理工系大学学部で学び、グローバル人材として活躍を目指す高校 1・2 年生の皆さん、保護者の皆様へ
高等学校理数科教諭の皆様へ

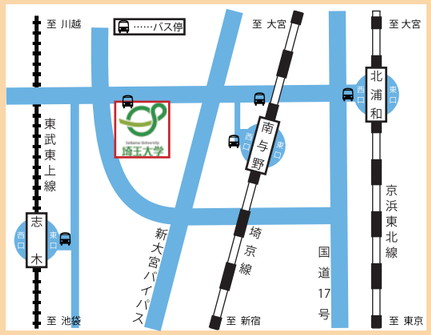
HiGEPS OB/OGコラム

埼玉大学理学部物理学科3年
須田　亮介
（さいたま市立浦和高等学校　出身）

HiGEPSでは講義・研究・海外研修など本当にいろいろな経験をすることができ、物理をはじめとして自然科学全体に興味を持つことができました。同時にもっとここで学びたいという思いから、私は埼玉大学に進学しました。現在は理学部物理学科で現代物理学の基礎を学びながら、HiGEPS同様のプログラムであるHiSEPに参加したり、数学や化学を勉強したりして、多分野にわたる興味を深めています。例えば、数学の線形代数という基礎的な分野が純粋な代数・幾何だけでなく量子力学やフーリエ解析など理工学全体に通じることがわかると、各領域個別の知識が繋がってアツいです。私もこのような自然科学の面白さを伝えていけるようになりたいと思っています。

埼玉大学工学部応用化学科3年
小熊　健太
（さいたま市立大宮北高等学校　出身）

HiGEPSでは、高校生活ではできない貴重な体験ができました。例えば、海外研修に2度行けたことです。そこでシンポジウムに参加したり現地の理系学生と交流できたのは、自分が海外に興味を持てたきっかけとなりました。また、天文の研究室で望遠鏡を利用して天体の特徴を探り、天文の知識を深めることが出来ました。
大学では工学部に所属しているため、HiSEPSとの直接的な関係はありませんが、企画に参加させてもらったり、研修の引率に呼ばれたりと何かと関わってきました。これからも幅広い知識を身に着けていきたいです。



・JR京浜東北線「北浦和駅」西口下車→バス「埼玉大学」ゆき（終点）
・JR埼京線「南与野駅」下車→北入口バス停から「埼玉大学」ゆき（終点）
・JR埼京線「南与野駅」下車→西口バス停から全ての便が埼玉大学を経由します
・東武東上線「志木駅」東口下車→バス「南与野駅西口」ゆき（「埼玉大学」下車）

2020年 5月31日　発行
企画・編集：埼玉大学大学院理工学研究科
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国立研究開発法人 科学技術振興機構（JST）グローバルサイエンスキャンパス 後継事業

埼玉大学ハイグレード理数高校生育成プログラム

「知と技、そして国際性」を併せ持つ
理工系エキスパートをめざして。

HiGEPS

High-grade
Global
Education
Program for
Sciences

HiGEPS Annual Review No.7 (2020.05.31)

http://higeps.phy.saitama-u.ac.jp/

埼玉大学大学院理工学研究科
Graduate School of Science and Engineering, Saitama University

HiGEPS
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埼玉大学ハイグレード理数高校生育成プログラム　HiGEPS

理数分野において優れた基礎学力と、強い好奇心・向上心を持つ高校生の皆さんを「知と技、そして国際性」を併せ持つ、理工系人材に育成することを目的とした特別プログラムです。「ベーシンクコース」では中学3年、高校１・２年生70名を募集・選抜します。理工系（数学・情報・物理・化学・生物・地学）にかかわる大学専門課程レベルの知識をセミナー形式で学び、加えて外国人研究者・留学生を含む講師による科学英語セミナー・談話会といった国際力強化企画を交えた育成プログラムを埼玉大学、および連携機関が協力して提供します。「聞くことができ、理解することができ、議論することができる」理工系人材として必要なスキルを習得し、アクティブ志向の高校生を育成します。さらに選抜を経て「アドバンスドコース」に進む高校１・２年生には、埼玉大学・連携機関の持つ研究・教育面での高いポテンシャルを活用した、個別研究活動、短期研修や国内グローバル教育プログラムを提供し、研究力・国際性・社会性を併せ持つ「理工系研究者の芽」を大きく育成していきます。

HiGEPS受講生(保護者・高等学校教諭)の皆様

埼玉大学理学部長
石井　昭彦

受講生の皆さん、HiGEPSに参加してきていかがですか？　まず、学校での勉強・クラブ活動や自宅での学習に加えて、「埼玉大学での理工系教育プログラム」に参加し、より深い知識と高いスキルを求めて学んできた皆さんの意欲と努力を讃えたいと思います。1年間の講座を通して、高校での理科・数学の学びの枠を超えてさらに裾広く、深く学ぶことで、さらに皆さんの好奇心・探究心が高まってきているに違いありません。また将来の研究活動に不可欠なコミュニケーション力、国際性も含めて、より自分を高めていかないといけないという向上心も強くなってきているのではないでしょうか。

皆さんが目指す理工学研究の目的は、自然の成り立ちとその仕組みを解き明かすことで自然が備えている法則性を見出すことであり、人間が本来持っている知的好奇心と探究心を満たすことに大きく貢献しています。同時に、現代社会が抱える様々な課題の解決への接点も追求しており、新しい技術や産業の礎になる可能性を秘めています。一方で理学研究で得られた知見や考え方は人文・社会科学にも大きなインパクトを与え、現代人の哲学や世界観にも影響を及ぼしています。

皆さんには、今後とも高校での勉学とHiGEPSでの経験を生かし、ますます好奇心を伸ばし、大学・大学院での高度な実践を積み重ねて、将来、優れた理工系グローバル人材として活躍されることを期待しています。

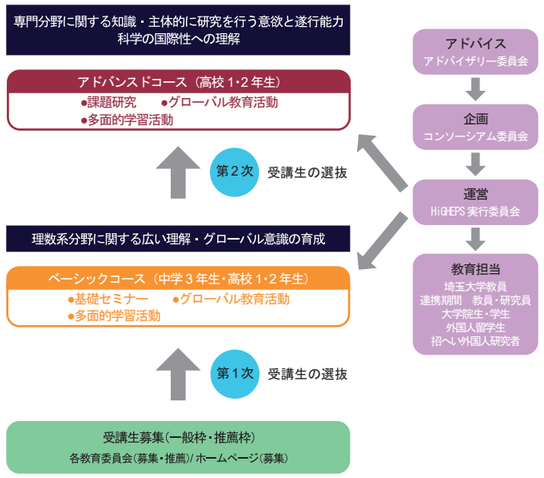
最後になりますが，保護者の皆様、各高校の先生方におかれましては、より受講生の皆さんに近いところで様々な指導・サポートをしていらっしゃるところですが、今後とも、その支援をお願いすると共に、もう一つの輪として埼玉大学理学部が実施するHiGEPSプログラムの趣旨・理念をご理解いただき、今後ともご指導・ご協力いただきたく、よろしくお願い申し上げます。

◆HiGEPSセミナー講師からのメッセージ

埼玉大学　教育学部　自然科学講座
岡本　和明　教授

皆さんは、将来にどんな目標を持っているでしょうか？私は高校生の頃遊んでばかりいて、研究への興味はさほどありませんでした。理学部に入学し、４年生になり実際に研究を始めると、とても楽しくなりました。そして研究生活をずっと続けています。大学の先生たちと研究を始められる皆さんは、とても素晴らしく、また幸せだと思います。2020年は、人類の歴史と進化の中で意味を持つでしょう。500年あまり前に起こった、ペストのパンデミックの際は、ルネサンスと呼ばれる文化、そして宗教の束縛から解放された科学への道がレオナルド・ダ・ヴィンチらにより開かれていきました。皆さんは、‘新しい科学’ を始めると期待しています。生命や人類の進化と地球全体の進化には深い関係があります。私は特に、初期生命や地震、火山に関わる地球内部の水の役割に興味を持って、観察や分析、実験を行なっています。皆さんと一緒に学んでいければ幸いです。

◆HiGEPS組織図



HiGEPS 受講生情報

	2015年度	2016年度	2017年度	2018年度	2019年度
ベーシックコース	57人 高校１年生　57人	77人 中学３年生　１人 高校１年生　75人 高校２年生　１人	67人 中学３年生　３人 高校１年生　63人 高校２年生　１人	70 人 中学３年生　４人 高校１年生　56人 高校2年生　10人	64 人 高校１年生　50人 高校２年生　14人
アドバンスドコース	10 人 高校２年生　10人	11 人 高校2年生 11人	15 人 高校２年生　15人	13 人 高校１年生　１人 高校２年生　12人	13 人 高校２年生　13人

◆受講生の主な出身高校

【埼玉】県立大宮高等学校　県立浦和高等学校　県立浦和第一女子高等学校　県立越谷北高等学校　県立熊谷西高等学校　県立所沢北高等学校　県立松山高等学校　県立川口北高等学校　県立伊奈学園総合高等学校　県立川越女子高等学校　県立川越高等学校　県立浦和西高等学校　県立春日部高等学校　県立春日部女子高等学校　県立与野高等学校　県立大宮光陵高等学校　県立久喜北陽高等学校　県立不動岡高等学校　県立杉戸高等学校　県立鴻巣高等学校　県立和光国際高校　県立豊岡高等学校　さいたま市立浦和高等学校　さいたま市立大宮北高等学校　さいたま市立浦和南高等学校　川口市立高等学校　さいたま市立内谷中学校　淑徳与野高等学校　浦和明の星女子高等学校　慶應志木高等学校　立教新座高等学校　山村学園高等学校　埼玉平成高等学校　開智高等学校　開智未来高等学校　和光国際高校　大宮開成中学校
【東京】お茶の水女子大学附属高等学校　都立北豊島工業高等学校　都立多摩科学技術高校　都立国際高等学校　豊島岡女子学園高等学校　早稲田実業学校高等部　海城高等学校　広尾学園高等学校　東京家政大学附属女子高等学校　十文字高等学校
【山梨】日本航空高等学校通信制普通科
【千葉】県立柏高等学校　千葉市立千葉高等学校　渋谷教育学園幕張高等学校
【神奈川】横浜サイエンスフロンティア高等学校
【茨城】県立古河中等教育学校　鹿島学園高等学校
【群馬】県立高崎高等学校　県立藤岡中央高等学校　県立高崎女子高等学校　群馬前橋育英高等学校
【栃木】県立矢坂東高等学校　県立宇都宮女子高等学校　宇都宮短大付属高等学校
【福島】県立安積高等学校

2019 年度 HiGEPS 年間計画表

実施日	企画内容	担当教員	分野	講座タイトル
5/18(土)	プログラムガイダンス	理学部教員　理学部学生 HiGEPSコーディネーター	ーー	プログラムガイダンス
	HiGEPSプレセミナー	井上直也 （理学部物理学科）	物理	超高エネルギー宇宙
6/22 (土)	HiGEPS受講の手引き （ガイダンス）	理学部教員　理学部学生 HiGEPSコーディネーター	ーー	HiGEPS受講の手引き（ガイダンス）
	HiGEPS オープニング基礎セミナー	Lewis M. Antill （学術振興会　研究員）	化学	The light fantastic: understanding light and its applications
7/20 (土)	第1回女性科学者の芽セミナー	片桐 千華（株)資生堂 グローバルイノベーションセンター） 埼玉大学女性教員・女子学生	全領域	第一部：探検！発見！理系が創る未来！ 第二部：女子学生・研究者とのQ&Aタイム
	先端施設見学 埼玉大学研究・教育施設見学	藤原隆司 （科学分析支援センター・ 理学部基礎化学科）	全領域	科学分析支援センター見学
	第1回イングリッシュシャワー	Tammo Reisewitz （HiGEPS英語コーディネーター）	英語	Why English?
8/8 (木)	夏休み集中講座	安積 卓也 （工学部情報工学科）	情報	自動運転技術 ～コンピュータが実現する認知･判断･操作～
		永澤　明 （埼玉大学名誉教授）	物理 化学	物理学と化学の接点
		大朝 由美子 （教育学部自然科学専修・ 大学院理工学研究科物理学コース）	地学	太陽の大きさを測ってみよう
		藤森 厚裕 （工学部応用化学科）	化学	繊維，プラスチック，ビニール，ゴムは、 同じもの？ "ポリマー"のお話 ーその始まりから， マイクロプラスチック問題までー
		小林 哲也 （理学部生体制御学科）	生物	ホルモンとは何モン？ ー生命をあやつる不思議な分子ー
8/27 (火)	基礎セミナー	戎崎俊一 （理研　計算宇宙研究室）	物理 工学	レーザーによる宇宙デブリ除去技術
9/21 (土)	サイエンスカフェ	理学部教員　理学部学生 埼玉大学理工系留学生	全領域	サイエンスカフェ
	グローバル特別講義	Eduardo de la Fuente Acosta （メキシコ　グアダラハラ大学 宇宙惑星研究所）	グローバル	Stellar Astrophysics and its relation with the High Energy Astrophysics
	基礎セミナー	是枝 晋 （理学部分子生物学科）	生物	アイスプラントの３つの顔
	第２回イングリッシュシャワー	Tammo Reisewitz （HiGEPS英語コーディネーター）	英語	Why English?

実施日	企画内容	担当教員	分野	講座タイトル
11/2 (土)	埼玉大学70周年理学部デー 理学部一般公開「理学部デー」	理学部教員　理学部学生 HiGEPSコーディネーター	全領域	理学部一般公開　～理科実験と研究発表～
	埼玉大学70周年理学部デー 埼玉大学大学院理工学研究科 学術セミナー連携企画 理学部デー特別セミナー	森田 浩介 （九州大学大学院理学研究科）	物理	新元素の探索
	埼玉大学70周年理学部デー 埼玉大学むつめキャンパス 連動企画	井上直也 （理学部物理学科）	物理	理学の中の物理学 ～大学で学ぶ最先端～
	埼玉大学70周年理学部デー サイエンスカフェ	理学部教員　理学部学生 埼玉大学理工系留学生	全領域	サイエンスカフェ
12/14 (土)	サイエンスカフェ	理学部教員　理学部学生 埼玉大学理工系留学生	全領域	サイエンスカフェ
	基礎セミナー	水本 好彦 （国立天文台　名誉教授）	地学 物理	太陽系外惑星探査と惑星形成研究の最前線
	第3回イングリッシュシャワー	Tammo Reisewitz （HiGEPS英語コーディネーター）	英語	How to study English
1/25 (土)	第4回イングリッシュシャワー	Tammo Reisewitz （HiGEPS英語コーディネーター）	英語	Why English?
	基礎セミナー	Neal Bez （理学部数学科）	数学	コンピュータグラフィックスと数学
	アチーブメントテスト	HiGEPS	全領域	ーー
1/26 (日)	アチーブメントテスト（予備日）	HiGEPS	全領域	ーー
2/22 (土)	第2回女性科学者の芽セミナー	林 杏果 （早稲田大学先進理工学部応用化学科） 埼玉大学女性教員　女子学生	全領域	第一部：いち学生が考える理系女子の今とこれから 第二部：女子学生・研究者とのQ&Aタイム
	基礎セミナー	古川 俊輔 （理学部基礎化学科）	化学	有機物が光る？電気を流す？ ー分子デザイナーへの道ー
	HiGEPS科学プレゼンコンテスト 発表会（Ⅰ）	HiGEPS	全領域	ーー
3/21 (土), 4/18（土） 延期	HiGEPS科学プレゼンコンテスト 発表会（Ⅰ）	HiGEPS	全領域	ーー
	基礎セミナー	大西 純一 （埼玉大学名誉教授）	生物	系統樹を作ってみよう！
	アドバンスドコース研究発表会	HiGEPS	全領域	ーー
	コース修了式	HiGEPS	ーー	ーー

ADVANCED COURSE RESEARCH REPORTS IN 2019

2019年度HiGEPSアドバンスドコース受講生による課題研究として、10件が本学教員・TA学生の指導のもとで行われました。テーマと概要を以下に掲載します。研究成果レポートは別冊子にて報告します。

Intensity of Natural Radiations and Their Absorption in Material
自然放射線強度と宇宙放射線成分の物質吸収特性

Motonao ISHIGAMI[1], Sayuri FUKE[2], Naoya INOUE[3]
[1] Omiya Senior High School , Saitama, Japan, [2]Urawa Akenohoshi Girls' Senior High School , Saitama, Japan,
[3] Graduate School of Science and Engineering, Saitama University, Saitama, Japan
石上元直[1], 普家小百合[2] , 井上直也[3] (1: 埼玉県立大宮高等学校; 2:浦和明の星女子高等学校; 3: 埼玉大学大学院理工学研究科)

Fundamental knowledge of natural radiation is sometimes required where science meets social problems. Especially, studies on natural radiations which exist around us are significant when we have to face to artificial radiation in and from restricted areas. In this study, we first measured natural radiation intensity at the campus of Saitama University and 726.8 /sec/m^2 was observed as standard data by Gamma Scout, and we also observed a cosmic ray muon intensity of 187.2 /sec/m^2. Based on the standard data, we studied the relation to atmospheric pressure using Gamma Scout and a scintillation detector. Down-going cosmic ray muons are a typical component of natural radiation, therefore we thought that overall radiation intensity will be somewhat reduced with increased pressure. The changes of atmospheric pressure indicate movement of air material, and their trace could be detected in the natural radiation. We also studied the measurement angle using the scintillation detector and found that it shows a downward graph like the relation to the atmospheric pressure. Both of them are caused by the effect of atmospheric material' s absorption.

Study on Type of wood suitable for biomass power generation
バイオマス発電に適する木材の種類の研究

Soma UETAKE[1], Toshihisa KOTAKE[2]
[1] Toyoka high school, Saitama, Japan
[2] Graduate School of Science and Engineering, Saitama University, Saitama, Japan
上竹 聡雅[1], 小竹 敬久[2] (1: 埼玉県立豊岡高等学校; 2: 埼玉大学大学院理工学研究科)

Last year a strong typhoon hit Japan. In Chiba prefecture, because forests have been neglected for a long time, driftwood and debris brought by the typhoon became a major social problem. As a result, it cost a lot of money to dispose of them. Japan has a lot of forests, but they require a lot of care. I wondered how to utilize thinned out wood as a source of bioethanol for energy. For this purpose, I did experiments to find out what kind of trees are suitable as material for bioethanol production. I also wanted to develop a way to generate as much bioethanol as possible. This time, I examined sawdust from Kuri, Hinoki, Sugi, Sawara, Akamatsu, Shide, Sakura, Shii, and Kunugi as the material for bioethanol. To make ethanol from cellulose of woods, cellulose first needs to be hydrolyzed into glucose by cellulase, an enzyme. Then glucose can be turned into ethanol by yeast fermentation. As cellulase I used an extract from cultured fungi as they secret many enzymes including cellulase. The amount of glucose released was checked by thin layer chromatography. As a result, sawdust from Hinoki appeared to be the most suitable material among the nine tree species to generate glucose. Finally, I observed combustion with concentrated ethanol from Hinoki.

Evolution of C_4 photosynthesis in Poaceae
イネ科におけるC_4光合成の進化

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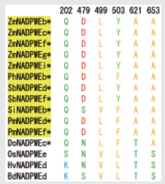

There are two types of plants: C_3 plants, which are the most common among land plants, and C_4 plants, which are often found in severe environments with harsh, hot and/or dry conditions. In the monocot family Poaceae, C_4 plants appear only in the PACMAD clade and not in the BEP clade. In this study, we tried to clarify the reasons for this difference between the two clades on evolutionability of the C_4 photosynthesis through comparing the amino acid sequences of four C_4-related enzymes, PEP-C, NADP-ME, PEP-CK, and NAD-ME. As the result, we found that the sequences of the enzymes of *Dichanthelium oligosanthes*, which is a C_3 plant in the PACMAD clade, were more similar to those of plants in the PACMAD clade than in the BEP clade. Therefore, it can be assumed that comparison of the sequences of enzymes in D. *oligosanthes* with those in the C_4 plants in the PACMAD clade could give valuable clues to identify mutations required to evolve C_4 photosynthesis. We will discuss possible amino acid residues important to C_4 evolution in each enzyme.

Constituent Sugars in Edible Plants and Oligosaccharides in Burdock
野菜・果物の構成糖の分析とゴボウのオリゴ糖の同定

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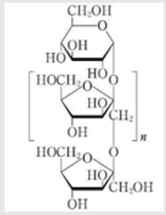
In plants, carbon dioxide is fixed as organic compounds by photosynthesis and converted to carbohydrates such as glucose, fructose, sucrose, and starch. Together with these carbohydrates, plants accumulate oligosaccharides and polysaccharides, which are used as daily products including functional foods and cosmetics. In this study, I measured the concentration of glucose, fructose, and sucrose included in the extract from fruits, vegetables, and flower nectar by high-performance anion-exchange chromatography with pulsed amperometric detection. Apparently different ratios of glucose, fructose, and sucrose were observed in these plants. The nectar of the Salvia flower contained quite high concentrations of these carbohydrates. The extract from burdock root contained oligosaccharides that were not observed in other plants. These oligosaccharides were identified as inulin as they were hydrolyzed into fructose by sucrase acting on alpha-1,2-linked fructose.



Salivary amylase activity of herbivores
草食動物における唾液内のアミラーゼ活性に関する研究

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Amylase is an enzyme that hydrolyzes starch. Humans have amylase in saliva to digest starch included in grains, vegetables, and fruits. Animals other than humans probably have amylase in their saliva; however it is not necessarily clear which animals have strong amylase activity in saliva. In the present study, amylase activity in herbivores eating grass was assayed. First, saliva was collected from five horses, five heads of cattle, and seven goats with the help of zoos. The amylase activity was measured by the reducing sugar method using commercial starch as the substrate. As saliva itself has reducing compounds, the amylase activity was estimated by comparing the reaction with saliva and that with boiled saliva. The protein concentration in saliva was determined by Bradford' s method. Then amylase activities per mL and per mg protein were calculated. As it is possible that the pH in saliva affects amylase activity, the pH of saliva was also measured using pH test paper. These experiments showed that two of the cattle had very high amylase activity in saliva whereas the other animals had less than 10% of their activity. The pH values of these ranged from 5 to 9. Feed of these horses, cattle, and goats did not differ significantly, indicating the activity of amylase in saliva depends on the animal type, but not on their feed. Amylase activity in herbivores is not necessarily high, because it is more efficient for herbivores to take glucose from cellulose. I plan to investigate why some cattle have high amylase activity and compare amylase activity among herbivores, carnivores and omnivores.

	吸光度	希釈倍率（倍）	遊離糖量(μmol)	活性(units/mL)	アミラーゼ重量mg/mL	活性units/mg protein
コハル（ウシ）	0.104	10000	0.003	99.189	1.460	67.957
モナカ（ウシ）	0.082	10000	0.002	78.206	1.156	67.629
ジャスミン（ウシ）	0.044	100	0.001	0.420	1.021	0.411
ソラ（ウマ）	0.071	1000	0.002	6.772	9.832	0.689
桜（ウマ）	0.627	100	0.018	5.980	10.382	0.576
月雨（ウマ）	0.193	10	0.006	0.184	3.235	0.057
アンコ（ヤギ）	0.069	10	0.002	0.066	0.692	0.095
ツル（ヤギ）	0.063	100	0.002	0.601	0.853	0.704
ヒト	0.544	100	0.016	5.188	–	–

Genetic analysis for an antibacterial and antifungial *Bacillus*
抗細菌性及び抗真菌性*Bacillus*の遺伝子解析

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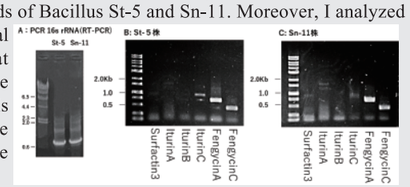
The Biology Club of Saitama prefectural Matsuyama High School has found a bacterium that produces antibiotics and forms a ring of inhibition against other bacteria or fungi in culture media. It has been proven by many studies that many bacteria belonging to the genus Bacillus groups have antimicrobial cyclic lipopeptides. So, antibacterial bacteria have antibacterial effects on pathogenic bacteria and fungi. Therefore we researched the effect of antibacterial *Bacillus* on many phytopathogenic bacteria and fungi that infect plants and allergen-causing fungi in 2018-2019 for application as biological pesticides. As a result we proved that our samples of antibacterial bacteria on pathogens isolated from solanaceous plants have beneficial effects for tomato pathogens. For instance, they have an effect against *Fusarium oxysporum* that is related to Tropical Race 4 (TR4) and *Ralstonia solanacearum* that is the pathogenic bacterium of bacterial wilt disease. *Ralstonia solanacearum* have already caused about 9.5 trillion yen (about 9.5 billion U.S. dollars) of damage in the world. However, the ability of these bacteria is still unknown, so we decided to research them mainly through genetic analysis of antibiotic-producing bacteria in Saitama University. In this research in the laboratory of Saitama University, I mainly did the RNA extraction and reverse transcription. The sample used for the experiment was two kinds of Bacillus St-5 and Sn-11. Moreover, I analyzed the cDNA on PCR with specific primer. This is because the production of antimicrobial cyclic lipopeptide needs a specific gene region, and RNA is likely to be used in that process. As a result of this experiment, the presence of a gene region specific for the production of multiple antimicrobial cyclic peptides in the cDNA was confirmed. This phenomenon is consistent with the hypothesis that transcription into RNA for the expression of a gene region specific for producing NRPS (non-ribosomal peptide synthase) is used for cyclic peptide synthesis.



Research on the distance and proper motion of star clusters by photometric observation
測光観測による星団の距離と固有運動の研究

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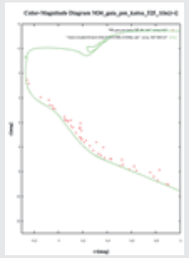

The Galaxy has a large number of star clusters. There are some artificial satellites and telescopes that observe heavenly bodies in the star clusters, such as Gaia, Hubble, Spitzer, etc. In this study, we observed some star clusters in the r band (550~680 nm), i band (700~810 nm) and z band (820~1000 nm) with the SaCRA Telescope at Saitama university, and analyzed the obtained data (photometry). Then we made histograms of star populations by distance to identify some cluster distances. In addition to these graphs, we also made color magnitude diagrams where we identified cluster distance in these graphs by means of the SaCRA Telescope and catalog of Gaia and Pan-STARRS. As a result, we could predict that M34 is located at about 775~975 pc, NGC188 is located at about 1800~2100 pc, M23 is located at about 775~875 pc, from the earth. On the other hand, we could not identify distances of M16, M71, Hyades. We think there are some reasons why we could not identify star cluster distance clearly. First, there is a possibility that light from celestial bodies was interrupted by molecular clouds in star clusters. Also, it is assumed that these cluster distances were so great that Gaia (artificial satellite) could not measure the annual parallax accurately to identify the distance, or so close that the camera which photographed star clusters reached light saturation.

Identifying star clusters by distance, proper motion and guessing their age
距離と固有運動による星団の特定とその年齢の研究

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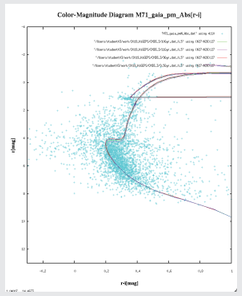

In the universe, there are clusters which consist of stars that are born at the same place at the same time and share their lives. In this study, we guessed the age of stars in the open clusters NGC188, M34, M67 and the globular cluster M71. Stars evolve as they get older. We investigated the stages of evolution by means of color-magnitude diagrams. First, to make color-magnitude diagrams, we selected members of the clusters. With histograms of star population by distance, we found the following fact. NGC188 is located at a distant place: M34 and M67 are located closer than NGC188. As it is difficult to catch light from distant stars, we identified stars that met the criterion of either distance or proper motion as members of NGC188. We identified stars that met the criteria of both of distance and proper motion as members of M34 and M67. As we couldn't find the distance of M71, we identified stars that met the criterion of proper motion as members of M71. Next, we guessed the age of clusters by comparing isochronous curves of theoretical evolution models and color-magnitude diagrams. As a result, we reached the conclusion that the globular cluster is older than the open clusters; M34 is 0.2 billion years old. M67 is 4 billion years old. NGC188 is 5 billion years old. M71 is 9 billion years old.

Luminescent Properties of the BF_2 Complexes of Flavonols
フラボノールのBF_2錯体の発光についての研究

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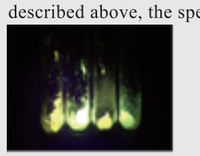
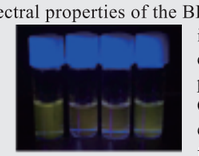
The BF_2 complexes of flavonols emit strongly when irradiated by UV light. Because flavonols have the interesting emission properties as described above, the spectral properties of the BF_2 complexes of 3-flavonol had been studied in the last year. In the previous study, an interesting peak shift in the emission and absorption maxima was observed. In order to clarify the properties of flavonols, we studied flavonols of different structures than previously reported and found that the absorption spectrum of the BF_2 complexes of OMe-5-flavonols was different from that of other BF_2 complexes. On the other hand the emission spectrum of the BF_2 complexes did not shift significantly compared to the flavonols before binding with BF_2.





Mechanochromism *of Cis*-cyclometalated Platinum(II) Complex with DL-Phenylalanine
白金錯体の発光特性と外部刺激に対する発光変化

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科学プレゼンテーション

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江崎　萌音	分子生物学から見た人体の美しさ
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山口　紗季	薬が効かない未来がやってくる!?～抗生物質と耐性菌～
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平田　優香	Space Elevator
吉田　陽向	Winning strategy for NumerOn

ENGLISH Essays by HiGEPS students in 2019

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The Wild Birds in Matsubushi Sogo Park, Matsubushi Kinen Park and the surrounding area
尾上　愛実

I will tell you about the wild birds in Matsubushi Sogo Park, Matsubushi Kinen Park and the surrounding area. I like birds and I have been researching what kinds of birds are there. Today, I want to introduce some of my findings. Matsubushi is a small town, which is located in the eastern part of Saitama. Matsubushi Sogo Park and Matsubushi Kinen Park are parks in Matsubushi. There are groves, fields, a regulating reservoir. Near these parks, there are a river, many reeds and a lot of rice fields.

I started this research October 2013. I have observed 92 species until January 2020. I have seen water birds like ducks, herons, plovers and sandpipers in the regulating reservoir or rice fields. Hawks and falcons have been usually in the sky or on a steel tower. I have seen many of the Passeriformes birds in groves.

Every season, 67 species have been seen in spring and fall. 54 species have been seen in winter. There are only 31 kinds of birds in summer. I have seen many birds in spring and fall. It means there are many Tabidori. Tabidori are birds which are seen in the area in spring and fall on their migratory way.

By environment, 38 species have been observed in rice fields. 35 species have been observed in groves. 18 species have been observed in the regulating reservoir. 8 species have been observed in reeds. I have seen many birds in groves and rice fields. It means there are many land birds.

By order, 47 species of the Passeriformes birds have been seen. It accounts for over half of the birds. Birds from other orders have been seen less than the Passeriformes.

To summarize, there are many kinds of environment supporting a big diversity of birds to live. Thank you for reading.

The mechanism of nuclear power plants
姫　越翔

Do you know how energy is generated in a nuclear power plant? Most nuclear power plants use nuclear reactors to initiate and control nuclear fission. In light nuclei, the nuclear force, which binds nucleons to create a spherical-shaped nucleus, is much stronger than the electrostatic force, which causes repulsion between protons. In a heavy nucleus, however, the situation changes in that repulsion becomes predominant because the nuclear force decreases exponentially while the electrostatic force decreases inverse-squarely when distance between two nucleons becomes larger. Therefore, atoms with a heavy nucleus are used in the nuclear reactor because nuclear fission mainly occurs in heavy nuclei since they have more protons so that the repulsion between protons is stronger.

In nuclear reactors, the first step is to collide a neutron with a nucleus to promote the nuclear fission. As a result, the nucleus captures the neutron and energy is produced due to the nuclear force acting between the neutron and nucleus. This energy deforms the nucleus into a two-lobed shape and the distance between the fragments is too far for the nuclear force to hold these fragments together.

As a result, two fissioned fragments move away from each other so that the nucleus splits into two nuclei. Some neutrons are also released from the nuclear fission and they collide with other nuclei so that nuclear fission happens again. Nuclear reactors use this reaction to cause nuclear fission successively.

Heat is produced through the nuclear fission. This is because nuclei can increase their binding energy by splitting into several fragments so that the mass decreases and the amount of change is released as energy due to the mass-energy equivalence. The heat is passed to fluids such as water and gas. Then, these fluids drive a turbine and electricity is generated in the end.

Slime mold
平田　洋祐

This is an experiment I was trying to do in school. I chose slime mold as the theme of this research. A club activity senior was using it for research. I knew the presence of slime mold then. I have always been interested in fungi, so I checked by myself. Slime molds are very interesting creatures. Slime molds are fungi, but also like animals. Slime molds make fruiting bodies and make spores like normal fungi. However, slime molds move on their own and eat food. This is an animal feature. In other words, slime molds are creatures that have both fungal and animal features. I was interested in slime mold favorite food, so I decided to experiment about it. First, culture the slime mold in a petri dish. I put a small petri dish upside down in another petri dish. I put filter paper on the small petri dish. I created a mechanism to pour water. Slime molds die when exposed to too much light, so I grew slime molds in a thermostat protected from light. I started the experiment when the slime mold had grown sufficiently. I put the slime mold in the center of the petri dish and put various foods around the slime mold. And I wanted to see how slime molds move. However, slime mold culture is difficult. So, I want to increase slime mold somehow.

Artificial photosynthesis
中川　未帆

We are plagued by global warming and energy problems. We have to build devices that get energy but don't emit carbon dioxide. At this time, artificial photosynthesis has attracted attention. It can convert carbon dioxide into organic compounds using solar energy.

The mechanism of artificial photosynthesis is to shine light into a photo electrode. Next, light is absorbed and the water molecules react, producing electrons, oxygen molecules, and hydrogen ions. Electrons pass through the wires and move to the catalyst electrode where they react with carbon dioxide and hydrogen ions. An organic compound is generated by this reduction reaction. At present, the main organic compound is formic acid. Now, research to produce organic compounds such as alcohol is being conducted.

The most important thing in artificial photosynthesis is how much energy conversion can be improved. One company has a lot of ingenuity. It has adopted nitride semiconductors for the photoelectrodes. It succeeded in raising the electrons excited by light to the energy needed to reduce carbon dioxide. Moreover, the company promotes the reaction of carbon dioxide by using a metal catalyst that easily conducts electrons. Since the electric loss is small, the reaction speed was increased, and it was possible to selectively generate organic matter compounds by changing the kind of metal too.

I think that the rate of energy exchange for artificial photosynthesis will increase and it will be put to practical use in the future.

The aggression and the courtship in Drosophila males
萩原　理織

I lived with many kinds of beetles in childhood. One day, I was happy when I saw the courtship and marking of rainbow beetles. Another day, I found a male rainbow beetle in the soil. It was only his head. That is because the female eats the male and gets essential nourishment for egg deposition. I was afraid of 'female'. Unfortunately, I am a female, too. Since then I am interested in gender and the mechanisms determining animal behavior.

Behaviors such as courtship and aggression, and communication between individuals have a lot of to do with how species thrive. So, scientists think that courtship and aggression are decided by genetic factors. We can usually see many kinds of males decide to attack or to court when they encounter a male or a female. How do they decide it? Now, it was found out that a cell group manages the system. It's the LC1 cell group. LC1 rejects to work the P1 and promotes pC1 cell groups. The P1 cluster is made up of double-sex and fruitless gene expressing neurons.

It leads the courtship of males. The fruitless gene was discovered as the causative gene of satori by Mr. Yamamoto. Satori is a mutant Drosophila where males only court males. To make fru-proteins in only male's body causes the gender difference in the brain. The doublesex expressing pC1 cluster is composed of neurons without fruitless expression. A male attacks another male by pC1 functioning. So, LC1 controls the courtship and promotes the aggression. But LC1 doesn't work for the aggression directly. It's related to the mAL cell group. The cluster usually works to check the attack behavior. LC1 causes aggression by suppressing the function of mAL.

Japanese Gecko and Me
榎本　実津穂

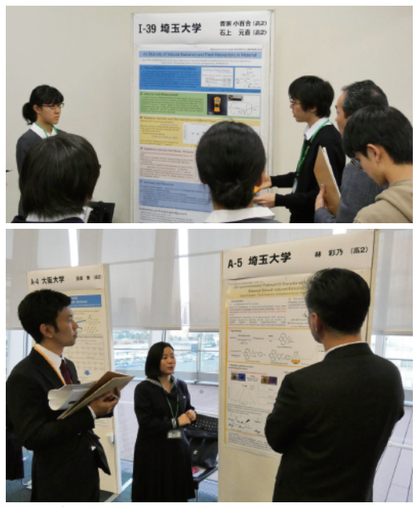
I am interested in biology and I like animals. Especially, I love Japanese Geckos. When I was in sixth grade in elementary school, my mother and my younger brother caught a Japanese Gecko at night in my garden. Then, we started to take care of the Japanese Gecko. Here are the characteristics of the Japanese Gecko. Japanese Geckos are reptiles. They mainly start activity at night. They are often seen at private houses in Japan, the eastern part of China, the southern part of the Korean Peninsula. They eat insects, spiders and so on. They can climb on the wall. They cut their tails when they feel in danger. When I was in first grade in junior high school, I researched about Japanese Geckos during summer vacation. The research was about where Japanese Gecko cannot climb. September 17th 2019, my younger brother caught a baby Japanese Gecko. But she cut her tail herself. I was interested in how long does her tail take to rebirth. Then, taking pictures, I have been observing her. Now, my family and I have taken care of three Japanese Geckos including the baby Japanese Gecko in my house. And I also have taken care of three Japanese Geckos in club activity. I am more curious about science than I used to be. This is the influence of meeting the Japanese Geckos. I think that I will keep taking care of Japanese Geckos. And I want to research about it much more in the future.

What we can do for us and Earth
八馬　怜奈

Life was expressed first on the Earth four billion years ago. And since 540 million years before now, the number of species increased sharply and mass extinction − no less than 75% of species on the Earth become extinct in a short time − has happened five times. Those extinctions are caused by major changes of the global environment such as global cooling, the rise of sea levels, crustal movement and asteroid collision. Then, let's focus on today's global environment. Endangered animals come up in conversation lately. In fact, living things which are designated as a threatened species account for 25% of the whole and it is said that the number of those living things will run up to 1 million in several decades. So, what is the cause of this? The answer is just human activities. People cut down forests and overhunt to get enough food and clothes. And by this, other living creatures lose their food and places to live. But living things which are being affected by that are not only those creatures. People also lose benefits which nature brings over by destroying nature. Currently, 0.6 percent of species may go extinct within a year and the speed is ten times as fast as ordinary speed. This suggests that today's Earth is in the sixth mass extinction. So, we must stop cutting down trees in other to stem the tide of it. But it is true that we are dependent on life with trees.

Now, what can we do to save our Earth? As one solution I think, we should use own-bags when we buy something like food. In addition to that, we also can do recycling activities. We must start doing something right now to be coexistent with nature.

2018 年度アドバンスドコース受講生の林さん
日本植物学会第 83 回大会高校生研究ポスター発表 (2019.09.15.) において、優秀賞を受賞



2019 年度アドバンスドコース受講生の普家さんと石上さん（上）と林さん（下）
令和元年度 全国受講生研究発表会 (2019.11.16) において、ポスター発表

Cancer and the latest medical care
福西　美玲

Cancer is the number one cause of death in both men and women in Japan. The death rate fromcancer in men by site is lung cancer in the first place and stomach cancer in the second place. In the case of women, the first place is lung cancer and the second place is the colon. The main cancer treatment from the past is the use of medicine and radiation. In recent years, various methods of treatment for cancer have been studied. Genomic medicine for cancer is attracting attention among new cancer treatments. In the genome treatment of cancer, the first step is to conduct a cancer gene panel test on cancer tissues. Cancer gene panel testing analyzes the data read using a gene reading device, properly semantics it, understands the characteristics of cancer, finds appropriate drugs and clinical trials, and uses it for treatment.

This treatment is characterized by the ability to select the appropriate drug by analyzing the data of the genome. The examination of cancer using nematodes was reported in the news recently. This examination uses nematodes with excellent sense of smell attracted to the smell of cancer. It is easy, painless, and early cancer can be detected. Cancer treatment is being researched and advanced every day. As medical science continues to evolve, I thought that in order to benefit from the latest medical care, I should research information by myself, rather than waiting for medical information to arrive.

How to make a trick of the eye
寺山　響

I will introduce a trick of the eye. I researched how to have an optical illusion. I got interested in a trick of the eye by watching TV programs. But I didn't know what I should do to make an illusion. To make an illusion, I researched and decided to use mathematics. First, I used GeoGebra to put a point at coordinates. GeoGebra is software which is in our school's PC. Then I folded paper to make three-dimensional coordinates. Next, I calculated where I should put a point at coordinates from the distance between viewpoint and image. In the end, I succeeded to make an illusion. But, there were some difficult points in this research. One of them was I couldn't understand how to put a point at three-dimensional coordinates. To solve this problem I devised a way to put a point at coordinates and looked at the paper by camera and one eye. I understood how to have an illusion from this research. This research was hard for me. However, by researching this topic, I have come to feel more familiar with math than before. And I want to know a good way to put point at coordinates to make a great illusion and make more complicated shapes.

About MOLD
新田　唯奈

Hello. My name is Yuina Nitta. I will talk about mold. First, I'll explain the reason I chose this theme. I culture actinomycetes in a science laboratory in school. So, I want to know mold and help my experiment. Mold was discovered in fossils that were about five hundred million years old. But we still don't know what shape they were. Mold exists all over the world. I was surprised to find out that they exist even in the Antarctic and the Arctic. The best condition which mold exists in is that temperature is about 25 degrees and humidity is more than about 70 percent. So Japan is good for mold living. And, they cling to something so they are not able to do something by themselves. Mold protects your body against pathogens. Too clean your hands or your body isn't good for your health. I was surprised to know this. However, bad mold also exists all over the world. For example, they cause an infection like athlete's foot. Many people in Japan agonize over athlete's foot. Then, what should we do for mold? The most important thing for not molding is to get a good cross-breeze. We should try to remove moisture. In summary, molds have many natures. I had an image which is not good for mold until now, but I learned a good point of mold which sometimes helps people. I'll prevent diseases which are caused by mold. And I'll improve my experiments. Thank you.

My purpose of learning
Swann　Pyayt　Sone

My dream is to be a systems engineer in the future. By offering convenient and efficient programming for workers, I want to contribute to the reconstruction of the working environment of Japan.

Recently, Japan has faced overwork problems. Many workers have been exhausted because of the daily overwork. I think some tedious work can be omitted with technological improvements and I want to help create a better working environment with it.

In order to realize my dream, three skills seem to be necessary for me.

First, I need to gain plenty of knowledge of the PC and IT. As I've been interested in using a PC from my childhood, I'm sure I can study it very hard.

Second, I want to gain analysis skills. Analyzing the current problems and finding solutions is a very important step for programming I think.

Third, I want to improve my creativity and imagination to help me. This needs a lot of communication and interaction with various kinds of people. I want to brush up my sense of humor and build a flexible way of thinking.

For these reasons, I want to study IT and become an expert on systems engineering which can help a lot of people by offering a better working environment.

Substructure for "The examination of the intervention method and the readvent of epidemic process of Dengue Fever using SIR model"
于　暁佳

This study focused on dengue fever, which is known to be transmitted by mosquitoes, and studied its outbreak using mathematical modeling and numerical analysis.

Dengue fever was reported in only nine countries in the 1970s but now spreads to 128 countries, affecting 96 million people each year. In Japan, more than 160 cases of infection were reported, which included Yoyogi Park in Tokyo in 2014. When dengue fever occurred and spread in Japan, we simulated and considered how the number of outbreaks until it subsided followed. Because vaccines do not exist now, this study may play an important role in preventing pandemics in Japan at a time when dengue fever comes in. In addition, this simulation is expected to be used not only for dengue fever but also for almost all anthropozoonosis.

Simulations of the dengue fever epidemic in 2017 New Caledonia and Tokyo were performed by using the SIR model. As a result, the simulation results could match its peak with the actual data. And, when we did the simulation of getting rid of the mosquitoes to half the previous, the effect of suppressing the number peak was observed. It was very interesting that the earlier the timing of mosquito control, the slower the convergence of the infection, and it would be worthwhile to consider the reason. For Tokyo, we did examine appropriate values for Sv (0) and Iv (0) and also performed simulations when mosquitoes are eliminated.

Through the result, we learned that it is important to make the number of cases realistic, as well as the duration of the epidemic, peaks, and graphs, in order to clarify the magnitude of the infection. And to improve the model, to verify the validity of the model.

Universe
増澤　香桜里

I like the universe very much. Before I knew it, I completely became its captive and I was saying "I want to be a researcher of the universe!" Now, I want to be an astrophysicist and active in the world. I am often asked "What do you like about the universe? Why do you like that?" But I can't answer this question. I don't know why I can't answer this question. Now, I'm going to think about "Since when did I like the universe?" "What do I like in the universe?" "What do I want to study?" "What research do I want to do?" First, since when did I like the universe? As I remember, my father said to me "The universe as viewed from the earth shows the past of its appearance" when I was 10 years old. So I examined about the universe. But I think when my father said that to me, I already liked the universe at that time. I can't understand no matter how much I think. But, I thought "If I asked 'When did you like the universe?' I will answer honestly 'I liked the universe before I knew it.'"

Second, what do I like about the universe? I thought a lot about it, I found an answer. I like the universe because it has many things we don't know. I have been curious since before. I like to investigate and resolve many things I don't know because it's fun. I can get lots of information because the universe has many things we don't know and haven't researched. Finally, what do I want to study and what research do I want? I'm interested about before the Big Bang and Dark energy. Astrophysics has two types, theory and observation. I want to do theory. I want to reveal the identity about before Big Bang and Dark energy using mathematics. I want to be an astrophysicist who can cooperate with colleagues. And I will get a Nobel Prize in Physics.

Interesting stuff that physics has
木下　郁美

"Physics". This is the subject that I like the best. From the perspective of using formulas, you may see that is so difficult, I think so too, but from the viewpoint of knowing the essence of moving substance, phenomena, for example, the relation of speed and mass, buoyancy and volume and so on… physics is very interesting and important, I think. That substance floats on the water, air is moving up and down like a wave, etc., are obvious phenomena. But we can see an interesting world if we express a phenomenon by a formula. By using a figure, we can see a lot of information that we cannot see when we are just watching everyday affairs.

Just reading textbooks, just memorizing formulas and doing calculation, I don't think it connects to complete understanding. The important thing is to understand why is that so. It is a dreadful misunderstanding "I can understand physics because I can apply numbers to a formula!". Sometimes I see such friends, moreover sometimes I think so myself. But it is a big wrong, right? It can say the same about mathematics. At physics world, the most important thing is knowing, understanding essence, I think. Anyone can only memorize formulas and do calculation.

"Understanding the essence of the phenomenon" it is the most necessary and difficult. Blind faith has no meaning. Seeing that a substance floats on the water, express by expression, find the number we want. When we do this series of events, we can say that we understand physics for the first time.

My friends say that physics is boring. I'm not good at physics still now. But I want my friends know fun came from understanding the essence of phenomena. It is difficult to understand physics completely, so, physics is interesting.

AMR –Problem of Anti-Microbial Resistance–
田中　珠貴

Do you always take all the medicines that are prescribed at the pharmacy and follow the rules of usage and dosage? We take medicines to recover our condition when we get sick, but I often hear that some people stop taking them before all the medicines are used. Also, a lot of them are thinking of taking the same medicines when they get the same illness. Now, we have a problem regarding anti-microbial resistance (AMR) all over the world. The causes of AMR are drug-resistant bacteria, which can resist the effects of the antibiotics which were able to treat the infection previously.

Antibiotics help us cure the infectious diseases from the target bacteria; however, drug-resistant bacteria can survive and increase in the body of the patients. After that, the drug-resistant bacteria spread through various people, animals, and the environment. Inappropriately using antibiotics becomes the cause of AMR. That's why we should take the medicines that are prescribed, following the rules of usage and dosage carefully.

Furthermore, in 2011 the World Health Organization (WHO) took up the problem of AMR as the task that they should work on in the world with the slogan, "No action today, no cure tomorrow". Nevertheless, substitute medical therapy or a high-dose antibiotic is necessary to solve the problem, and they are expensive, and the treatment of AMR is toxic. This is a case when the words "Too much is as bad as too little" are true.

In conclusion, AMR is a serious problem on earth. I want to be a pharmacist in the future, and I would like to help reduce the problem of AMR. Therefore, I think I must study hard with the phrase, "No study today, no cure tomorrow."

2019 年度イングリッシュシャワー (Tammo 先生) の様子




海外研修 (ロシア (上)、ベトナム (下)) の様子

A study of light
宮崎　剛

I am going to talk about light. I learned about the properties of light in physics class. However, I wonder what is light essentially. So, I searched about light, and summarized it.

Firstly, the first person who focused on light was Newton. He thought light was particles. Lavoisier, who is called the pioneer of chemistry, supported the idea, and he considered light as an element. However, Young showed that light is not particles because light showed the nature of diffraction by his experiment with light. It showed that light is a wave. Then, what is light? In fact, light is particle and wave. That was indicated by Einstein. So, light has the nature of both particles and waves.

Also, it is said that light is the fastest thing in the universe. And its speed will not change forever, wherever, in any situation. For example, if we see another car from a moving vehicle, the apparent speed is not the same as the real speed. However, even if we see light from a vehicle which is almost at the same speed, light's speed does not change in the case that we see it from the ground. Einstein thought such a mysterious nature is the law of nature. I thought it was wonderful because he was not obsessed by conventional ideas, and he came up with a way of solving the problem.

With these matters, we can perceive color. It is caused by light. White light, such as sunlight, is the gathering of many colors of light. So, if we see something red, it just reflects red light, it is not a red thing originally. The wavelength of red light is longer than blue, or purple. And the longer the wavelength is, the farther the wave reaches. Then, I found that that's the reason why the traffic light's stop signal is red.

Through my search, I knew that Young was not just a physicist, but a doctor and an archaeologist, and learned mathematician. Then, a broad view of things is needed to discover something new or revolutionary. I thought I should learn something with the mind that I should understand the essence from various perspectives.

Betelgeuse will disappear
橋口　真由

Scientists say Betelgeuse will disappear. The Orion which we usually see at night will lose its shape. By the way, why are there stars that disappear? Because hydrogen which is fuel for fixed stars runs out. If fixed stars don't have hydrogen, they can't make energy to shine. "How long are they shining" is decided by their weight. If the fixed star is heavy, its lifespan will be short. If the fixed star is light, its lifespan will be long. How does hydrogen cause nuclear fusion? Hydrogen's nuclei make helium's nuclei. And helium's nuclei make other nuclei. This reaction advances until iron is made. How Betelgeuse disappears is different according to weight. If a fixed star is 0.08~8 times as heavy as the sun, a main sequence star changes into a white dwarf. If the fixed star is 8~40 times as heavy as the sun, a main sequence star changes into a neutron star. If the fixed star is 40~ times as heavy as the sun, a main sequence star changes into black hole. The sun's weight is 1.989*10^30kg. Betelgeuse's weight is 2.188*10^31kg. Betelgeuse's weight is about 11 times as heavy as the sun. It means Betelgeuse will change into a neutron star and cause a supernova explosion. What things happen to earth by supernova explosion? One is shock wave, and the other is gamma rays. The shock wave carries 30~50 light years. But Betelgeuse is 600 light years from the earth. So the earth won't be affected. Gamma rays cause destruction of the ozone. Ultraviolet rays affect creatures' health. But gamma rays are not falling on the earth. So the earth won't be affected by this either.

The miracle of my "favorite thing"
狩野　月帆

Possibly I may be blessed with own favorite things.

In one of the many universities which I visited after I became a high school student, I came across a material called C60 fullerene.

I loved chemistry classes in high school, and for me who was interested in chemistry, it was an encounter attractive and very fascinating. On the other hand, I learned calligraphy from second grade in elementary school. From beginning to learn it, it is now eight and a half years. I was able to finally take the qualification of instructor just the other day. I use sumi for the calligraphy. As for that, soot and glue are used as raw materials, and carbon is included. In fact, C60 fullerene, which I mentioned as the first topic, is made of carbon. Carbon, which I came across in my favorite chemistry class. Carbon, which is used by my favorite calligraphy. I want to do work about this carbon in the future. Specifically, it is research and development of the solid sumi and India ink. Even in school education India ink is used now, but solid sumi was used before it was used. When India ink had begun to be used, the people criticized it for poor brush condition and the letters which I wrote were glittering. When a brush was used, the India ink was criticized by people at the beginning. The reason was that it caused a bad state of the brush. In addition, it meant that the letter which I wrote with sumi was shiny. However, those problems were overcome as a result of research and development now. Furthermore, not only that but also India ink with the taste of the solid sumi is made. I am happy if I will make use of knowledge of chemistry in the future and can be engaged in further development of India ink.

HiGEPS セミナー (是枝先生 (左上)、Fuente 先生 (左下)、Lewis 先生 (右)) の様子

The power of science learned through HiGEPS
廣澤　絵美梨

I didn't know exactly what I wanted to do in the future. When I decided to join HIGEPS, I hadn't decided whether to go to humanities or science. However, I love science and attended schools in Saitama University from kindergarten to junior high school, so I felt familiar and participated. There were times when I could not participate because I studied abroad during this program, but with this program I was able to experience the essence and depth of chemistry that cannot be taught at school. Especially after returning to Japan, I realized that science was a common language in the world. Some of my favorite creatures could talk to each other in foreign lands. Until now, I was keen on vague career choices that looked only at universities. However, in the past year, I have gained the power to look ahead. My dream is to make the world smile with my favorite science. I haven't decided anything concrete yet, but I want to live with this as my axis. I'm not good at scholastic ability, but my love of science is
second to none. I always want to be with science forever.　Thank you for reading this far.

I want to be an occupational therapist
山口　紗季

I want to do a job in the future where I support the children who have a handicap and will live every day with a disability. Therefore, I intend to take the qualification of occupational therapist. It is the effect of my older brother on me that I have thought that I want to do such work. My older brother has a disability. So he has received the support of various people since childhood. While I looked at people who supported him with various people since I was child, I began to think that I wanted a job like that. However, I didn't know how I could get the work. When I was troubled about my own future, I took the trial lesson of the university about occupational therapy offered as a school event of the high school unexpectedly. I was not interested in occupational therapy at all previously, but I want to do it in the future after hearing the lesson I began to think that I seemed to be able to work. And it turned out that I got the work while I searched it myself. I aim at becoming an occupational therapist now, but, as well I want to take the qualification of speech therapist in the future.For
My future dream is to make many children smile!

About elements and their history
佐藤　弘崇

I am going to introduce the history of chemistry which we can learn from the periodic table. We can learn various things from it, for example, the elements, the elements symbols, etc. This knowledge is very important when we learn chemistry. However, many students are content with this knowledge alone. Many stories are hidden behind the periodic table that we use now. I can't introduce all the stories this time, but I would like to introduce some stories that I want many people to know about because it is a great opportunity to learn more about the history of chemistry.

Let's talk about hydrogen, the most basic element. The name hydrogen was given to it in 1783 by Antoine Lavoisier. It is a very familiar and famous element, but at one time it was said that it hardly remained inside the earth. However, this was denied by a high school student at the time called Takuo Okuchi, and it is internationally believed that the main role of light elements inside the earth is played by hydrogen today. Some tales of chemistry have some sadness associated with it because of many victims. The story of Fluorine, a familiar element, it is one. Let me introduce the story.

Fluorine is a highly reactive acid. It destroyed labware, rendering many scientists to be poisoned with fluorine. Humphrey Davy, the Knox brothers, Jerome Nikle, and many others have been killed by experiments with fluorine. In 1886 Henri Moissan finally succeeded in isolation. He electrolyzed hydrogen fluoride in a platinum container and extracted a small amount of gas into a transparent fluorite vessel. It is a familiar name now, but it had a very severe history until it was contained.

You can discover many interesting stories about the elements; the periodic table contains many of them.

About microplastic waste
土橋　宏輝

Nowadays, the amount of plastic waste is increasing. Despite this, some people continue to use plastic. I know we need plastic because plastic is lightweight but durable, transparent, colorable, heat-insulating, and resistant to electricity. In addition, it can be mass-produced, is cheap, resistant to rust and corrosion, and has good chemical resistance. But I strongly believe that we should use less plastic. First, people are not processing plastic. For example, in the sea, plastics become microplastics, greatly affecting organisms and seabirds in the sea. This damage was caused because plastic used by people was washed away into the sea, mistaken for food, and sea creatures ate it. Therefore, it is clear that people have to reduce their use of plastic. The way to reduce plastic is to carry 'my bags' and not get a shopping bag, or go out and carry a water bottle and not buy a plastic bottle. In conclusion, people must reduce their use of plastics unless they can process them. It is natural that people have to reduce their use of plastic for the above reasons. In the future, it is hoped that everybody in the world will be aware of reducing the amount of plastic waste.

Function hidden in a small body
山本　愛花

Hearing the word "insect", how do you feel? I read an article and changed my mind about insects. It was a newspaper article about biomimetics. Biomimetics is a technology that observes or analyzes the structure and function of living organisms, uses them to develop new technologies, and makes things. Although the word biomimetics is new, for many years, people have been looking to nature for ideas to use when they develop various products.

For example, sharp, a major electronics manufacture, used a dragonfly that could fly comfortably in strong winds despite its small size as a hint for the development of air conditioners. The secret lies in the unevenness conditions. The secret lies in the unevenness of the wing cross section. The formation of air vortices in the wing depression reduces wind resistance and enables stable flight. Sharp says that by applying this to the fan in air conditioners, ventilation efficiency has been improved by 30% compared to the past.

The characteristics of insects are also utilized in medical settings. There are expectations for new uses of silkworms which have been used by humans since ancient times. Scientists have developed a technology that allows transgenic silkworms to make special proteins that respond to osteoporosis and Alzheimer's disease. Using the silkworm method to make special proteins is easier than other methods.

Currently, research is being conducted to apply it to anticancer drugs and surgical threads. After reading this article, I was able to understand "Biomimetics". Looking at nature around as once, not just looking at the latest technologies, such as computers, can make our lives more advanced. Leaning on nature and imitating insects that have evolved over the years through their own unique evolution can also reduce technology development time. If you realize that insects have supported our lives, you can take a different perspective. I want to see things from a different perspective, not just one aspect, and have different ways of thinking.