fusion energy is one of fortunate candidates for electricity generation due to abundant supply of fuels for nuclear fusion. Moreover, accident vulnerability in reaction is much less compared with fission. In addition, carbon dioxide (CO_2) emission is less compare to oil and coal based thermal power plant. Approximately 2000 scientists and engineers are recently working on a broad range of fusion research and development (R&D) projects in over 20 laboratories, including European Torus (JET). Furthermore, the domestic R&D's in Japan, the collaborator all over the world of the fusion, International Thermonuclear Experimental Reactor (ITER) project was started in 1985. After that collaboration among Japan, Europe, USA, Russia, China, Korea, and India was formed in 2007 to make ITER organization (IO) and their target were fusion output power of 500 MW at Q(gain)>10 for 500 seconds. Conclusively, fusion energy has the future to offer a viable solution to global energy demands. ITER is the world's highest energy scheme which purposes to establish that fusion can be a part of the solution by improving our energy blend to meet the global energy demands. Therefore, it will be economic to keep investing on fusion energy project. Engineers and scientists in this area should keep more focus for reducing the cost of this system to make more practical and profitable as it is an environment friendly. At the same time, government and organization should assist them. Lastly, it is important to mention that this kind of discussion among different fields' students can effectively improve our understanding, finding problem and solution.

Masahito Tanaka

工学府 地球資源システム工学 一貫制博士4年（博士2年）

Group 5 discussed applicability of fusion energy. When light elements such as deuterium and tritium are fused, it turns to helium and neutron. The energy can be obtained depending on the difference between the molecular weights. Generation of fusion energy has four advantages discussed in our student session; (1) less CO_2 emission compared to conventional power generation plants, (2) no radioactive waste unlike nuclear power generation, (3) abundant raw materials produced from sea water, (4) high energy production efficiency; for example, one gram deuterium-tritium can produce the energy as well as eight tons petroleum.

This fusion energy generation has been studied in some research institutes, especially ITER collaborated among countries such as Japan, EU, US, Russia, China, Korea and India. However, the practical trial production does not proceed. In terms of economic viability, it requires high capital investment because the construction of the system and plasma production cost become quite high. Main cost consumptions consists of grid system and specific direct conversion components (20%) and superconducting magnets (33%). Fusion energy generation needs much higher temperature (150 million °C) than the center of the sun. For this reason, plasma confinement shows high operation cost to maintain high temperature and fusion condition. This is one of the negative aspects of this energy. Therefore, further improvement of fusion power generation efficiency is required for well economic consistency between energy generation and consumption. Q value which indicates the ratio of fusion energy production and fusion plasma generation energy is 1.25 at the moment. Many research institutes all over the world tried to improve this Q value to over 10, especially up to 30. Moreover, resources consumption should be discussed for further development. The resources of fusion energy, deuterium and tritium come from sea water. Therefore, depletion of the resources does not occur. However, to produce tritium, lithium is required which is one of the resources possibly dried up. Utilization of lithium should be control to generate stable fusion energy for long term.

There are breakthrough advantages in fusion energy. However, the production is still in the middle of development. In addition, there are some negative aspects such as high capital, operation cost and low efficiency. It produces high energy which human has never experienced before. It thus remains in doubt we can control this power generation. However, to achieve the sustainable society not to utilize fossil fuels, it should continue to develop and be installed for sustainable society. One problem of this contains still low efficiency. Because feasibility remains, it however cannot be asserted that research should be stopped. For the novel possibilities unprecedented, we should keep investing to the development of fusion energy.

Group 6 ……Topic 2

Leader : Ni'Mah Ayu Lestari
Supporter : Sendy Dwiki

Fatin Hazwani Binti Mohamad Azahar ,
Wu Shun , Sendy Dwiki ,
Md Amirul Islam , Takaya Fujisaki ,
Ni'Mah Ayu Lestari , Keishi Oyama ,
Shinji Matsumoto

Sendy Dwiki

工学府 地球資源システム工学 一貫制博士4年（博士2年）

International GA Forum was held in Chikushi Campus, at 1st December

2016. It was divided into three main activities: lectures from invited guest, poster session and discussion as well as presentation of result of discussion from Green Asia students. The invited lecture firstly was delivered by Dr. Masaya Hanada, from Naka Fusion Institute, National Institute for Quantum and Radiological Science and Technology. His title is 'Research and Development for Fusion Energy in QST', where he mainly talked about latest development of the thermonuclear fusion that generates the power via the high energy neutron from reaction of deutreum and tritium plasmas. This large experimental fusion machines in project, namely JT-60, unfortunately has shut down in 2006. Moreover, the world-wide collaborative project has been developing (ITER or International Thermoneuclear Experimental Reactor) that has been participated by Japan, with QST as representative. After the achievements that were achieved by JT_60 and ITER performance, the fusion energy in Japan has been developed up until now. The second lecture is 'Role of Rock Mechanics in Mining Development in Indonesia', by Dr. Suseno Kramadibarata. He is the President and CEO of PT Bumi Resources Mineral in Indonesia and also was affiliated with Institut Teknologi Bandung and as President of Indonesia Rock Mechanics Society. In his lecture, he introduced about the basic of rock mechanics and its important role for mining, especially for safety reason when dealing with massive scale of natural rocks. Moreover, he also discussed about the development of rock mechanics in Indonesia regarding its as science and research. Lastly, Dr. Kenji Kato from Nippon Steel & Sumikin Engineering was discussed about the 'Leading Edge of Coal Utilization Technologies'. He discussed about the technology which currently available for low rank coal utilization in order to use this type coal for high energy efficiency. The technologies include: cokemaking, coal gasification and development of new cokemaking technology (SCOPE21).

The poster session was attended mostly by doctoral students of Green Asia. Divided by two duration time based on the odd and even numbers, student has to explain their current research to the reviewer. Even though not all of the students have chance to be able reviewed, it was a good opportunity for us to communicate with other academician whom might not familiar with our research field. This will increase the awareness of the importance of communication in order to be fully understood, especially in applying our research for society and opening up a possibility to build work with different research fields.

The last session was discussion time. Our group theme was about e-waste management, where we tried to explain the definition and our view regarding the e-waste. Basically, as the technology has been advanced currently and lead to the numerous innovations invented, the waste which was caused by the demand of high-end technology also escalated. Furthermore, the material that had been thrown away already equal to the proven resources in the world. In addition to that, the highly polluted materials also produced by this kind of waste. Therefore, we believe that e-waste needs to be managed carefully by implementing reduce, reuse and recycle, and also supported with adequate regulation and law to force the subject of e-waste producer to take care of their waste.

Group 7 ……Topic 3

Leader : Yuta Sato
Supporter : Tarek Mahmoud Atia Mostafa

Sameh Ahmed Okasha Zaki Mohamed ,
Muhammad Faisal Hasan ,
Tarek Mahmoud Atia Mostafa , Yuta Sato ,
Kitjanukit Santisak , Takayuki Maekura ,
Dabin Chung , Gede Dalton Surya Prayoga

Tarek Mahmoud Atia Mostafa　総合理工学府 量子プロセス理工学 一貫制博士4年（博士2年）

Mobile application development is a term used to denote the act or process by which application software is developed for handheld devices, such as personal digital assistants, enterprise digital assistants or mobile phones. These applications can be pre-installed on phones during manufacturing platforms, or delivered as web applications using server-side or client-side processing (e.g. JavaScript) to provide an "application-like" experience within a Web browser. Easily the impact on the economy of such industries can be marked in several examples such as Facebook, Twitter, Instagram, Youtube, and Google. "The Four Horsemen" Amazon/Apple/Facebook/Google, are the most dominant tech companies with a higher combined market cap than the GDP of South Korea.

Mobile apps have changed how we negotiate our relationships with family, spouses and close friends. Increased levels of mobile apps subscriptions are linked with improvements in education, gender equality and political participation, particularly in developing countries. They are also associated with higher economic growth.

For example, a research report by the Cologne Institute for Economic Research, explored that mobile apps strongly influence economics, society and people's private lives across 10 countries – the UK, Germany, Italy, Spain, China, India, Turkey, Egypt, Kenya and South Africa.

The effects of increasing mobile phone subscriptions on GDP growth across 10 countries are all positive for the years 2010 to 2020, forecast to grow continuously in this period. They range between 1.8% in the UK and 24.9% in Egypt (compared with today's GDP).

I found this session very valuable and useful for me for several reasons such as:

•The topic is relatively new for me that encouraged me to read about new topics and get different type of information related to another field rather than my original one which is a bit far from this area of research.

•Due to the diversity in the group that we were 6 persons from five different countries and backgrounds, we could look to the problem with a wider view and discuss the problem from variant spots. Every time we reflect our discussion to the point of view of different person with different way of thinking, we could get deeper in the issue and in finding solution as well.

Group 8 ……Topic 4

Leader : Cheng Xiaoyang
Supporter : Ryan Imansyah, Yu Narazaki

Ramadan M M Aljamal , Ali Yousefian ,
Yu Narazaki , Ryan Imansyah ,
Mohammad Tawheed Kibria ,
Cheng Xiaoyang , Alisa Bannaron ,
Yusuke Egawa

Ryan Imansyah　総合理工学府 量子プロセス理工学 一貫制博士4年（博士2年）

I got the discussion topic number 4 which is about energy sources. There are 4 questions that should be discuss by the team. Here is the question and discussion result of our team :

•Different energy resources

Energy sources can be devided into 2 groups, renewable and non-renewable energy sources. The example of renewable energy sources are solar energy, wind energy, geothermal energy, and bio energy. While the non-renewable

energy sources are fossil fuels and nuclear fuels. The fossil fuels itself divided into 3 main energy resources, coal, gas, and oil.

•The current situation of the energy globally

It is believed that the fossil fuels will be finished in the near future due to the lack of total reserves of it. For example, oil deposits will be gone by 2052 if there is no increase in population growth, while the gas will give us the energy until 2060 if it is used to fill the energy gap left by the oil. On the other hand, coal is going to be last until 2088 to give us the energy.

•The effect of reduction of the oil prices

The effect of reduction in oil prices to the countries is depend on the status of its country, whether they are an importer or exporter. The reduction of oil prices means the reduction of cost of living because the transport cost will directly fall, thus it will lead to a lower inflation rate for the oil importer country such as Europe, Japan, and China. Besides the lower inflation, the impact of this reduction is higher output because there is more income to spend like on the other goods and services.

•Which energy resources are potential to lead the future energy sector and how?

According to the situation of the fossil fuels energy, it seems that the future energy source will be held by the renewable energy or nuclear energy source. There is some renewable energy that is potentially to give huge amount of energy such as wind turbines, however, this type of energy source is not good for the ecosystem since it's disturbing the birds line. The other renewable energy is transparent solar cell window, this technology can produce the energy without opening a new space for the installation. The ordinary window can be replaced by a solar cell, thus the solar power can be harvest easily without opening a new space for the solar cell.

In the nuclear energy side, nuclear fusion is attractive since it doesn't produce nuclear waste like the nuclear fission. Scientists are getting closer to pulling off this effect on earth, but the reactor are still expected to expend more energy than the producing. As the technology improves fusion will become an increasingly attractive option for future energy source.

Yu Narazaki 総合理工学府 量子プロセス理工学 一貫制博士4年（博士2年）

I took part in the student session after I have heard three keynote speakers' invited lectures and given my Ph. D research in the poster session at the GA forum. There were four types of an attractive discussion topic in respect to "Fusion Energy", "E-wastes Management", "Mobile Apps Economy" and "Energy Resource", respectively. Moreover, discussion teams were organized eight teams which each two teams discuss an above topic. I was in charge of a supporter in the team eight which team members were composed of Ms. Cheng, Ms. Alisa, Mr. Ryan, Mr. Tawheed and Mr. Ezaki, including me. We were talking about "Energy Resource" as Ms. Cheng was leading presentation contents. We all suggested various kinds of an opinion toward its topic, for example "energy recourse for the future" and "an expectation of renewable energy", by utilizing our related bringing materials. I was able to support our discussion and to determine some exiting pictures for our conclusion in our presentation slides. After we were discussing for two hours, it was time for us to give presentation to all of the GA students and staffs. Our presenters were Cheng, Alisa and Tawheed and contents were introduction of energy recourse, transition of it, its future plans and conclusion. I heard eight teams' respective presentations and understood "what and how is the Fusion Energy", "E-waste problems nowadays", "different between good and bad mobile apps" and "the trend of a energy resources for the future" base on shared attractive data and their thinks in presentations. Of course, our team was successful in the presentation. Finally, we, Mr. Yoneda, Mr. Ryan, Ms. Zayda and Mr. Tarek as a leader of each sections, were organized this forum in this time. Sometime, we created some dissensions during organization of the forum. However, we might be delight because this forum was quite smooth and successful. Especially, the student session was quite great because I was impressed that those who are coming from various countries discuss, corporate, finalize their opinions, thinks and viewpoints and present them toward a give topic. Moreover, they definitely consider economic, sociological and environmental aspects in their opinions and then their presentations were interesting and considerable. I believe that this opportunity is difficult for students without Green Asia program to experience if they want. Next challenge is coming soon so next leaders who are organizing the next GA forum will be required to produce more excellent next one than we did.

Topic 1 Fusion Energy

1. What is fusion energy?
2. What are the advantages of using fusion energy?
3. Research the feasibility of fusion energy.
4. Is it economic to keep investing in fusion energy?

Topic 2 E-wastes (electronic wastes) management

1. Different types of e-waste and global e-waste volume.
2. Man driving forces for e-waste recycling.
3. Recycling systems and policies in different countries.

Topic 3 Mobile Apps Economy

1. What is App economy?
2. Mobile Apps statistics in global scale.
3. The Apps economy growth and its effect on the global economy
4. Mobile Apps effect on different Societies
5. Mobile apps impact on the economy of the developing countries

Topic 4 Energy Resources

1. Different energy resources.
2. The current situation of the energy globally.
3. The effect of reduction of oil prices.
4. Which energy resources are potential to lead the future energy sector and how?

佐賀および長崎への国内研修旅行についての報告

九州大学グリーンアジア国際リーダー教育センター・助教
渡辺 貴史

＜概要＞

2016年12月12日および13日の二日間をかけて、1日目には佐賀県吉野ヶ里町の吉野ヶ里メガソーラー発電所および長崎県長崎市の長崎原爆資料館を、二日目には同長崎市の三菱造船博物館および長崎県諫早市の諫早干拓資料館での研修を行った。この研修にはグリーンアジアの学生が19名、IEIの学生が11名、教員2名の計32名が参加した。両日とも学生諸君は旺盛な学習意欲を示して、各見学地の関係者に質問をしたり、仲間同士で議論を交わすなど、終始活発な活動を続けた。期間中怪我や事故もなく、全員が充実した研修を行った。

＜研修の目的＞

本研修の目的は、北部九州に拠点を置く日本を代表する企業や九州北部の歴史的文化的施設、あるいは地域の環境問題に関わる施設を訪問することによって、日本の商工業および環境政策の現状を理解することにあった。特に留学生諸君に対しては、日本の現状を直接見ることによって、知見を深める機会を提供することにあった。さらに、多くの国々からの留学生及び日本人学生諸君が、ともに行動し議論しあうことで、互いに刺激し合い友好関係を育む機会を提供することであった。またその過程で、英語によるコミュニケーション能力を向上させることにあった。

＜日程＞

日程は以下のようであった。移動はバス1台で行った。

12月12日(月)	
09:00–09:50	伊都キャンパス発→筑紫キャンパス着
10:00–11:00	筑紫キャンパス発→佐賀吉野ヶ里メガソーラー発電所着
11:00–11:10	ビデオによる説明
11:10–12:10	施設内部の見学
12:10–12:40	技術者らとの意見交換
12:50–15:30	吉野ヶ里メガソーラー発電所発→長崎原爆資料館着
15:30–17:15	長崎原爆資料館および平和記念公園の見学
12月13日(火)	
09:30–10:15	宿泊施設発→三菱造船所博物館着
10:15–11:15	ビデオによる説明及び博物館内の見学、質疑応答
11:15–13:00	三菱造船所博物館発→諫早干拓資料館着
13:10–14:10	施設内の見学および担当者との意見交換
14:45–17:30	諫早干拓資料館発→筑紫キャンパス着
18:30	伊都キャンパス着、解散

＜学生への課題について＞

まず学生は5～6名の小さなグループに分けられ、各グループそれぞれには1名の日本人学生が配置された。各グループでは、リーダー及び副リーダーがそれぞれ1名ずつ指名され、彼らはグループ成員全員が支障なく研修を行えるように様々な配慮をするように求められた。また日本人学生は、研修全般を通じて、グループ内の他の留学生の通訳の役目を果たすよう求められた。

その上で、グリーンアジアの学生には、次のような課題が与えられた。

研修旅行前：

●見学に訪れる各施設について各自下調べをしておくこと、及び見学当日にすべき質問を各自少なくとも二つは考えておくこと。

研修旅行中：

●各グループのリーダーは、各メンバーが考えた質問内容を精査し、メンバーと相談の上で適切な質問を各訪問先につき2つ選択し、発表すること。

●各グループの日本人学生は、各施設で日本語の説明が行われた場合や質疑応答において、自分のグループのメンバーに対してわかりやすく英語に翻訳し説明すること。また、メンバーの英語での質問を日本語に翻訳して担当者に伝え、議論を円滑に進めるよう努力すること。

研修旅行後：

●各グループそれぞれがレポートを提出すること。

●レポートの執筆にあたって、グループ内の各学生が、それぞれレポートの一章を受けもつこと。また、リーダーと副リーダーには、レポートの編集と提出について責任をもつこと。

＜総評＞

総勢32名の国内研修であったが、学生諸君はグループごとにリーダーの指導のもと、きびきびとした態度で熱心な学習意欲を見せながら、つつがなく日程を終えることができた。工場見学及び技術者との質疑応答の際には、日本語での説明を日本人学生がそれぞれのグループメンバーに対して逐一通訳をし、また留学生が英語で質問する際には、分かりやすい日本語に翻訳して伝えていた。どの見学地においても、議論は熱心に続けられ、学生諸君からの質問が絶えることはなかった。

課題であるレポートは、すべての各グループから締め切り前に提出された。提出されたレポートは、いずれも英文レポートとしての体裁を整えており、また規定の文字数を満たした内容の濃いものに仕上がっていた。

以上のことから、今回の国内研修は、十分にその目的を達成したものと思われる。

海外短期実習　台湾（2017年1月17～19日）

九州大学グリーンアジア国際リーダー教育センター・助教
折本 裕一

アジア諸国の政治、経済、歴史、文化を現地に赴いて肌で学ぶことを目的として、昨年度の韓国に引き続き、2016年度の海外短期実習は台湾（高雄を中心とした南部）を訪問した。今回の実習には九州大学から学生28名、教員17名、テクニカルスタッフ2名の計47名が参加した。また、本実習は、訪問先の一つである中山大学の学生・ポスドク等21名も参加して行われた。16日夜に高雄市入り後、翌17日に同市にある国立中山大学（National Sun Yat-sen Univ.）を訪問した。海と山に囲まれた自然豊かで美しい場所にある総合大学である。午前9時からジョイントワークショップを行ない、午前中は教員4名による講演、午後は学生によるグループディスカッションとその発表、続いて学生4名による研究発表が行われ、午後4時半に閉会した。ワークショップでは、科学技術、経済発展、環境問題等に関する最新の研究報告に基づき活発な意見交換が行われた。また、グループディスカッションでは3つの学生チームが各種テーマに基づき、ユニークな視点からのプレゼンテーションを繰り広げた。

翌18日には高雄市より北に移動し、台南市にある南部サイエンスパーク（Tainan Science and Technology Park）を訪れた。午前中、医薬品原料メーカーであるサイノファーム台湾（ScinoPharm Taiwan, Ltd.）を訪問し、会社の説明を受けた後、質疑応答を行った。午後には、同パーク内の半導体メーカーTSMC社（Taiwan Semiconductor Manufacturing Co., Ltd.）を訪問し、施設見学等を行った。ここでは、一部の学生等がクリーンルーム用作業服の着用体験を行った。最先端の製薬、半導体分野の雰囲気を感じ取ることのできた一日となった。最終日の19日には、再び中山大学を訪問し、研究室の見学、および、汚染物質の検出に関する研究の演示を見学した。

3日間と言う短い時間ではあったが、大学、産業界の両方の視点から台湾の科学技術と経済発展を実体験することができた。さらには、台湾から見た日本の位置付けなども感じ取れた。GAコース生の教育にとって大変有益な実習であったと考える。本実習は中山大学、サイノファーム台湾、TSMCのGAプログラムへの理解と協力無しには実現できないものであり、厚く感謝申し上げたい。

H28年度 GA Afternoon Colloquium

第9回 10/14

高橋 良彰 准教授　［先導物質化学研究所 物質理工学専攻］
Assoc. Prof. Yoshiaki Takahashi［Department of Advanced Device Materials, Institute for Materials Chemistry and Engineering］

［テーマ］
Toward the molecular characterization of
natural polymers insoluble into ordinary solvents
［開催キャンパス・場所、開催時刻］
【筑紫】C-Cube7階710号室【伊都】West2号館531号室　午後1～3時


第10回 10/21

中川 剛志 准教授　［総合理工学府 物質理工学専攻］
Assoc. Prof. Takeshi Nakagawa［Department of Molecular and Material Sciences］

［テーマ］
Small, but strong magnet: nanoscale magnetism
［開催キャンパス・場所、開催時刻］
【筑紫】C-Cube7階710号室【伊都】West2号館531号室　午後1～3時


第11回 11/8

大屋 裕二 教授　［応用力学研究所 新エネルギー力学部門］
Prof. Yuji Ohya［Division of Renewable Energy Dynamics, Research Institute for Applied Mechanics］

［テーマ］
Highly Efficient Harnessing System of
Fluid Energies Using Wind-Lens Technology
［開催キャンパス・場所、開催時刻］
【筑紫】C-Cube7階710号室【伊都】West2号館531号室　午後1～3時

第12回 11/25

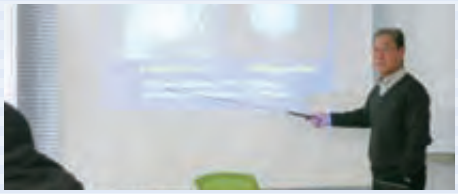
Prof. Md. Zakir Hossain　［群馬大学］
Gunma University

［テーマ］
Graphene - the material for next generation technology
［開催キャンパス・場所、開催時刻］
【筑紫】C-Cube7階710号室【伊都】West2号館531号室　午後3～5時


第13回 12/16

新川 和夫 教授　［応用力学研究所 附属自然エネルギー統合利用センター］
Prof. Kazuo Arakawa［Renewable Energy Center, Research Institute for Applied Mechanics］

［テーマ］
Topic for dynamic friction
［開催キャンパス・場所、開催時刻］
【筑紫】C-Cube7階710号室【伊都】West2号館531号室　午後3～5時



第14回 1/10

谷本 潤 教授　［総合理工学府 環境エネルギー工学専攻］
Prof. Jun Tanimoto［Department of Energy and Environmental Engineering］

［テーマ］
Report on staying at Max Planck Institute for
Evolutionary Biology, Plön, Germany.
［開催キャンパス・場所、開催時刻］
【筑紫】C-Cube7階710号室【伊都】West2号館531号室　午後1～3時

■GAプログラム担当者（平成29年3月1日）

- 原田　明 — プログラム責任者
  大学院総合理工学府・物質理工学専攻・教授/
  大学院総合理工学府・学府長
- 谷本　潤 — プログラムコーディネーター
  大学院総合理工学府・環境エネルギー工学専攻・教授
- 林　潤一郎 — 副プログラムコーディネーター
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 水野　清義 — 副プログラムコーディネーター
  大学院総合理工学府・物質理工学専攻・教授
- 萩島　理 — 副プログラムコーディネーター
  大学院総合理工学府・環境エネルギー工学専攻・教授
- 笹木　圭子 — 副プログラムコーディネーター
  大学院工学府・地球資源システム工学専攻・教授
- 浜本　貴一
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 西田　稔
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 大瀧　倫卓
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 波多　聰
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 尹　聖昊
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 中島　寛
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 菊池　裕嗣
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 岡田　重人
  大学院総合理工学府・量子プロセス理工学専攻・教授
- 堤井　君元
  大学院総合理工学府・量子プロセス理工学専攻・准教授
- 青木　百合子
  大学院総合理工学府・物質理工学専攻・教授
- 中島　英治
  大学院総合理工学府・物質理工学専攻・教授
- 永島　英夫
  大学院総合理工学府・物質理工学専攻・教授
- 吾郷　浩樹
  大学院総合理工学府・物質理工学専攻・教授
- 小山　繁
  大学院総合理工学府・環境エネルギー工学専攻・教授
- 伊藤　一秀
  大学院総合理工学府・環境エネルギー工学専攻・教授
- 平島　剛
  大学院工学府・地球資源システム工学専攻・教授
- 渡邊　公一郎
  大学院工学府・地球資源システム工学専攻・教授
- 沖部　奈緒子
  大学院工学府・地球資源システム工学専攻・准教授
- Bidyut Baran Saha
  九州大学カーボンニュートラル・エネルギー国際研究所・教授
- 松本　広重
  九州大学カーボンニュートラル・エネルギー国際研究所・教授
- 大屋　裕二
  大学院工学府・航空宇宙工学専攻・教授
- 円谷　裕二
  大学院人文科学府・人文基礎専攻・教授
- 藤田　敏之
  大学院経済学府・経済工学専攻・教授
- 近藤　加代子
  大学院芸術工学府・芸術工学専攻・教授
- 原田　達朗
  炭素資源国際教育センター・教授
- 三木　一
  大学院工学研究院・地球資源システム工学部門・准教授
- 山本　圭介
  大学院総合理工学研究院エネルギー物質科学部門・助教

■グリーンアジア国際リーダー教育センター教員

- 中尾　安幸 特任教授
- 古野　裕史 准教授
- Kyaw Thu 准教授
- Andrew Spring 助教
- 折本　裕一 助教
- 渡辺　貴史 助教
- 渡邉　智明 助教
- 前　奈緒子 助教
- 船津　貴弘 助教

■事務局スタッフ（平成29年3月1日）

氏　名	フリガナ	職　名	備　考	居　室
佐本　美恵子	サモト　ミエコ	室長	勤務場所：筑紫地区	E棟 3階 313号室
平島　美和	ヒラシマ　ミワ	テクニカルスタッフ	勤務場所：伊都ブランチ	ウエスト2号館　6階　641号室
松榮　美菜子	マツエ　ミナコ	テクニカルスタッフ	勤務場所：伊都ブランチ	ウエスト2号館　6階　641号室
藤倉　友	フジクラ　ユウ	テクニカルスタッフ	勤務場所：筑紫地区	E棟 3階 313号室
叶　佳子	カノウ　ヨシコ	テクニカルスタッフ	勤務場所：筑紫地区	E棟 3階 313号室
林　祐子	ハヤシ　ユウコ	テクニカルスタッフ	勤務場所：筑紫地区	E棟 3階 313号室
井上　美枝子	イノウエ　ミエコ	テクニカルスタッフ	勤務場所：筑紫地区	E棟 3階 313号室
牧野　正義	マキノ　マサヨシ	テクニカルスタッフ	勤務場所：筑紫地区	E棟 3階 313号室
西尾　陽子	ニシオ　ヨウコ	事務補佐員	勤務場所：筑紫地区	E棟 3階 313号室
石橋　麻衣	イシバシ　マイ	事務補佐員	勤務場所：筑紫地区	E棟 3階 313号室
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岩橋　愛	イワハシ　アイ	事務補佐員	勤務場所：筑紫地区　人事係	事務棟　2階
大石　知子	オオイシ　トモコ	事務補佐員	勤務場所：筑紫地区　経理係	事務棟　1階

■スケジュール

H29年　3月24日	学府学位記授与式
H29年　4月　5日	大学院入学式、専攻オリエンテーション
H29年　4月　5～11日	安全衛生教育
H29年　4月10日	春学期開始

九州大学　博士課程教育リーディングプログラム
グリーンアジア国際戦略プログラム
Kyushu University　Program for Leading Graduate Schools
Advanced Graduate Program in Global Strategy for **Green Asia**

■グリーンアジア国際リーダー教育センター事務局
〒816-8580　福岡県春日市春日公園6-1 筑紫キャンパス E棟 3階313号室
TEL▶092-583-7823/7825　FAX▶092-583-8909

■伊都ブランチ
〒819-0395　福岡県福岡市西区元岡744 ウエスト2号館 6階641号室
TEL▶092-802-6660　FAX▶092-802-6660

E-mail: greenasia@ga.kyushu-u.ac.jp
http://www.tj.kyushu-u.ac.jp/leading