TABLE OF CONTENTS

Message from Minister of Education and Science of the Republic of Sakha (Yakutia) ........................................ 1
Message from the President of APCYS ........................................ 2
Message from Principal of Sakha Junior Science Academy .......... 3
About the 8th APCYS 2019 ..................................................... 4
Organizers & Partners ......................................................... 5
Programme At A Glance ..................................................... 6
Daily Schedule ............................................................... 7
Rules and Regulations ....................................................... 9
English - Russian - Sakha Vocabulary ................................... 10
Accommodation ............................................................ 11
Venues ................................................................. 11
Excursions .............................................................. 12
Yakutsk Schools Visit ................................................... 12
Main Venues of APCYS 2019 .......................................... 13
Contact Us ............................................................. 13
RLI Map ............................................................... 14
List of Foreign Participating Organizations/Schools ................. 15
List of Participating Schools of the Republic of Sakha (Yakutia), Russia ......................................................... 16
APCYS 2019 Jury .......................................................... 17
Teacher’s Conference Presentation Platform ........................ 22
Category ............................................................... 24
Abstracts .............................................................. 33
Notes ............................................................ 72
Dear Young Scientists, Educators, Researchers!

Yakutia is called the land of Olonkho, of ancient myth and heroic stories. Despite having been located in the region with the most extreme climatic condition, it is the warmest place as far as the welcome of strangers is concerned.

Our region is unique in many ways. Only here a monthly temperature median can go down as low as -60 Celsius in January and +35 Celsius in July. Almost 75 degrees difference in temperature. The valley where we are today 560 million years ago was the inception point of the Cambrian Explosion, when the emergence of multicellular animals occurred, tens of thousands of years ago the woolly mammoth lorded over it.

Many brave and talented scientists studied this land and made a great many discoveries. Local school students were also responsible for finding the first diamond, oil and gas deposits, and other minerals during their school expeditions that helped to develop local extraction industries.

As you all know this year the science world celebrates the 150th anniversary of the Dmitri Mendeleev' Periodic Table of Elements. Mendeleev started his scientific endeavors as a school student. And it is true that your interest in science can spark ideas that will one day help to solve the world’s challenges.

I would like to greet young scientists, who travel from faraway places, like Guam, Philippines, Macao, India, Indonesia, Singapore, Malaysia, Nepal, Thailand, and Slovenia, to take part in the 8th Asia-Pacific Conference of Young Scientists in Yakutsk. Your transit of several thousand miles to the north brought you to the 62 degrees of latitude the closest proximity of the Arctic Circle, which is located 300 miles up north from Yakutsk.

I am sure that your stay here will be the most valuable experience in your life and you will find new friends and get new ideas. The networking and activities will definitely lead to wider collaboration and academic exchanges, precursors of a worldwide community of like-minded people who would work together or in concert in order to innovate and create the future.

Let me again to welcome you all to Yakutsk! Let me wish you the most fruitful and eventful week! Let’s get going, make friends and enjoy doing science at the Asia-Pacific Conference of Young Scientists – 2019.
Message from Principal of Sakha Junior Science Academy

It is with a great pleasure that I congratulate you all for taking part in this
It will be the first time for Russia to host young scientists from the far and
wide, from countries with diverse cultures and languages, who have
gathered in Yakutsk, at the heart of the most wonderful part of the Asian
continent, that lies firmly within the realm of the Permafrost, the
perennially frozen ground. It is also true that the Asia-Pacific Conference
of Young Scientists will be held in Yakutsk, a city in the Eastern Siberia,
the biggest city built on Permafrost anywhere in the world. In the depth of
the Permafrost may lie hidden remains of the great woolly mammoths
that used to roam the valley where Yakutsk stand today. For the young
scientists there are may be great many opportunities to uncover their own
mammoth discoveries for the world around us is beaming with unknown
that only waiting to be unlocked and studied.

My thanks go to Mr. Muhammed Sanjay Bin Paramarie, Professor Dr
Ramlee Mustapha, Dr Rachain Konsanlavit and Professor Fu Chao-Ming, who have never before visit this part of
the continent and have braved the elements to bring the light of knowledge and scientific inquiry to the coldest
region in the world to the delight and excitement of young people of Yakutia.

I am extremely grateful to our dearest friend, Professor Leong Chuan Kwek of Center for Quantum Technologies
of Singapore, whose unfailing support made this day possible. I am also happy to feel the goodness of heart of my
friend Professor Ram Rameshwar Adhikari of Tribhuvan University, Kathmandu, who gave us valuable advice as
to the organizing this event. It is under the guidance of the APCYS President Madam Monika Raharti of Indonesia
our ship of science and discovery is sailing in some new waters and has arrived to the heart of Siberia and for that
we are ever so thankful.

Most importantly, I would like to thank all our conference organizers for their tremendous efforts, especially Dr.
Milana Fedotova and the entire Sakha Junior Science Academy team, as well as our much beloved volunteers.
Your sleepless nights shall bring great results.

8th Asia Pacific Conference of Young Scientists will bring all the best to young researchers, a unique opportunity
to proudly show the results of your work, to engage in scientific dialogue with the world’s most prominent
scientists, to discover new cultures, and to meet bright and wonderful friends from different countries.

I hope that APCYS-2019 will be remembered as a brilliant celebration of science and friendship. I am confident
that you all will become good friends for you share many things in common, especially infinite curiosity and love of
science!

Yours truly,
Dr. Vasilii Pavlov,
Principal of Sakha Junior Science Academy,
Chairman of the APCYS 2019 Local Organizing Committee

About the 8th Asia-Pacific Conference of Young Scientists
in Yakutsk, October 14-20, 2019

Asia-Pacific Conference of Young Scientists (APCYS) is the most prestigious exhibition-competition of research
works of students in the Asia-Pacific region. The aim of the conference is to promote and foster an atmosphere of
scientific research exchange among students from secondary schools in the Asia-Pacific region.

APCYS is held annually. In 2019, from October 14 to October 20, 2019, the 8th APCYS will be held in Yakutsk,
Russia. Seven previous conferences have been held in Indonesia, Taiwan, Malaysia, India, Nepal, and Thailand.
The APCYS encourages the submission of research projects in five categories: Computer Sciences,
Environmental Sciences, Life Sciences, Mathematics and Physics. Participants will present their research
projects in both poster and oral presentations. In addition, the conference will feature a keynote lecture by a
prominent scientist, cultural performances from participating countries, teacher’s exchange session, and
excursions to local areas of interest, and recreational activities.

APCYS is a top event in the Asia Pacific, which is only possible by the invitation of the best schools with a scientific
bias of education. More than 30 schools from 26 countries (Australia, Canada, China, Guam (USA), Hong Kong,
India, Indonesia, Japan, South Korea, Malaysia, Mexico, Holland, Russia, Singapore, Slovenia, Sri Lanka, Taiwan,
Thailand, Turkey, etc.) are regular participants in this event.

On behalf of the APCYS organizers we wish you all the best!
## PROGRAMME AT A GLANCE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7:30</strong></td>
<td>Arrivals, Check-in</td>
<td>Breakfast</td>
<td>Breakfast</td>
<td>Breakfast</td>
<td>Breakfast</td>
<td>Breakfast</td>
<td></td>
</tr>
<tr>
<td><strong>8:00</strong></td>
<td></td>
<td></td>
<td>Preparation</td>
<td>Preparation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8:30</strong></td>
<td></td>
<td></td>
<td>Preparations</td>
<td>Oral Presentations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9:00</strong></td>
<td>Breakfast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9:30</strong></td>
<td>Official Opening Ceremony</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>10:00</strong></td>
<td>Arrival, Check-in</td>
<td></td>
<td></td>
<td></td>
<td>“Sosnovy Bor” / SJSJA / Teacher’s Conference</td>
<td>Excursions</td>
<td>Departures</td>
</tr>
<tr>
<td><strong>10:30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11:00</strong></td>
<td>Keynote Lecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11:30</strong></td>
<td>Oral Presentations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>12:30</strong></td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13:00</strong></td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13:30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>14:00</strong></td>
<td>Free time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>14:30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15:00</strong></td>
<td>Briefings, Registration, Poster Mounting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15:30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>16:00</strong></td>
<td>Visit to Schools / SJSJA / Teacher’s Conference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>16:30</strong></td>
<td>Free time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>17:00</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>17:30</strong></td>
<td>Free time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>18:00</strong></td>
<td>Dinner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>18:30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19:00</strong></td>
<td>Free time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19:30</strong></td>
<td>Meet &amp; Greet Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>20:00</strong></td>
<td>Gala-Dinner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>20:30</strong></td>
<td>Games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>21:00</strong></td>
<td>Free time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>21:30</strong></td>
<td>Farewell party</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>22:00</strong></td>
<td>Departures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## DAILY SCHEDULE

### ARRIVAL DAY (MONDAY, 14 OCTOBER 2019)

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>VENUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>09.00-10.00</td>
<td>Breakfast</td>
<td>Places of residence (students – Smena, leaders – Triumph, Committee – Polar Star)</td>
</tr>
<tr>
<td>10.00-11.00</td>
<td>Arrivals, Check-in, Registration</td>
<td></td>
</tr>
<tr>
<td>13.00-14.00</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>15.00</td>
<td>Briefing, Safety Rules Instructions, Meeting with Attaches</td>
<td>Republic’s Lyceum-Boarding School (RLI)</td>
</tr>
<tr>
<td>18.00-20.00</td>
<td>Dinner</td>
<td>Places of residence</td>
</tr>
</tbody>
</table>

### DAY 1 (TUESDAY, 15 OCTOBER 2019)

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>VENUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>07.30-08.30</td>
<td>Breakfast</td>
<td>Places of residence</td>
</tr>
<tr>
<td>10.00-10.45</td>
<td>Opening Ceremony of APCYS 2019 and YISF 2019</td>
<td>Academy Hall, RLI</td>
</tr>
<tr>
<td>10.45-11.30</td>
<td>Keynote Lecture</td>
<td></td>
</tr>
<tr>
<td>11.30-12.30</td>
<td>Lunch</td>
<td>Places of residence</td>
</tr>
<tr>
<td>13.00-17.00</td>
<td>Poster Session</td>
<td>Sports Hall, RLI</td>
</tr>
<tr>
<td>18.00-19.00</td>
<td>Dinner</td>
<td>Places of residence</td>
</tr>
<tr>
<td>19.00-21.00</td>
<td>Meet and Greet Activities</td>
<td>Smena</td>
</tr>
</tbody>
</table>

### DAY 2 (WEDNESDAY, 16 OCTOBER 2019)

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>VENUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>07.30-08.30</td>
<td>Breakfast</td>
<td>Places of residence</td>
</tr>
<tr>
<td>10.00-13.00</td>
<td>Oral presentations</td>
<td>RLI</td>
</tr>
<tr>
<td>13.00-14.00</td>
<td>Lunch</td>
<td>Places of residence</td>
</tr>
<tr>
<td>14.00-17.00</td>
<td>Oral presentations</td>
<td>RLI</td>
</tr>
<tr>
<td>19.00-21.00</td>
<td>Gala-Dinner</td>
<td>Students – Smena, leaders, Committee – “Muus Khaya” restaurant</td>
</tr>
</tbody>
</table>

### DAY 3 (THURSDAY, 17 OCTOBER 2019)

<table>
<thead>
<tr>
<th>TIME</th>
<th>OVERSEAS STUDENTS</th>
<th>YAKUTIA STUDENTS</th>
<th>LEADERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.00-09.00</td>
<td>Breakfast</td>
<td>places of residence</td>
<td>Breakfast</td>
</tr>
<tr>
<td>09.30</td>
<td>Departure to “Sosnovy Bor”</td>
<td></td>
<td>Departure to SJSA</td>
</tr>
<tr>
<td>10.00-13.00</td>
<td>Visit to Sosnovy Bor</td>
<td>Oral Presentations</td>
<td>Venue: Sosnovy Bor</td>
</tr>
<tr>
<td>10.00</td>
<td>APCYS 2019 Briefing</td>
<td></td>
<td>14.00 Excursion to Treasury of Yakutia</td>
</tr>
<tr>
<td>13.00-14.00</td>
<td>Lunch</td>
<td>Sosnovy Bor</td>
<td>15.30-17.00 Teachers’ Conference</td>
</tr>
<tr>
<td>14.00-17.00</td>
<td>Visit to Yakutsk Schools</td>
<td>YISF Oral Presentations</td>
<td>Venue: Yakutsk State National Grammar School, Aiy Kyhata, Sakha Grammar School</td>
</tr>
<tr>
<td>14.00</td>
<td>Departure to Smena</td>
<td></td>
<td>17.00 Departure of YISF 2019</td>
</tr>
<tr>
<td>15.00-17.00</td>
<td>Teachers’ Conference</td>
<td></td>
<td>18.00-20.00 Dinner</td>
</tr>
<tr>
<td>16.15</td>
<td>Group Photo</td>
<td></td>
<td>20.00 YISF 2019 Closing Ceremony</td>
</tr>
<tr>
<td>17.00</td>
<td>Departure to the places of residence</td>
<td></td>
<td>19.00-20.00 Cultural Activities</td>
</tr>
<tr>
<td>18.00-19.00</td>
<td>Dinner</td>
<td></td>
<td>21.00 Departure to Yakutsk</td>
</tr>
<tr>
<td>19.00-20.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DAY 4 (FRIDAY, 18 OCTOBER 2019)

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>VENUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.30-09.30</td>
<td>Breakfast</td>
<td>Places of residence</td>
</tr>
<tr>
<td>09.30</td>
<td>Departure to excursions</td>
<td>Mammoth Museum, History Museum, Kingdom of Permafrost, Khomus Museum</td>
</tr>
<tr>
<td>10.00-12.30</td>
<td>Excursions</td>
<td></td>
</tr>
<tr>
<td>12.45-13.15</td>
<td>Departure to the places of residence</td>
<td></td>
</tr>
<tr>
<td>13.00-14.00</td>
<td>Lunch</td>
<td>Places of residence</td>
</tr>
<tr>
<td>14.00-15.15</td>
<td>APCYS 2019 Closing Ceremony</td>
<td>Sergelyaksky Lights</td>
</tr>
<tr>
<td>16.15</td>
<td>Group Photo</td>
<td></td>
</tr>
<tr>
<td>17.00</td>
<td>Departure to the places of residence</td>
<td></td>
</tr>
<tr>
<td>18.00-19.00</td>
<td>Dinner</td>
<td>Places of residence</td>
</tr>
<tr>
<td>20.00-22.00</td>
<td>Farewell Party</td>
<td>Smena</td>
</tr>
</tbody>
</table>
### DAILY SCHEDULE

**DEPARTURE DAY** *(SATURDAY, SUNDAY, 19-20 OCTOBER 2019)*

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>VENUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole dya</td>
<td>Departures</td>
<td>Places of residence</td>
</tr>
<tr>
<td>08.30-09.30</td>
<td>Breakfast</td>
<td>Places of residence</td>
</tr>
<tr>
<td>13.00-14.00</td>
<td>Lunch</td>
<td>Places of residence</td>
</tr>
<tr>
<td>18.00-19.00</td>
<td>Dinner</td>
<td>Places of residence</td>
</tr>
</tbody>
</table>

### Rules and Regulations of Residence during APCYS -2019

Please read carefully:

1. Please hand in your room key to the administrator when you are out.
2. Keep rooms tidy and take part in all kinds of works connected with self-service.
3. Keep up and maintain tidiness in places of common use: toilet, bathroom.
4. Keep up the safety rules and fire safety standards. Do not keep firearms, inflammable substances or explosives.
5. Take care of facilities and inventory of the dormitory. A resident should bear a responsibility for the dormitory property.
6. Compensate material damage of equipment and inventories caused by the fault of a resident.
7. Second pair of shoes or shoe covers are compulsory.
8. Do not make noise or speak loudly, please tone down the volume of the TV set, limit your walking around the floor/the rooms after 10 p.m.
9. Be aware that the dormitory entrance door is locked after 10 p.m.
10. Let the dormitory administrator know about the time of return at night beforehand.
11. Upon leaving the dormitory or temporary departure a student should inform an administration or other the place of residence workers.
12. It is strictly prohibited to use drugs (except prescribed medications).
13. A visitor should leave his/her document at the reception desk.
14. When leaving your room, don’t forget to turn off the electric stove, TV set, lights, water, and to close the windows.

The following is prohibited:

1. Letting visitors stay for nights. Visits are allowed till 10 p.m.
2. Replacing an inventory from one room to another.
4. Switching on music (TV, etc.) aloud after 10 p.m.
5. Keeping pets anywhere on campus.
6. Switching on lights, TV, etc. after 10 p.m.
7. Drinking beer and other alcoholic beverages in the dormitory.
8. Having a party at nights.
10. Coming being drunk.

Upon getting 3 reprimands for the violation of above-cited rules a resident will be evicted from the place of residence. Thank you for understanding!
**VENUES**

1. Republic’s Lyceum-Boarding School – Poster Sessions & Oral Presentations
2. High School of Innovation Management - Teacher’s Conference

**ACCOMMODATION**

1. “Smena” Dormitory – students
2. AZIMUT Polar Star Hotel – Steering Committee
3. “Triumph” Hotel – team leaders

**EXCURSIONS**

1. Khomus Museum
2. Kingdom of Permafrost
3. Yaroslavsky Museum of History and Culture of the Northern Peoples
4. Mammoth Museum

**VISIT TO YAKUTSK SCHOOLS**

1. “Sosnovy Bor” Children Recreation Center
2. Aiyy Kyhata
3. Sakha Gymnasium
4. Yakutsk City National Gymnasium
MAIN VENUES OF APCYS 2019

1 RLI (Republic’s Lyceum-Boarding School) – Opening Ceremony, Poster Session and Oral Presentations
2 “Smena” – Dormitory of the North-Eastern Federal University (NEFU) – accommodation for students
3 “Triumph” Hotel – accommodation team leaders
4 Sergeliakhsky Lights – Closing Ceremony

CONTACT US

Organizing Committee
Ms. Luybov Popova / for STUDENTS, ................................................, +79243684799
Ms. Aitalina Timofeeva / for LEADERS, ................................................., +79241675434
Dr. Vadim Yakovlev / for ORGANIZERS, ............................................., +79644277206
Dr. Vasilii Pavlov / for APCYS STEERING COMMITTEE ................................, +79246622548

RLI MAP

<table>
<thead>
<tr>
<th>№</th>
<th>Room</th>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>241</td>
<td>Physics</td>
<td>Oct 16</td>
</tr>
<tr>
<td>2</td>
<td>239</td>
<td>Environmental Sciences</td>
<td>Oct 16</td>
</tr>
<tr>
<td>3</td>
<td>237</td>
<td>Life Sciences</td>
<td>Oct 16</td>
</tr>
<tr>
<td>4</td>
<td>235</td>
<td>Computer Sciences</td>
<td>Oct 16</td>
</tr>
<tr>
<td>5</td>
<td>233</td>
<td>Mathematics</td>
<td>Oct 16</td>
</tr>
<tr>
<td>6</td>
<td>231</td>
<td>YISF Jury</td>
<td>Oct 15</td>
</tr>
<tr>
<td>7</td>
<td>229</td>
<td>Organizers</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>225</td>
<td>APCYS Jury Coffee-break</td>
<td>Oct 16</td>
</tr>
<tr>
<td>9</td>
<td>223</td>
<td>Volunteers</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>221</td>
<td>APCYS Jury</td>
<td>Oct 15-16</td>
</tr>
<tr>
<td>11</td>
<td>Sports Hall</td>
<td>APCYS Poster Sessions</td>
<td>Oct 16</td>
</tr>
<tr>
<td>12</td>
<td>Small Sports Hall</td>
<td>YISF Poster Sessions</td>
<td>Oct 16</td>
</tr>
<tr>
<td>12</td>
<td>Assembly Hall</td>
<td>APCYS &amp; YISF Opening Ceremony, APCYS &amp; YISF Jury Coffee-break</td>
<td>Oct 15</td>
</tr>
</tbody>
</table>
PARTICIPATING ORGANIZATIONS/SCHOOLS

Nepal
- St. Xavier's College
- Nightingale International Secondary School
- Asmita English School
- Omega College
- Uniglobe College
- Southwestern State College

Indonesia
- Center for Young Scientists

Malaysia
- Malaysia Young Scientists Organisation

Thailand
- Suranaree University of Technology
- Kamnoetvidya Science Academy

Guam
- St. John's School

Philippines
- Philippine Science High School

Slovenia
- Gimnazija Vič

Macao, China
- Pui Ching Middle School Macau

India
- Foundation for Glocal Science Initiatives

PARTICIPATING SCHOOLS OF
THE REPUBLIC OF SAKHA (YAKUTIA), RUSSIA (SJSA TEAM)

1. V.P. Larionov Physics and Technology Lyceum, Yakutsk
2. E.A. Varshavsky Information Technology Lyceum No. 24, Neryungri
3. Legoy Secondary School, Kepteni, Ust-Aldansky Ulus (District)
4. Academician L.V. Kirensky Amginsky Gymnasium, Amga, Amginsky Ulus (District)
5. A.N. Chusovskoy Nyurbinsky Technical Lyceum, Nyurba
6. Specialized Educational and Scientific Center - University Lyceum of M.K. Ammosov North-Eastern Federal University, Yakutsk
7. Nizhny Bestyakh Secondary School No. 2, Nizhny Bestyakh, Megino-Kangalassky Ulus (District)
8. V.V. Alekseev Myuryu Gymnasium for Boys, Borogontsy, Ust-Aldansky Ulus (District)
9. City Classical Gymnasium, Yakutsk
10. A. Osipov Berdigestyakh Secondary School, Berdigestyakh, Gorny Ulus (District)
11. N.S. Okhlopkov Namtsy Ulus Gymnasium, Namtsy, Namsky Ulus (District)
12. Gymnasium No 2, Neryungri
13. S.K. Makarov Churapcha Gymnasium, Churapcha, Churapchinsky Ulus (District)
14. Republican Lyceum Boarding School, Yakutsk
15. Secondary School No. 12, Yakutsk
16. Polytechnic Lyceum, Mirny
17. Aldan Lyceum, Aldan
18. Mokhsogollok Secondary School, Moksogollok, Khangalassky Ulus (District)
APCYS 2019 Jury

PHYSICS

Prof. Dr. Fu Chao-Ming
Taiwan
Professor, National Taiwan University
Email: chaomingfu@phys.ntu.edu.tw

Dr. Stanislav Alekseev
Russia
PhD, Senior Specialist of the Press Service of the “Yakut Scientific Centre of the Siberian Branch of the Russian Academy of Sciences” in international issues
Email: s.n.alekseev@mail.ru

Dr. Igor Koltovskoy
Russia
Yu. G. Shafer Institute of Cosmophysical Research and Aeronomy of Siberian Branch of the Russian Academy of Sciences
Email: koltigor@mail.ru

Ms. Arlene Bigornia Chua
Guam
Chair of Science Department, St. John’s School
Email: achua@stjohnsguam.co

Dr. Anastasiiia Ammosova
Russia
Candidate of Sciences in Physics and Mathematics, researcher, Shafer Institute of Cosmophysical Research and Aeronomy, Siberian Branch of the Russian Academy of Sciences
Email: ammosovaam@mail.ru

Ms. Nadezda Nikolaeva
Russia
Assistant, Institute of Physics and Technologies, M. K. Ammosov North-Eastern Federal University
Email: Larsoon696@mail.ru

APCYS 2019 Jury

MATHEMATICS

Mr. Muhammad Sanjay Bin Paramarie
Malaysia
Director of the Program, Malaysia Young Scientists Organization
Email: cascoordmtd@gmail.com

Dr. Nyurgun Lazarev
Russia
Doctor of Sciences in Physics and Mathematics, Head of the Institute of Mathematics and Information Science, M. K. Ammosov North-Eastern Federal University
Email: nyurgun@ngs.ru

Dr. Tatiana Popova
Russia
Candidate of Sciences in Physics and Mathematics, Docent-researcher, Institute of Mathematics and Information Science M. K. Ammosov North-Eastern Federal University
Email: ptsokt@mail.ru

Mr. Egor Fedotov
Russia
Graduate student, Institute of Mathematics and Information Science, M. K. Ammosov North-Eastern Federal University
Email: Egorfedotov2011@gmail.com

Dr. Elley Shamaev
Russia
Candidate of Sciences in Physics and Mathematics, Associate Professor, Researcher, Institute of Mathematics and Information Science, M. K. Ammosov North-Eastern Federal University
Email: eshamaev@mail.ru
APCYS 2019 Jury

COMPUTER SCIENCES

Prof. Dr. Leong Chuan Kwek
Singapore
National University of Singapore, Nanyang Technological University
Email: kwekleongchuan@nus.edu.sg

Dr. Petr Sivtsev
Russia
Candidate of Sciences in Physics and Mathematics, Researcher, Institute of Mathematics and Information Science, M. K. Ammosov North-Eastern Federal University
Email: sivkapetr@mail.ru

Dr. Mikhail Antonov
Russia
Email: mikhail@s-vfu.ru

Dr. Aleksandr Pavlov
Russia
Candidate of Sciences in Physics and Mathematics, Associate Professor, Institute of Mathematics and Information Science, M. K. Ammosov North-Eastern Federal University
Email: Av.pavlov@s-vfu.ru

Mr. Vladimir Everstov
Russia
Senior Lecturer, Institute of Mathematics and Information Science, M. K. Ammosov North-Eastern Federal University
Email: vv.everstov@s-vfu.ru

Mr. Petr Gogolev
Russia
Head of Game Design department, Mytona Pte. Ltd.
Email: petrgogolev@mytona.com

APCYS 2019 Jury

ENVIRONMENTAL SCIENCES

Prof. Dr. Ramlee Mustapha
Malaysia
Sultan Idris Education University
Email: drramlee@yahoo.com

Ms. Silka Abyadati
Indonesia
Content Manager, Center for Young Scientist
Email: silkaindonesia@gmail.com

Ms. Samsiah Binti Radiman
Malaysia
Teacher, Sultan Alam Shah School
Email: samsiah@sas.edu.my

Ms. Izabella Baisheva
Russia
Graduate student, Institute of Natural Sciences, M. K. Ammosov North-Eastern Federal University
Email: izabaiant@gmail.com

Dr. Ruslan Gorodnichev
Russia
Candidate of Sciences in Biology, Head of the Biological Monitoring Lab, Institute of Natural Sciences, M. K. Ammosov North-Eastern Federal University
Email: rusgorodnichev@gmail.com

Ms. Sardana Levina
Russia
Researcher Institute of Natural Sciences, M. K. Ammosov North-Eastern Federal University
Email: levina.sardan@mail.ru

Dr. Antonina Savvinova
Russia
Candidate of Sciences in Geography, Associate Professor, Institute of Natural Sciences, M. K. Ammosov North-Eastern Federal University
Email: sava.73@mail.ru
**APCYS 2019 Jury**

**LIFE SCIENCES**

**Dr. Rachain Kosanlavit**  
Thailand  
Principal, Kamnoetvidya Science Academy  
Email: rachain.k@kvis.ac.th

**Ms. Alenka Mozer**  
Slovenia  
Chemistry Teacher, Gimnazija Vič  
Email: amoz60@gmail.com

**Dr. Vasily Pavlov**  
Russia  
PhD, Principal, Sakha Junior Science Academy  
Email: mail@sjsa.ru

**Dr. Efim Khlebnuy**  
Russia  
Candidate of Sciences in Biology, Leading Researcher, Acting Head of Ecological & Biochemistry, Biotechnology & Radiobiology Lab, Institute of Biological Problems of Cryolithzone, Siberian Branch of the Russian Academy of Sciences"  
Email: chicloon@gmail.com

**Dr. Milana Petrova**  
Russia  
Candidate of Sciences in Medicine, Associate Professor, Institute of Medicine, M. K. Ammosov North-Eastern Federal University  
Email: mpetrova@gmail.com

**Dr. Marina Fedotova**  
Russia  
Candidate of Sciences in technology, Institute of Physics and technology, M. K. Ammosov North-Eastern Federal University  
Email: fedmar.fsi@mail.ru

**Dr. Maria Krylova**  
Russia  
Candidate of Sciences in Medicine, Institute of Medicine, M. K. Ammosov North-Eastern Federal University  
Email: Maria_krylova@mail.ru

---

**Teacher's Conference Presentation Platform**

<table>
<thead>
<tr>
<th>№</th>
<th>Name</th>
<th>Position, Organization</th>
<th>Country</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Galina Alekseeva</td>
<td>Institute of the Educational development and advanced training after S.N. Donskoy-II</td>
<td>Russia</td>
<td>Development of professional competence of teachers working with gifted children</td>
</tr>
<tr>
<td>2</td>
<td>Mr. Yuri Romanov</td>
<td>Computer Science Teacher at the Physical and Technical Lyceum</td>
<td>Russia</td>
<td>Cansat Competitions - first steps of the future space engineers</td>
</tr>
<tr>
<td>3</td>
<td>Ms. Arlene B. Chua</td>
<td>Chair, Science Department, St. John's School</td>
<td>Guam</td>
<td>Student-designed experiments in the physics classroom</td>
</tr>
<tr>
<td>4</td>
<td>Ms. Nadezda Timofeeva</td>
<td>Berd Digestyak Gymnasium, Gorny Ulus</td>
<td>Russia</td>
<td>From the experience of organizing research activities of learners</td>
</tr>
<tr>
<td>5</td>
<td>Ms. Ana Maria A. Chupungco</td>
<td>Special Science Teacher III, Philippine Science High School</td>
<td>Philippines</td>
<td>The PHS Research Program: Challenges in the Face of Change</td>
</tr>
<tr>
<td>6</td>
<td>Ms. Tatiana Popova</td>
<td>Principal, Mayinsky Lyceum, Megino-Kangalassky Ulus</td>
<td>Russia</td>
<td>Case-laboratory “Experimentarium” in the Mayinsky Lyceum</td>
</tr>
<tr>
<td>7</td>
<td>Dr. Shanta Pokhrel</td>
<td>Assistant Professor, Tri-Chandra Multiple Campus, Tribhuvan University</td>
<td>Nepal</td>
<td>Challenges of Research Activities at School Level in Nepal</td>
</tr>
<tr>
<td>8</td>
<td>Dr. Sharmila Pradhan Amatya</td>
<td>Assoc. Professor, Amrit, Campus, Tribhuvan University</td>
<td>Nepal</td>
<td>Implementation of integralism for transformative education research</td>
</tr>
<tr>
<td>9</td>
<td>Ms. Alenka Mozer</td>
<td>Senior chemistry teacher and students’ projects supervisor at Gimnazija Vič; National coordinator for student science research project at Slovenian secondary schools</td>
<td>Slovenia</td>
<td>Establishing a National Model for Students’ Science Research Projects (cooperation of schools, researcher institutions/companies)</td>
</tr>
<tr>
<td>10</td>
<td>Ms. Sardana Zakharova</td>
<td>Deputy Principal for Educational Work, Head of the Tonuochaan Club VVBS after M.A. Alekseev</td>
<td>Indonesia</td>
<td>From the experience of organizing research expeditions of VVBS after M.A. Alekseev</td>
</tr>
<tr>
<td>11</td>
<td>Ms. Thanaporn Thanodomdech</td>
<td>Mathematics Teacher, Kamnoetvidya Science Academy</td>
<td>Thailand</td>
<td>SINOS class in KVIS</td>
</tr>
<tr>
<td>12</td>
<td>Ms. Siriporn Suntiwarapong</td>
<td>Biology Laboratory Teacher, Kamnoetvidya Science Academy</td>
<td>Thailand</td>
<td>The Possibilities Research at Middle School using Traditional Locally Available materials in Nepal</td>
</tr>
<tr>
<td>13</td>
<td>Mr. Binod Kumar Dulal</td>
<td>Science Teacher, Asmita English Secondary School</td>
<td>Nepal</td>
<td>From the experience of organizing research expeditions of VVBS after M.A. Alekseev</td>
</tr>
<tr>
<td>Project ID</td>
<td>Country</td>
<td>Given name</td>
<td>Family name</td>
<td>Organization</td>
</tr>
<tr>
<td>-----------</td>
<td>----------</td>
<td>------------</td>
<td>-------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>COM01</td>
<td>Russia</td>
<td>Anatoly</td>
<td>Antonov</td>
<td>V.P. Larionov Physics and Technology Lyceum, Yakutsk, Republic of Sakha (Yakutia)</td>
</tr>
<tr>
<td>COM02</td>
<td>Russia</td>
<td>Andrey</td>
<td>Petrov</td>
<td>V.P. Larionov Physics and Technology Lyceum, Yakutsk, Republic of Sakha (Yakutia)</td>
</tr>
<tr>
<td>COM03</td>
<td>Russia</td>
<td>Danil</td>
<td>Zelenskiy</td>
<td>E.A. Varshavsky Information Technology Lyceum No. 24, Neryungirinsky District, Republic of Sakha (Yakutia)</td>
</tr>
<tr>
<td>COM04</td>
<td>Russia</td>
<td>Kirill</td>
<td>Kunitsyn</td>
<td>E.A. Varshavsky Information Technology Lyceum No. 24, Neryungirinsky District, Republic of Sakha (Yakutia)</td>
</tr>
<tr>
<td>COM05</td>
<td>Nepal</td>
<td>Kritish</td>
<td>Pokharel</td>
<td>St. Xavier’s College</td>
</tr>
<tr>
<td>COM06</td>
<td>Indonesia</td>
<td>Muhammad</td>
<td>Fadhlan</td>
<td>Center for Young Scientists</td>
</tr>
<tr>
<td>COM07</td>
<td>Russia</td>
<td>Valeria</td>
<td>Starkova</td>
<td>Legoy Secondary School, Ust-Aldansky Ulus (District), Republic of Sakha (Yakutia)</td>
</tr>
<tr>
<td>COM08</td>
<td>Russia</td>
<td>Vladislav</td>
<td>Izhik</td>
<td>E.A. Varshavsky Information Technology Lyceum No. 24, Neryungirinsky District, Republic of Sakha (Yakutia)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Country</th>
<th>Given name</th>
<th>Family name</th>
<th>Organization</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENS02</td>
<td>Russia</td>
<td>Aaiynova</td>
<td>Filippova</td>
<td>Academician L.V. Kirensky Amginsky Gymnasium, Amginsky Ulus (District), Republic of Sakha (Yakutia)</td>
<td>Lakes Distributions Coefficient on the Territory of Amginsky District</td>
</tr>
<tr>
<td>ENS03</td>
<td>Russia</td>
<td>Algyys</td>
<td>Bytyrov</td>
<td>Academician L.V. Kirensky Amginsky Gymnasium, Amginsky Ulus (District), Republic of Sakha (Yakutia)</td>
<td>Permafrost Temperature Conditions in the Valley of the Amga River in Amginsky Ulus, Republic of Sakha (Yakutia)</td>
</tr>
<tr>
<td>ENS04</td>
<td>Malaysia</td>
<td>Ayman</td>
<td>Khair</td>
<td>Malaysia Young Scientists Organisation</td>
<td>Ecodet - Circular Economy Implementation Using Fruits Waste</td>
</tr>
<tr>
<td>ENS05</td>
<td>Russia</td>
<td>Diana</td>
<td>Nikolaeva</td>
<td>A.N. Chusovskoy Nyurbin Technical Lyceum, Nyurbin District, Republic of Sakha (Yakutia)</td>
<td>The Ecological State of the Lakes of Nyurba Town Vicinity</td>
</tr>
<tr>
<td>ENS06</td>
<td>Thailand</td>
<td>Disatom</td>
<td>Dejvajara</td>
<td>Suranaree University of Technology</td>
<td>Extending Environmental Benefits of Diesel Fuel through Incorporation of Castor Oil-Based Ethyl Ester Biodiesel</td>
</tr>
<tr>
<td>ENS07</td>
<td>Guam</td>
<td>Grace</td>
<td>Hutapea</td>
<td>St. John’s School</td>
<td>An Alternative to Guam’s Current Sewage Systems - Using the Microbial Fuel Cell to Determine Which Type of Sewage Will Produce More Power</td>
</tr>
<tr>
<td>ENS08</td>
<td>Guam</td>
<td>Jamie</td>
<td>Lee</td>
<td>St. John’s School</td>
<td>A Sustainable Agricultural Model: Dryland Rice Farming in Acidic Soils of the Pacific Island of Guam</td>
</tr>
<tr>
<td>ENS09</td>
<td>Russia</td>
<td>Marina</td>
<td>Berdyanova</td>
<td>E.A. Varshavsky Information Technology Lyceum No. 24, Neryungirinsky District, Republic of Sakha (Yakutia)</td>
<td>The Degree of Pollution of Neryungir District Reservoirs (Case Study of the Chulman River)</td>
</tr>
<tr>
<td>Project ID</td>
<td>Country</td>
<td>Given name</td>
<td>Family name</td>
<td>Organization</td>
<td>Project Title</td>
</tr>
<tr>
<td>------------</td>
<td>---------------</td>
<td>------------</td>
<td>-------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ENS10</td>
<td>Malaysia</td>
<td>Muhammad</td>
<td>Farhan Azwar</td>
<td>Malaysia Young Scientists Organisation</td>
<td>From Waste to Value - Bananaqueous as Heavy Metal Adsorbent</td>
</tr>
<tr>
<td>ENS11</td>
<td>Malaysia</td>
<td>Muhammad</td>
<td>Harraz Nazhan</td>
<td>Malaysia Young Scientists Organisation</td>
<td>Praxtaber (Presstage Timber)</td>
</tr>
<tr>
<td>ENS12</td>
<td>Thailand</td>
<td>Nichsiree</td>
<td>Kuakuliat</td>
<td>Kamnoetviyda Science Academy</td>
<td>Carbon Aerogel Derived from Watermelon Peels for Oil Spill Treatment</td>
</tr>
<tr>
<td>ENS13</td>
<td>Indonesia</td>
<td>Nicole</td>
<td>Nathania</td>
<td>Center for Young Scientists</td>
<td>“Feces” Enhancement of Fecal Sludge Conversion into Biogas</td>
</tr>
<tr>
<td>ENS14</td>
<td>Russia</td>
<td>Nurgun</td>
<td>Makarov</td>
<td>Specialized Educational and Scientific Center - University Lyceum of M.K. Ammosov North-Eastern Federal University, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Geoinformation Analysis of the Forest Cover of Central Yakutia from Winter Satellite Images Landsat</td>
</tr>
<tr>
<td>ENS15</td>
<td>Thailand</td>
<td>Tewis</td>
<td>Pattarawan</td>
<td>Kamnoetviyda Science Academy</td>
<td>Investigation of Polyethylene Degradation by Bacillus Cereus Using Peptone Extract from Peanut Shells</td>
</tr>
<tr>
<td>LIS01</td>
<td>Philippines</td>
<td>Alyssa</td>
<td>Kaye</td>
<td>Philippine Science High School</td>
<td>Detection of an N-acetyl muramoyl-L-alanine Amidase-like Protein Encoding Gene in Bacillus licheniformis</td>
</tr>
<tr>
<td>LIS02</td>
<td>Russia</td>
<td>Anastasia</td>
<td>Izbekova</td>
<td>D.F. Alekseev First Khomustakh Secondary School Namsky Ulus (District), Republic of Sakha (Yakutia)</td>
<td>Morphological and Genetic Variation of Species of the Genus Betula</td>
</tr>
<tr>
<td>LIS03</td>
<td>Russia</td>
<td>Anzhelika</td>
<td>Vasileva</td>
<td>Specialized Educational and Scientific Center - University Lyceum of M.K. Ammosov North-Eastern Federal University, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Yakutia Fish as a Source of Essential Amino Acids</td>
</tr>
<tr>
<td>LIS05</td>
<td>Slovenia</td>
<td>Arne</td>
<td>Klemen</td>
<td>Gimnazija Vič</td>
<td>Spectroscopic Analysis of Polyethylene Used in Hip and Knee Prosthetics</td>
</tr>
<tr>
<td>LIS06</td>
<td>Indonesia</td>
<td>Carina</td>
<td>Jane</td>
<td>Center for Young Scientists</td>
<td>Cocoa Pod Husk as a Food Alternative High Fibre Focoa Pod Husk Granules</td>
</tr>
<tr>
<td>LIS07</td>
<td>Macao, China</td>
<td>Weng I</td>
<td>Leong</td>
<td>Pui Ching Middle School Macau</td>
<td>An Automated Microfluidic Platform for Food Safety and Human Allergy Analysis</td>
</tr>
<tr>
<td>LIS08</td>
<td>Macao, China</td>
<td>Chun Hei</td>
<td>Fong</td>
<td>Pui Ching Middle School Macau</td>
<td>Identification, Cloning and Recombinant Expression of Novel Bioactive Peptides from Coral: Clues to Potential New Therapeutics for Human</td>
</tr>
<tr>
<td>Project ID</td>
<td>Country</td>
<td>Given name</td>
<td>Family name</td>
<td>Organization</td>
<td>Project Title</td>
</tr>
<tr>
<td>-----------</td>
<td>----------</td>
<td>------------</td>
<td>-------------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>LIS09</td>
<td>Thailand</td>
<td>Damrongrat</td>
<td>Siriwanna</td>
<td>Kamnoetvidya Science Academy</td>
<td>Reversible Thermo-C Fuse</td>
</tr>
<tr>
<td>LIS10</td>
<td>Nepal</td>
<td>Dikshya</td>
<td>Sanjel</td>
<td>Asmita English School</td>
<td>Comparative Study of Use of Foldscope and Light Microscope for the Morphological Study of Some Common Insects and Effective Application in Low Budget</td>
</tr>
<tr>
<td>LIS11</td>
<td>Indonesia</td>
<td>Felicia</td>
<td>Averine</td>
<td>Center for Young Scientists</td>
<td>Fi-Shion: Biodegradable Weed-based Packing Cushions</td>
</tr>
<tr>
<td>LIS12</td>
<td>Russia</td>
<td>German</td>
<td>Okhlopkov</td>
<td>V.V. Alekseev Myuryu Gymnasium for Boys, Ust-Aldansky Ulus (District), Republic of Sakha (Yakutia)</td>
<td>Vital Status of the Population of Veronica Incana Ust-Aldansky Ulus</td>
</tr>
<tr>
<td>LIS13</td>
<td>Russia</td>
<td>Natalya</td>
<td>Tretyakova</td>
<td>City Classical Gymnasium, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Comparative Characteristics of Technologies for Production of Fish Meal from the Waste of the Fishing Industry</td>
</tr>
<tr>
<td>LIS14</td>
<td>Nepal</td>
<td>Rishi Kumar</td>
<td>Gupta</td>
<td>Kathmandu Model College</td>
<td>Homemade Incubator</td>
</tr>
<tr>
<td>LIS15</td>
<td>Russia</td>
<td>Saiana</td>
<td>Danilova</td>
<td>V.P. Larionov Physics and Technology Lyceum, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Siberian Crane Flyway: New Warming Ground in China</td>
</tr>
<tr>
<td>LIS17</td>
<td>Russia</td>
<td>Sergey</td>
<td>Timofeev</td>
<td>N.S. Okhlopkov Namsky Ulus Gymnasium, Namsky Ulus (District), Republic of Sakha (Yakutia)</td>
<td>Ecology of the Golden Eagle in the Vicinity of Yakutsk</td>
</tr>
<tr>
<td>LIS18</td>
<td>Thailand</td>
<td>Supalak</td>
<td>Tongtantai</td>
<td>Suranaree University of Technology</td>
<td>Extraction and Modification of Alpha-Mangostin</td>
</tr>
<tr>
<td>LIS19</td>
<td>Thailand</td>
<td>Tawin</td>
<td>Makaraphiram</td>
<td>Suranaree University of Technology</td>
<td>Preparation and Fuel Properties of Microemulsion-based Biofuel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Country</th>
<th>Given name</th>
<th>Family name</th>
<th>Organization</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT01</td>
<td>Russia</td>
<td>Aelina</td>
<td>Savvinova</td>
<td>A.N. Chusovskoy Nyurbinsky Technical Lyceum, Nyurbinsky District, Republic of Sakha (Yakutia)</td>
<td>Melting Ice and Pick’s Theorem</td>
</tr>
<tr>
<td>MAT02</td>
<td>Nepal</td>
<td>Bibek</td>
<td>Dhungana</td>
<td>Omega College</td>
<td>An Approach for Traffic Mitigation in a Mathematical Way</td>
</tr>
<tr>
<td>MAT03</td>
<td>Indonesia</td>
<td>Kenneth</td>
<td>Samuel</td>
<td>Center for Young Scientists</td>
<td>Closing in on Pi: Comparative Analysis for Determining Pi</td>
</tr>
<tr>
<td>MAT04</td>
<td>Malaysia</td>
<td>Muhammad</td>
<td>Amirul</td>
<td>Malaysia Young Scientists Organisation</td>
<td>Basket Tech - Leading Edge Basketball Coaching App</td>
</tr>
<tr>
<td>MAT05</td>
<td>Thailand</td>
<td>Phunnawat</td>
<td>Khampheng</td>
<td>Kamnoetvidya Science Academy</td>
<td>Classes of Equally Likely Outcomes of Riffle Shuffles on an Alternating Deck of Repeated Cards</td>
</tr>
<tr>
<td>MAT06</td>
<td>Indonesia</td>
<td>Raymond</td>
<td>Sean</td>
<td>Center for Young Scientists</td>
<td>Fibonacci in Music: Investigation of the Fibonacci Sequence in Indonesia’s Traditional Music</td>
</tr>
<tr>
<td>MAT07</td>
<td>Russia</td>
<td>Stefania</td>
<td>Brakk</td>
<td>Gymnasium No 2, Neryungirinsky District, Republic of Sakha (Yakutia), Russia</td>
<td>Graph Theory in Solving Problems of Secondary School Mathematics and Informatics</td>
</tr>
<tr>
<td>MAT08</td>
<td>Thailand</td>
<td>Wattana-boon</td>
<td>Chuarod</td>
<td>Suranaree University of Technology</td>
<td>Investigations in Partitions of Integers</td>
</tr>
<tr>
<td>Project ID</td>
<td>Country</td>
<td>Given name</td>
<td>Family name</td>
<td>Organization</td>
<td>Project Title</td>
</tr>
<tr>
<td>------------</td>
<td>---------</td>
<td>------------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>PHY01</td>
<td>Russia</td>
<td>Andrei</td>
<td>Monastyrev</td>
<td>S.K. Makarov Churapcha Gymnasium, Churapchinsky Ulus (District), Republic of Sakha (Yakutia)</td>
<td>Experimental Research of Electricity from Silt in Yakutia Conditions</td>
</tr>
<tr>
<td>PHY02</td>
<td>Russia</td>
<td>Anton</td>
<td>Danilov</td>
<td>Specialized Educational and Scientific Center - University Lyceum of M.K. Ammosov North-Eastern Federal University, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Construction of the Smart House in Permafrost</td>
</tr>
<tr>
<td>PHY03</td>
<td>Russia</td>
<td>Artem</td>
<td>Vasilev</td>
<td>Republican Lyceum Boarding School, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Research of Cosmic Ray Intensity Using Muon Telescopes</td>
</tr>
<tr>
<td>PHY04</td>
<td>Russia</td>
<td>Arthur</td>
<td>Lebedev</td>
<td>Secondary School No. 12, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Sinking Bubbles</td>
</tr>
<tr>
<td>PHY05</td>
<td>Nepal</td>
<td>Astha</td>
<td>Shah</td>
<td>X. Xavier College</td>
<td>Gravitational Waves, Its Detection and Possibilities</td>
</tr>
<tr>
<td>PHY06</td>
<td>Nepal</td>
<td>Birendra</td>
<td>Budha</td>
<td>Uniglobe College</td>
<td>AI Based Traffic Management System</td>
</tr>
<tr>
<td>PHY07</td>
<td>Indonesia</td>
<td>Dhonandra</td>
<td>Hibatullah</td>
<td>Center for Young Scientists</td>
<td>Slip - Stick Phenomenon</td>
</tr>
<tr>
<td>PHY08</td>
<td>Russia</td>
<td>Elizaveta</td>
<td>Semenyakina</td>
<td>Polytechnic Lyceum, Mirny District, Republic of Sakha (Yakutia)</td>
<td>Nitinol Engine</td>
</tr>
<tr>
<td>PHY09</td>
<td>Russia</td>
<td>Igor</td>
<td>Myarikyanov</td>
<td>City Classical Gymnasium, Yakutsk, Republic of Sakha (Yakutia)</td>
<td>Production of Three-Layer Wall Panels Using Heavy-Duty Concrete with Carbon Single-Walled Nanotubes</td>
</tr>
<tr>
<td>PHY10</td>
<td>Malaysia</td>
<td>Irfan</td>
<td>Rozaine Merican</td>
<td>Malaysia Young Scientists Organisation</td>
<td>Blimmer – Solving Blind Swimmer</td>
</tr>
<tr>
<td>PHY11</td>
<td>Russia</td>
<td>Ivan</td>
<td>Dudarenko</td>
<td>Aldan Lyceum, Aldansky District, Republic of Sakha (Yakutia)</td>
<td>Investigation of the Properties of Magnetic Fluid as a Lubricant and Sealant in Drilling Equipment</td>
</tr>
<tr>
<td>PHY12</td>
<td>Indonesia</td>
<td>Jonathan</td>
<td>Sebastian</td>
<td>Center for Young Scientists</td>
<td>Tuning Balinese Gamelan</td>
</tr>
<tr>
<td>PHY13</td>
<td>Russia</td>
<td>Naina</td>
<td>Platonova</td>
<td>S.K. Makarov Churapcha Gymnasium, Churapchinsky Ulus (District), Republic of Sakha (Yakutia)</td>
<td>Experimental Research of Optimal Methods for Wood Strengthening</td>
</tr>
<tr>
<td>PHY14</td>
<td>India</td>
<td>Raghavendra</td>
<td>Ranbir Singh</td>
<td>Foundation for Global Science Initiatives</td>
<td>EvWIE (Evolution Without Eyes)</td>
</tr>
<tr>
<td>PHY15</td>
<td>Guam</td>
<td>Soomin</td>
<td>Lee</td>
<td>St. John’s School</td>
<td>The Correlation between the Input Power and the COP in a Dehumidifier</td>
</tr>
<tr>
<td>PHY16</td>
<td>Russia</td>
<td>Sviatoslav</td>
<td>Konstantinov</td>
<td>Mokhsogollokh Secondary School, Khangalassky Ulus, Republic of Sakha (Yakutia)</td>
<td>Amplitude Changes of VLF Radio Signals over the Pacific Region during Geomagnetic Disturbances on August 31 - September 6, 2019</td>
</tr>
<tr>
<td>PHY17</td>
<td>Nepal</td>
<td>Swaraj</td>
<td>Sagar</td>
<td>Southwestern State College</td>
<td>Use of Micro Satellites for Global Connectivity, High Speed Transmission &amp; Data Analysis</td>
</tr>
</tbody>
</table>
COM01

AUTOMATIC OBJECT TARGETING SYSTEM
Anatoly Antonov
V.P. Larionov Physics and Technical Lyceum, Yakutsk, Republic of Sakha (Yakutia), Russia
Supervisor: Yurii Romanov
Email: awendo@mail.ru

In the process of developing different missions using any moving objects (drones, satellites, etc.) there often appears to be the problem of receiving radio signals from that object (for example, video signal). We had to set aside an individual for that mission, manually guiding antenna, or we used to receive signal by a broad directional antenna. These ways to receive signals didn’t give the appropriate signal quality. This research discusses the solution of the problem with the help of GPS automatic antenna guidance system, based on trigonometry, programming, software developing and engineering.

Keywords: GPS automatic antenna guidance system

COM02

DESIGNING A NON-PREEMPTIVE TASK MANAGER FOR SMALL SATELLITE CONTROL
Andrey Petrov
V.P. Larionov Physics and Technical Lyceum, Yakutsk, Republic of Sakha (Yakutia), Russia
Supervisor: Yurii Romanov
Email: petroff.ap@gmail.com

This study describes an example design of a non-preemptive task scheduler, which can be used to replace real-time operating systems in small satellites. The scheduler is later tested on hardware, close to the hardware of a real amateur satellite, and its performance is compared to the performance of other satellite control solutions.

Keywords: rtos, cubesat, software, AVR rtos, cubesat, software, AVR
### COM03

**SOFTWARE REALIZATION OF INFORMATION SECURITY**  
Danil Zelenskiy  
E. A. Varshavsky Information Technology Lyceum No. 24, Neryungri, Neryungri District, Republic of Sakha (Yakutia), Russia  
Supervisor: Mikhail Zhilin  
Email: danil.zelenskiy.2005@mail.ru

Nowadays, information is subject to hacking. Modern software programs that protect data do not give any guarantees. Therefore, I decided to create a unique encryption algorithm and on its basis to create an encryption program for protecting data. After studying crypography and using the method of trial and error, we were able to develop a program to encrypt data. At the very beginning my program ran slowly, and the level of data protection was very low. But over time, I studied cryptography thoroughly, and it allowed me to maximize the protection of data. Knowledge in programming allowed me to speed up the program, making it easier to understand the algorithms for the processor. Our program uses symmetric streaming encryption. The algorithm is based on the golden ratio and code phrase. Encryption can occur for any kind of data as the program encrypts a binary table, not text.  

**Keywords:** information security, encryption, algorithms

### COM04

**PORTABLE WI-FI ACCESS POINT WITH A MULTI-LEVEL PROTECTION ALGORITHM**  
Kirill Kunitsyn  
E. A. Varshavsky Information Technology Lyceum No. 24, Neryungri, Neryungri District, Republic of Sakha (Yakutia), Russia  
Supervisor: Sergey Deminov  
Email: kirill.kunitsyn@gmail.com

We developed a multilevel algorithm to protect the data packets transmission via a wireless router. Several separate data encryption tools were combined sequentially into a single console working simultaneously through secure communication channels. The onion routing (TOR), which allows traffic to be directed through several anonymous and secure servers, was used as the main protection mechanism. Since each technology has its own vulnerabilities and TOR is not an exception, therefore in order to avoid data loss, all information is encrypted prior to the transmission through a stage that utilized the SOCKet Secure-5 (SOCKSS) network protocol with parallel use of DNS proxy technology. This algorithm provides an authorization procedure that allows open full access to legitimate users only, thereby protecting the data transmission from third parties.  

**Keywords:** The onion routing (TOR), SOCKET Secure-5 (SOCKSS), DNS proxy technology

### COM05

**A NEW WAY OF LIVING: IOT**  
Kritish Pokharel  
St. Xavier College, Nepal  
Supervisor: Shanta Pokhrel  
Email: kritish.pokharel@icloud.com

We are entering a new era of computing technology that many are calling the Internet of Things (IoT). IoT is a system of interrelated computing device which has its own unique identifier (UIDs) and has the ability to transmit data over a network with or without requiring human-to-human or human-to-computer interaction. The IoT is comprised of smart machines interacting and communicating with other machines, objects, environments and infrastructures. But how can we turn our traditional devices and things into IoT devices?, especially in low cost so that even people of underdeveloped and developing countries can use the concept of IoT to make their lifestyle smart and well managed. Today’s era is the time of technology and it is right of every human being to use the technology to enhance their standard of living. Therefore, the research is based on understanding the concept of IoT, its application and how can we use it in our day to day activities or how can we covert our traditional things/objects into an IoT device.  

**Keywords:** computing technology, communication, internet, smart machines

### COM06

**SNAPBOT: SELF-NAVIGATING MAPPING ROBOT**  
Muhammad Fadhlan Mahendra  
Center for Young Scientists, Indonesia  
Supervisor: Rika Siti Jahara, S.Pd.  
Email: fadhlan.mahendra@gmail.com

A self-navigating mapping robot is a robot that can avoid obstacles and can map out its environment at the same time. This robot uses an ultrasonic sensor that is mounted on a micro servo which allows it to scan and avoid obstacles in a 180 degree rotation. When this robot reaches an obstacle, the robot will scan its left and right sides to measure the distances. Once it has done measuring the distance the robot will decide whether to turn right or left based on the clearer area to avoid the obstacles. At the same time the robot will send mapping data to the computer to be monitored as a radar. The result and summary is that this robot can successfully detect obstacles 20 cm or closer then chooses to turn right or left based on the clearer area to avoid the obstacle. This robot can successfully map out its environment by using an ultrasonic sensor and then sends the mapping data via bluetooth to the computer to be monitored as a radar.  

For future work, this robot can only detect obstacles in the same place and height of the ultrasonic sensor, more ultrasonic sensors can be added in various different places of the robot to scan different obstacles. The robot can be given an SD card to store its mapping data so it could retrace it and follow its way back if necessary. The robot can be given a specific task or instruction to follow. The robot can go to places where it is too dangerous for people to go in, such as being used by search and rescue teams during a disaster. This form of ultrasonic technology can be used to help blind people to walk around. It is hoped that this robot can be useful to people in various different ways.  

**Keywords:** self-navigating mapping robot; obstacle; ultrasonic sensor; bluetooth
The Internet is an amazing thing. Nowadays, we cannot imagine how people used to live without it. They had no interesting opportunities that exist today - all of these endless possibilities to communicate, learn and work. And as we all know, more than half of the Internet consists of web-sites – web-pages which are logically interrelated. And all the websites consist of three basic coding languages: HTML, CSS, and JavaScript. However, web-site developers often face the problem of writing very long lines of code when creating web-sites, and so, they turn to so-called frameworks, such as Bootstrap, Picnicss, Vital, Bulma and so on. But when using these frameworks one might want to, for example, change a particular already pre-written parameter of a certain element to a different one. To do that, they need to find that single line of code which describes that parameter inside the huge source code of the framework and change it to the desired one. Sometimes it can be very tiring and time-consuming. So, we have come up with the idea to create our own framework that would solve this particular problem.

Keywords: web-development framework Python CSS

Nepal has a potential of producing more than 83,000 MW of energy; however, it is harnessing only 1.2% of its capacity. Almost all hydropower plants in Nepal are being exclusively used for producing electricity thereby undermining their multiple-use potential. We developed a prototype to demonstrate the multiple uses of water resources. Our research methodology was based on an extensive literature review and expert consultations. We found that Nepal has a potential for using hydropower plants in multiple ways. Dams can be used for recreational activities, such as boating and swimming, and integrated fish farming. More importantly, water from hydropower can be used for irrigation to increase agriculture production which ultimately contributes to food security. Similarly, produced electricity can be used for modernising agriculture practices. In addition, it contributes to achieving Sustainable Development Goals, particularly eliminating poverty (Goal 1), zero hunger (Goal 2), and affordable and clean energy (Goal 7).

Keywords: agriculture production, food security, hydro power, sustainable development

The use of Blockchain technology to preserve the history of studies at the university will guarantee the authenticity of the document on higher education. Authentication of diplomas through a web resource connected to Blockchain technology will help reduce the number of unskilled employees.

Keywords: Blockchain technology

After studying literature on lakes we found out that the people of Amginsky Ulus is actually not informed about modern state of their lakes. Therefore, the goal was to create an atlas of Amginsky Ulus and to compile the maps of the lakes distributions coefficient. In total, we studied 28 lakes and their morphometric, physico-biological and chemical parameters. We used a set of methods: limnological, hydrochemical, comparative-geographical, geoinformational. Reference book of the investigated lakes was compiled based on summer expeditionary materials, which will make it possible to correctly assess the role of the reservoir in ecosystems and to make recommendations on their protection and rational economic use.

Keywords: atlas; morphometric, physico-biological and chemical parameters; maps
One of the most real consequences of global warming is the degradation of permafrost. Based on this, we set a goal: to study changes in soil temperature in the valley of the Amga River in Amginsky Ulus, Republic of Sakha (Yakutia). In the summer of 2017, we drilled 3 wells 1 m deep. Then we programmed our sensors, and placed them in wells at depths of 0 m and 1 m. And then we recorded our sensors on the GPS. And about a year later we collected data from our loggers. We studied the physical and geographical features of the Amga River valley and drilled 3 wells 1 meter deep. We installed loggers and temperature sensors at different depths, conducted observations and made an analysis of the soil temperature. Conducting such observations allows us to identify the dynamics of the temperature conditions of frozen soils on different types of terrain. This will determine the nature of the degradation of permafrost soils under global warming conditions.

Keywords: permafrost, soil temperature conditions
Guam, on a daily average, treats 5.5 million gallons of sewage per day and the sewage is treated while solids are disposed of in landfills (Guam Waterworks Authority). On a national level, the U.S. EPA estimates that in the United States alone 1.2 trillion gallons of wastewater are emptied into the nation’s fresh and salt waters every year. This means that about 3.28 billion gallons are dumped every single day. Waste is categorized into blackwater and greywater. Blackwater consists of waste containing human bodily fluids and waste from food preparation sinks. Greywater waste consists of sewage that does not contain bodily fluid nor waste from sinks but contains the water from laundry machines or bathroom sinks. In this experiment, the objective is to build a microbial fuel cell, test different types of sewage, and find out if and how much power will be produced from this alternative sewage treatment system. The microbial fuel cell consists of a salt bridge and two chambers: one will be used for water and one will be for the sewage. Inside the chambers are electrodes attached to a wire which will be used to measure the energy. The purpose of this experiment is to test an alternative type of sewage treatment system by building a small-scale microbial fuel cell and testing different types of sewage to determine which type of sewage will produce the most energy and then comparing this sewage system to Guam’s current sewage system.

Keywords: microbial fuel cell, power, sewage, blackwater sewage, greywater sewage, sewage systems

Pacific Island farmers are always trying to figure out ways to increase their subsistence yield despite relatively low rainfall and high acidic soil content. Borrowing influence from Neolithic Chamorros and applying it to a 21st century sustainable organic model, Marianas farmers could grow and harvest rice using less water with enhanced natural soils. For this experiment, create four different types of soils: Guam’s naturally occurring Akina soil, Akina soil mixed with a natural composite mix, Akina soil and biochar, and Akina soil coupled with biochar and the natural composite mix. Prepare the soils before planting, then, plant the rice seedlings and use 150 ml of water every hour for 12 hours. The total amount of water should not exceed 300,000 ml (approximately 80 gallons) during a typical 11-week growth cycle. Since the greenhouse facilitated growth at an accelerated pace, daily monitoring of the plants is essential. After 11 weeks, the rice is good enough to harvest. Cut the rice plant at the base, leaving 5 cm of stalk in the soil for the next cycle of propagation. The conclusion showed the rice with the biochar and compost mix grew at a faster rate and was substantially heavier after drying. Initially, the biochar and soil mixture provided enough nutrients to the soil for faster growth rates, but the plants soon plateaued. Rice planted in the biochar/compost mixture produced the highest amount of the four soils, which supported my hypothesis.

Keywords: rice, Akina Soil, biochar, compost

Water is the main resource that is necessary for the vital functions of the human body and all living things on the Earth, but the degree of pollution of natural reservoirs is growing every year. Today, 95 per cent of all available water resources in the world are polluted to some extent, and the main reason for this is human activity. The process of mining and enrichment of coal has a harmful effect on water quality and the environment as a whole in Neryungri District.

Keywords: water, coal mining, harmful effect

Water is one of the most important things for humans. Up to 60% of the human adult body is made out of water. One out of nine people in the world currently does not have safe access to clean and drink water. In addition, as much as 80% of illness in developing countries are linked to unsanitary water conditions. Good water is essential to the human health, social and economic development, and the ecosystem. However, as population grow and natural environments become degraded, ensuring there are sufficient and safe water supplies for everyone is becoming increasingly challenging. Therefore, Banaquos is produced using recycle fruit items such as banana, orange or apple. Banana peels contain sulphur, nitrogen and carboxylic acid that can remove copper and lead. Lead has been proven to affect the brain and nervous systems. While copper can cause nausea, vomiting, stomach cramps and damage the liver and kidney. Apple peels can also remove a range of dissolved water pollutants through adsorption process. The product was produced as Filter Module, tea bags or as modified filter paper. Percentage of adsorption, ICP metal analysis and PH value has been tested as part of the research. This project is targeted to be able to recycle waste, an alternative to clean water supply and is affordable to rural area citizen.

Keywords: water, filter module
There are various types of trees that are available to plant in Malaysia, which located near the equator. Most of the trees are useful to our daily life. However, deforestation occurs due to the economic value of the tree such as redwood, pine, cedar and others. The effect of the deforestation is harmful to human and environment. While some of the trees that are invaluable will be burnt and lead to air pollution. Pressstage timber is a process that use the timbers that are low in economic value such as plantation teak, mango tree and taku to produce the wood tile that only require lower cost compare to redwood and pine. Besides, pressstage timber does not require any chemical substances and does not produce gases that will lead to air pollution.

Keywords: pressstage timber, pressure, aging, stability, free of chemical substances

Oil spill from petroleum transport affects economy, tourism, and especially environment. There are many methods to clean up the oil spill, but the most efficient on is using carbon aerogel absorbent. Because, carbon aerogel has high porosity, low density and high hydrophobic behavior. This research uses watermelon peel for synthesizing carbon aerogel by hydrothermal carbonization, freeze drying, and pyrolysis. Then characterize carbon aerogels by Scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction spectroscopy (XRD), N2 absorption-desorption isotherm analysis, and oil absorption measuring. The synthesized carbon aerogels have high oil absorption efficiency and hydrophobic behavior as well. Furthermore, porosity of pyrolyzed carbon aerogels dramatically increases.

Keywords: carbon aerogel

Fecal sludge or human feces is produced abundantly on a daily basis, making it a large potential source for the production of methane gas as renewable energy in order to replace diminishing fossil fuels. However, the process of anaerobic digestion in fecal sludge is hampered due to its high nitrogen concentration. As a solution, this study investigates the process of methanogenesis in fecal sludge with the presence of iron powder (Fe) as an electron donor. Five treatments of 40g of fecal sludge were applied with 0g (control treatment), 0.5g, 1.0g, 1.5g, and 2.0g of Fe respectively, and methane production was measured over a duration of 7 days. The results show that addition of 2.0g of Fe (treatment with highest Fe added) had produced the highest volume of methane at 198.6 ml, followed by 1.0g Fe at 193.1 ml, 1.5g Fe at 185.4 ml, 0.5g Fe at 171.8 ml, and 0g Fe at 150.5 ml of methane. Addition of iron powder (Fe) had showed a positive correlation with the volume of methane produced. This proves that methane production in fecal sludge can be enhanced with the addition of iron powder as an electron donor, making fecal sludge a strong and abundant potential source for renewable energy.

Keywords: methanogenesis, anaerobic digestion, fecal sludge, methane, iron powder
INVESTIGATION OF POLYETHYLENE DEGRADATION BY BACILLUS CEREUS USING PEPTONE EXTRACT FROM PEANUT SHELLS

Tewis Pattarawarin
Kamnoetvidya Science Academy, Thailand
Supervisor: Arjaree Thirach, Siriporn Suntiworapong
Email: tewis.p@kvis.ac.th

In Thailand, peanut shell consumption leads to a massive amount of waste. Microplastic contamination, mainly polyethylene, in marine environment has become of great concern. Some bacteria, such as Bacillus cereus, have been found to help reduce microplastic waste by producing enzymes, including lipase. This study focuses on using peptone extracted from peanut shells in B. cereus culture media to enhance enzyme production and improve PE degradation. The experiment was divided into 3 parts. First, peptone was extracted from peanut shells using papain, then verified by Bradford protein assay and SDS-PAGE. Second, B. cereus were cultured for 28 days in the media containing either commercial or peanut peptone. The PE degradations were compared using mass and SEM analysis. Third, the supernatants from 7 days-cultivation were collected for lipase assay. The results verified that the extract from peanut shells contained proteins, and can be implied as peptone. There was no difference in cell growth between the cultures containing commercial and peanut peptone, indicating the possible substitution for bacterial culture. Moreover, SEM images show a decreasing trend in PE degradation, with different roughness values, when adding higher concentrations of extracted peptone. Lipase production yield, similar to roughness analysis, also shows a decreasing trend, implying that a low concentration of peanut peptone is more optimal for PE degradation.

Keywords: microplastics, PE degradation, peanut shells, bacillus cereus, peptone, lipase

DETECTION OF AN N-ACETYLMURAMOYL-L-ALANINE AMIDASE-LIKE PROTEIN ENCODING GENE IN BACILLUS LICHENIFORMIS

Alyssa Kaye Ragasa, Kristina Marie Dela Cruz
Philippine Science High School, Philippines
Supervisors: Donna Salve Comes-Hipolito, Dr. Neil Andrew D. Bascos
Email: alyssakaye.ragasa@gmail.com, delacruz kristinamarie@gmail.com

N-acetylmuramoyl-L-alanine amidase (NALA) is a protein known for its toxic properties which have many uses in the agricultural industry, they serve as biopesticides and as genetic instructions for insect-resistance. This study aims to determine the presence of the NALA protein encoding gene in Bacillus licheniformis, a less studied Bacillus bacterium, to determine its potential use for the agricultural industry. The genomic DNA (gDNA) of B. licheniformis isolated from soil (Philippines) was extracted through magnetic bead-based extraction. Specific gene amplification was done with a polymerase chain reaction (PCR) using forward and reverse primers based on bacteriocin genes from other Bacillus species. To determine the optimal annealing conditions for PCR, 20 runs were done across a temperature range of 46-56°C. At 46°C, agarose gel electrophoresis (AGE) revealed the production of the desired amplicon (300 bp), which was excised and sequenced with capillary sequencing. The resulting sequences were analyzed with the Basic Local Alignment Search Tool (BLAST) which revealed a 96.4% similarity with NALA from Bacillus thuringiensis. Up until now, no studies have been done to verify the presence of this protein-producing gene in B. licheniformis. This study reveals the potential of B. licheniformis as a source for this industrially relevant enzyme, and highlights the usefulness of tapping genetic information for defining ways to enhance industries with alternative strategies.

Keywords: protein; Bacillus licheniformis; gene identification
In Yakutia, birch forests are one of the most common deciduous formations. They perform important biospheric (oxygen evolution, production of organic substances), environmental stabilizing (anti-erosion, water, soil, permafrost, sanitary-hygienic), social (recreational, therapeutic) functions. The role of birch in everyday life is great: ornamental, building, fuel wood and a source of medicinal raw materials. Birch forests of Yakutia are still not well understood. In total, there are 6 species of birch trees in Yakutia. They form diverse interspecific hybrids in areas where their natural habitats are combined, which are extremely difficult to identify by morphological methods. We hypothesized that many different intrageneric hybrids of birch trees grow in the Lower Lena basin, and that the hybridization process significantly increases their morphological variability. In this regard, the goal of our research was to study the morphological variability of species of the genus Betula (Betulaceae) and to identify hybrids in the Lower Lena basin. We set the following tasks: 1) to study the literature on birches, and their variability and variability of species of the genus Betula (Betulaceae) and to identify hybrids in the Lower Lena basin. We set the following tasks: 1) to study the literature on birches, and their variability and variability of species of the genus Betula, as well as to identify hybrids by external characteristics; 3) analyze the nucleotide polymorphism of the ITS region of the rDNA of species and hybrids, confirm or refute the hybrids we have identified.

Keywords: Betula, Yakutia, hybridization, hybrid indices, ITS-region rDNA

In Yakutia, more than 36 species of fish in rivers and lakes are crucian carp, vendace, omul, chum, nema, and sturgeon - are most often used as food. In Yakutia, the meat-and-fish nutrition prevails, historically due to the extreme natural conditions of Yakutia. The harsh continental climate requires special adaptation of the organism in this territory. Fish meat is characterized by fine taste, but also rich in valuable amino acids (valine, leucine, threonine, lysine, glycine, alanine), proteins, carbohydrates, minerals, other fatty acids and it is easier to digest them. The study of the amino acid composition after hydrolysis showed the content of essential amino acids - alanine, glycine, threonine, valine, leucine in all the fish samples we studied. Phenylalanine and aspartic acid were not detected by TLC in any sample, which indicates their minimum content in the samples. Tryptophan was identified in carp, sturgeon and vendace. Isoleucine was detected in vendace, crucian carp, sturgeon, omul and broiler. Thus, the amino acid composition of river and lake fish of Yakutia was determined, which are most easily hydrolyzed and make up the protein basis of fish meat.

Keywords: Yakutia fish, amino acids, proteins, carbohydrates, minerals, fatty acids

---

The issue of frequent and long-term children’s illness remains relevant and continues to attract pediatricians’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. That is why the use of local technology, in particular inhalation with essential oils (EM), which has antiseptic, antiviral, bactericidal and anti-inflammatory effects and does not require a special inhaler, deserves special attention in improving the health of children in organized groups. The goal is to study organo-mineral filler to plaster mixtures inhalation on the basis of local zeolite for school-age children to prevent ARVI. We studied an extensive literature on plaster mixtures, properties of EM, the incidence of school-age children to find out the mechanism of penetration of essential oils in the human body, to develop a methodology for the manufacture of organo-mineral filler based on local zeolite, to make samples of composite plaster using experiment planning methods, to explore the physico-chemical parameters and the subjective value of the smell of composite plaster mixture, to investigate the effect of passive inhalation with organo-mineral filler on the prevention of ARVI. During the study the following methods were used: the method of organo-mineral filler manufacturing, methods of composite plaster sample making, methods of physical properties study, methods of manipulation of experimental data, methods of making two-way layout planning of experiment, research methods of incidence of illnesses, research methods of pediatrics’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. The harsh continental climate requires special adaptation of the organism in this territory. Fish meat is characterized by fine taste, but also rich in valuable amino acids (valine, leucine, threonine, lysine, glycine, alanine), proteins, carbohydrates, minerals, other fatty acids and it is easier to digest them. The study of the amino acid composition after hydrolysis showed the content of essential amino acids - alanine, glycine, threonine, valine, leucine in all the fish samples we studied. Phenylalanine and aspartic acid were not detected by TLC in any sample, which indicates their minimum content in the samples. Tryptophan was identified in carp, sturgeon and vendace. Isoleucine was detected in vendace, crucian carp, sturgeon, omul and broiler. Thus, the amino acid composition of river and lake fish of Yakutia was determined, which are most easily hydrolyzed and make up the protein basis of fish meat.

Keywords: organo-mineral filler, essential oils, passive inhalations, plaster mixture

---

The issue of frequent and long-term children’s illness remains relevant and continues to attract pediatricians’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. That is why the use of local technology, in particular inhalation with essential oils (EM), which has antiseptic, antiviral, bactericidal and anti-inflammatory effects and does not require a special inhaler, deserves special attention in improving the health of children in organized groups. The goal is to study organo-mineral filler to plaster mixtures inhalation on the basis of local zeolite for school-age children to prevent ARVI. We studied an extensive literature on plaster mixtures, properties of EM, the incidence of school-age children to find out the mechanism of penetration of essential oils in the human body, to develop a methodology for the manufacture of organo-mineral filler based on local zeolite, to make samples of composite plaster using experiment planning methods, to explore the physico-chemical parameters and the subjective value of the smell of composite plaster mixture, to investigate the effect of passive inhalation with organo-mineral filler on the prevention of ARVI. During the study the following methods were used: the method of organo-mineral filler manufacturing, methods of composite plaster sample making, methods of physical properties study, methods of manipulation of experimental data, methods of making two-way layout planning of experiment, research methods of incidence of illnesses, research methods of pediatrics’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. The harsh continental climate requires special adaptation of the organism in this territory. Fish meat is characterized by fine taste, but also rich in valuable amino acids (valine, leucine, threonine, lysine, glycine, alanine), proteins, carbohydrates, minerals, other fatty acids and it is easier to digest them. The study of the amino acid composition after hydrolysis showed the content of essential amino acids - alanine, glycine, threonine, valine, leucine in all the fish samples we studied. Phenylalanine and aspartic acid were not detected by TLC in any sample, which indicates their minimum content in the samples. Tryptophan was identified in carp, sturgeon and vendace. Isoleucine was detected in vendace, crucian carp, sturgeon, omul and broiler. Thus, the amino acid composition of river and lake fish of Yakutia was determined, which are most easily hydrolyzed and make up the protein basis of fish meat.

Keywords: organo-mineral filler, essential oils, passive inhalations, plaster mixture

---

The issue of frequent and long-term children’s illness remains relevant and continues to attract pediatricians’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. That is why the use of local technology, in particular inhalation with essential oils (EM), which has antiseptic, antiviral, bactericidal and anti-inflammatory effects and does not require a special inhaler, deserves special attention in improving the health of children in organized groups. The goal is to study organo-mineral filler to plaster mixtures inhalation on the basis of local zeolite for school-age children to prevent ARVI. We studied an extensive literature on plaster mixtures, properties of EM, the incidence of school-age children to find out the mechanism of penetration of essential oils in the human body, to develop a methodology for the manufacture of organo-mineral filler based on local zeolite, to make samples of composite plaster using experiment planning methods, to explore the physico-chemical parameters and the subjective value of the smell of composite plaster mixture, to investigate the effect of passive inhalation with organo-mineral filler on the prevention of ARVI. During the study the following methods were used: the method of organo-mineral filler manufacturing, methods of composite plaster sample making, methods of physical properties study, methods of manipulation of experimental data, methods of making two-way layout planning of experiment, research methods of incidence of illnesses, research methods of pediatrics’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. The harsh continental climate requires special adaptation of the organism in this territory. Fish meat is characterized by fine taste, but also rich in valuable amino acids (valine, leucine, threonine, lysine, glycine, alanine), proteins, carbohydrates, minerals, other fatty acids and it is easier to digest them. The study of the amino acid composition after hydrolysis showed the content of essential amino acids - alanine, glycine, threonine, valine, leucine in all the fish samples we studied. Phenylalanine and aspartic acid were not detected by TLC in any sample, which indicates their minimum content in the samples. Tryptophan was identified in carp, sturgeon and vendace. Isoleucine was detected in vendace, crucian carp, sturgeon, omul and broiler. Thus, the amino acid composition of river and lake fish of Yakutia was determined, which are most easily hydrolyzed and make up the protein basis of fish meat.

Keywords: organo-mineral filler, essential oils, passive inhalations, plaster mixture

---

The issue of frequent and long-term children’s illness remains relevant and continues to attract pediatricians’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. That is why the use of local technology, in particular inhalation with essential oils (EM), which has antiseptic, antiviral, bactericidal and anti-inflammatory effects and does not require a special inhaler, deserves special attention in improving the health of children in organized groups. The goal is to study organo-mineral filler to plaster mixtures inhalation on the basis of local zeolite for school-age children to prevent ARVI. We studied an extensive literature on plaster mixtures, properties of EM, the incidence of school-age children to find out the mechanism of penetration of essential oils in the human body, to develop a methodology for the manufacture of organo-mineral filler based on local zeolite, to make samples of composite plaster using experiment planning methods, to explore the physico-chemical parameters and the subjective value of the smell of composite plaster mixture, to investigate the effect of passive inhalation with organo-mineral filler on the prevention of ARVI. During the study the following methods were used: the method of organo-mineral filler manufacturing, methods of composite plaster sample making, methods of physical properties study, methods of manipulation of experimental data, methods of making two-way layout planning of experiment, research methods of incidence of illnesses, research methods of pediatrics’ attention. One of the leading pathophysiological bases of frequent diseases of schoolchildren is a reduction in the effectiveness of local protection factors. The harsh continental climate requires special adaptation of the organism in this territory. Fish meat is characterized by fine taste, but also rich in valuable amino acids (valine, leucine, threonine, lysine, glycine, alanine), proteins, carbohydrates, minerals, other fatty acids and it is easier to digest them. The study of the amino acid composition after hydrolysis showed the content of essential amino acids - alanine, glycine, threonine, valine, leucine in all the fish samples we studied. Phenylalanine and aspartic acid were not detected by TLC in any sample, which indicates their minimum content in the samples. Tryptophan was identified in carp, sturgeon and vendace. Isoleucine was detected in vendace, crucian carp, sturgeon, omul and broiler. Thus, the amino acid composition of river and lake fish of Yakutia was determined, which are most easily hydrolyzed and make up the protein basis of fish meat.

Keywords: organo-mineral filler, essential oils, passive inhalations, plaster mixture
LIFE SCIENCES

LIS05

SPECTROSCOPIC ANALYSIS OF POLYETHYLENE USED IN HIP AND KNEE PROSTHETICS

Arne Klemen Marušič, Matic Jože Grdadolnik
Gimnazija Vič, Slovenia
Supervisor: Prof. Alenka Mozer, Dr. Urban Novak
Email: arne.marus@sezam.com, matic.grdadolnik@outlook.com

The number of people with functional immobility due to the pathological conditions of knee or hip joints is increasing, because of the aging of human population on one side, and injuries in accidents on the other; this can be solved by hip or knee replacements. Such a surgery is very expensive, so it is very important that replaced artificial hip or knee is of the best quality that ensures no further complications.

The weakest point in artificial joints represents the material - ultra-high molecular weight polyethylene (UHMWPE), which is the ideal polymer for such use. However, any small deviations in chemical structure of the polymer may result in change of mechanical behavior of the replaced joint. We need a fast, accurate and non-destructive method to test the polymer before surgery.

Since the mechanical properties of UHMWPE are closely related to its chemical composition, we systematically applied infrared (IR) and Raman spectroscopy to probe the structure of UHMWPE. We have found appropriate spectral parameters, which are sensitive to degree of crystallinity, degree of cross-linked chains and level of oxidation. At first, we tested the proposed methodologies on samples with known structure. We applied vibrational spectroscopy to analyze the chemical structure of two types of UHMWPE. Our findings were also applied to real samples of damaged artificial joints.

The results have proven that vibration spectroscopy is a very efficient tool for characterization of the UHMWPE.

Keywords: vibrational spectroscopy, UHMWPE, artificial joints, analysis, crystallinity, crosslinking, oxidation

LIS06

COCOA POD HUSK AS A FOOD ALTERNATIVE HIGH FIBRE COCOA POD HUSK GRANULES

Carina Jane Winoto
Center for Young Scientists, Indonesia
Supervisor: Pungki Waluyo
Email: carinajanew@gmail.com

Indonesia is the third biggest producer of cacao, reaching 792,791 tons of cocoa seeds. However, the cocoa pod husks are disposed of, creating a waste of 2,585,188 tons every year. Indonesia is also known as the fourth most populated country with 21.8% people experiencing obesity. One of the reasons this might be due is fibre deficiency. In the modern era, a decrease in fibre consumption can be seen. Those backgrounds lead on to this research goal which is to utilize cocoa pod husks as a dietary food alternative through fermentation.

To do this, 13 samples based on yeast concentration to distilled water (0g/250ml, 10g/250ml, 20g/250ml and 30g/250ml) and the duration of fermentation (0 hours, 24 hours, 48 hours, 72 hours and 96 hours) were created as powder. The samples were tested for its fibre and protein levels, amount calories in 1 gram and its water and lipid absorption. For fibre percentage, R1D3 has the highest (41.01%) and R1D4 with the lowest (18.25%). This corresponds with its water absorption, R1D3 at the highest (38.52%) while R3D4 has the lowest (21.82%). For protein composition, R2D2 as the highest (7.5%) while R3D4 had 2.4%. This also relates to it’s lipid absorption, R2D2 at the highest (22.72%) and R3D4, the lowest (14.05%). For calorie estimation, R3D3 has the highest amount (1.03 cal/1 gram) with untreated powder at 0.5 cal/1 gram. Thus showing that R1D3 is the best sample with the highest fibre percentage (41.01%) and water absorption (38.52%) with its protein levels and lipid absorption being 7.08% and 17.37% and an estimation of 0.7 calories in 1 gram.

This concludes that fermentation increases fibre percentage until a maximum time limit (D3), making these cocoa pod husks possible as a dietary food alternative.

Keywords: cocoa pod husk, dietary food alternative, fibre
AN AUTOMATED MICROFLUIDIC PLATFORM FOR FOOD SAFETY AND HUMAN ALLERGY ANALYSIS

Weng I Leong, Chi U Lam
The Association for Promotion of Science and Technology of Macau, Macau
Supervisor: Io Ho Fai
Email: leongfeng@gmail.com, lamchiu1201@gmail.com

Food allergy is a growing problem around the globe. We used a healthcare system with a device which can detect what are the patients allergic to, and a detector which can prevent patients from ingesting an allergen. We used granulocyte activation test to help us analyze the patients. It is an effective approach to the diagnosis of allergic disease by measuring the release of mediators like prostaglandin D2 and beta-hexosaminidase in vitro. The mediators are detected by using an ELISA chip and an enzyme detecting chip. Combining both techniques can help us efficiently and accurately diagnose what patients are allergic to. Moreover, we also wanted to prevent patients from ingesting allergens. We personalized an allergen detector chip by using ELISA. However, the experimental procedure is time-consuming. Therefore, we automated the system. In conclusion, our system consists of four parts:

1. Cell Chip: The chip allows granulocytes to be cultured on the chip for allergen stimulations.
2. ELISA Microfluidic Chip: The design of the chip can be customized according to the number of samples and kinds of allergens. Therefore, we can use it to detect mediators or allergens.
3. Enzyme Detecting chip: A chip that allows beta-hexosaminidase to react with its substrate, therefore diagnosing an allergic reaction.
4. Automated Reagent Delivery System: A series of pumps can be programmed to deliver different chemical solutions to different chips, and controlled by software.

Keywords: food allergy, ELISA, microfluidic chip, food safety

IDENTIFICATION, CLONING AND RECOMBINANT EXPRESSION OF NOVEL BIOACTIVE PEPTIDES FROM CORAL: CLUES TO POTENTIAL NEW THERAPEUTICS FOR HUMAN DEFENSES

Chun Hei Fong
The Association for Promotion of Science and Technology of Macau, Macau
Supervisor: Io Ho Fai
Email: fongch929@gmail.com

Invertebrates only have the innate immunity, which can be divided into humoral and cellular defenses. Humoral defense usually involves components released from the cells, including antimicrobial peptides, proteases and proteinase inhibitors. In our project, RNA-Seq was used to obtain the transcriptome data of a coral species, Palythoa Caribaeorum. The transcriptome data was blasted against a protein database to predict putative functional peptides. Two novel coral peptides show high similarity to the Kazal type domain which was previously reported to have bacteria and serine protease inhibitory functions. Therefore, we further characterized these peptides for antimicrobial activity in bacteria cells, inhibitory functions to serine proteases. Consequently, they are found to be able to inhibit E. coli and E. faecium effectively and exhibit a novel antibiotic, vancomycin.

Meanwhile, they also found to be able to inhibit trypsin, elastase. They also showed low toxicity in cardiomyoblast. The results indicate that they can inhibit pathogens like E. coli, E. faecium, trypsin, and elastase effectively making the novel peptides provide insight into a discovery of potential therapeutic agents from a marine invertebrate.

Keywords: coral, bioinformatics, antibacterial peptide, recombinant DNA technology

REVERSIBLE THERMO-C FUSE

Damrongrat Siriwanna
Kamnoetviya Science Academy, Thailand
Supervisors: Dr. Suranan Anantachaishilp, Dr. Min Medhisuwakul
Email: phil@hotmail.com

Nowadays, fuse is normally used as the devices to prevent the overcurrent. However, it has disadvantage and inconvenience for practical use. For example, fuses are single-time-use; replacing fuse is needed which causes inconvenience and electronic waste. This research aims to invent an innovative thermal fuse which has a reversible ability to enhance users experience. Thermo-C fuse uses Curie temperature, which involves losing of metal magnetic property, to be a mechanism of opening circuit. The Ni-Cu nanoparticle is used as a Curie material due to its Curie temperature at 63 degree Celsius. We synthesized magnetic nanoparticle by Sol-Gel method using Cu(NO3)2·3H2O and Ni(NO3)2·6H2O as substrates. Then, the sample was reduced under H2/N2 gas, and the silica matrix was replaced with hydrazine hydrate. The nanoparticle was characterized by using SEM, XRD, TEM, and VSM. The morphology and crystallinity confirmed the product of nanoparticle synthesis to be Ni-Cu alloy. During the reduction, the size of particles decreases after been reduced. The elemental composition of the material comprised of Ni and Cu in the ratio of 0.62:0.21. In conclusion, the material that was synthesized is Ni-Cu alloy. Next, the particle was mixed with binder PEDOT:PSS at concentration of 8% by mass and was compressed into a rod. Furthermore, the calculation of nanoparticle rod dimension is illustrated, also the designing of Thermo-C fuse including method of product testing.

Keywords: Curie temperature, reversible, fuse, nickel copper alloy, overcurrent

COMPARATIVE STUDY OF USE OF FOLDSCOPE AND LIGHT MICROSCOPE FOR THE MORPHOLOGICAL STUDY OF SOME COMMON INSECTS AND EFFECTIVE APPLICATION IN LOW BUDGET

Dikshya Sanjel, Arjun Saru
Asmita English School, Nepal
Supervisor: Binod Kumar Dulal
Email: dulalbinod1@gmail.com

Dr. Manu Prakash developed a cheap microscope made up of paper named as foldscope. It is portable and can be carried by the students of all level for diagnostic study of microorganisms. It is more advantageous to those reason of the world where people cannot afford high instrumental budget. Here in Asmita English school we assembled it by folding on the dotted lines, inserted battery and lens. Preliminarily we used foldscope to test the morphology studies of tiny insects. The various physical parts such as eyes, head, antennae, legs, proboscis, wings can be studied more prominently. Our surroundings are the home of thousands of tiny insects. To study the morphology of insect in their natural habitat found around us using foldscope is possible, morphological study of insects helps us to identify the species, its characterization and classification. Surroundings which is home to the thousands of living organisms. Collection of insects and dissecting them using Common laboratory tools then was placed on the slide and observed using foldscope. Every insect has its own structures it was possible to observe and count the hair on the leg of insects which can be beneficial for the entomologist to study and identify the species in the working field without electricity. It can also be beneficial to farmers, Scientist and Students for the research and discovery.

Keywords: morphology, foldscope, microscope, dissect, entomologist
THE VITAL STATUS OF THE POPULATION OF VERONICA INCANA IN UST-ALDANSKY ULUS

German Okhlopkov
V.V. Alekseev Myuryu Gymnasium for Boys, Ust-Aldansky Ulus (District), Republic of Sakha (Yakutia), Russia
Supervisor: Yuliia Burtseva
Email: germanokhlopkov42@gmail.com

The work is devoted to the study of important population characteristics: the life status of species Veronica incana L. and vitality structure of the populations of the species. The study took two years and was carried out with the use of geo-botanical and cenopopulation methods. The habitat of Veronica incana of both prairie and meadow species in the terms of moisturizing, pretty rich soil, mild or moderate impact of grazing are described. We found out the account of 10 morphological parameters of 20 - 30 Veronica incana species in each cenopopulation. The comparison of mean values for 2015 – 2017 showed that the indicators are stable, the changes relate to the quantitative parameters of the number of pairs of leaves and number of flowers. The evaluation of the life state of cenopopulation is given, and a prosperous condition of the majority cenopopulations is determined. Also, in this paper we consider the question of vitality dependence on the complex of environmental factors. It was revealed that a significant impact on the IVC has a wealth-salinity factor. Veronica incana life strategy is defined as a stress-protective one; the species is patient’s samples. Thus, the life state of Veronica incana cenopopulations at the moment is respectively optimal and is connected with ecological and phytosemotic conditions of habitats.

Keywords: cenopopulation, vitality structure, geo-botanical and cenopopulation methods, patient...
Our work focuses on the Siberian crane flyway, especially wintering sites of the eastern population of the Siberian crane, that are currently known and discovered. The eastern population of the Siberian crane (Grus Leucogeranus) ranks third among 15 rare species of cranes in the world, after the American and Japanese ones (Meine, Archibald, 1996). According to census data in places where birds accumulate during wintering, today there are 3,500-4,000 Siberian cranes. This crane is listed on the IUCN Red List of Threatened Animals as most endangered species (Bird Life International 2000). The species is included in the Red Books of the Russian Federation and the Republic of Sakha (Yakutia) and protected under the Ramsar and Bonn Conventions. The relevance of the work is that on the Lake Poyang in China there is an excessive crowding of Siberian cranes in winter and decreasing habitats optimal for their wintering, due to the degradation. The goal of the paper is to study wintering grounds and living conditions of the eastern population of Siberian cranes in winter time.

**Keywords:** Siberian crane, Grus Leucogeranus, eastern population of the Siberian crane, wintering grounds, Lake Poyang in China

---

**THE ENVIRONMENT OF INTRODUCED WOOD BISON IN THE TAIGA ZONE OF YAKUTIA**

Sakhayana Alekseeva
A. Osipov Berdigestyakh Secondary School, Gorny Ulus, Republic of Sakha (Yakutia), Russia
Supervisor: Sargylana Olenova
Email: alsaka2108@gmail.ru

The wood bison have been studied in the process of their adaptation in order to study the environment and the adaptation process of the introduced wood bison in Yakutia, and materials on the seasonal use of pastures and daily bison activity are obtained for the first time in Central Yakutia by installing satellite transmitters on animals. The work uses generally accepted guidelines for ground surveys, geobotanical studies, and also data on satellite monitoring of bison using satellite radio collars of the Argos system. We conducted research on the environment of the wood bison in the process of their adaptation both in the pen and in the wild. We processed data in the GIS program Google Earth Pro obtained from satellite transmitters worn on bison before being released. The research of the nutrition of wood bison shows that the fodder resources of Central Yakutia fully correspond to the nutritional needs of this species, and an analysis of the data obtained from satellite transmitters indicates that only 15 sq.km are enough for a small herd of bison in the middle valley of the Sinaya River. Thus, there are practically no climatic factors limiting the number of wood bison in Yakutia. In general, the reacclimatization of the wood bison on the territory of the Republic of Sakha (Yakutia) is successful.

**Keywords:** wood bison, adaptation, monitoring, reacclimatization

---

**EXTRACTION AND MODIFICATION OF ALPHA-MANGOSTIN**

Supalak Tongtantai
Suranaree University of Technology, Thailand
Supervisor: Dr. Sakesit Chumnarnsilpa
Email: pattranith2010@gmail.com

Mangosteen is known for its excellent taste and caused tons of mangosteen peels waste every year. Mangosteen peels are rich of xanthones, especially the group called alpha-mangostin, which has biological properties including antioxidant, anti-bacterial, anti-inflammatory and anti-cancer activities. This project aims to extract alpha-mangostin from Mangosteen peel and it to alter properties for various applications. Alpha-mangostin was extracted from dried mangosteen peels with ethanol and further purified and identified by Thin Layer chromatography (TLC) and Nuclear Magnetic Resonance (NMR). It was found that Alpha-mangostin was good extracted from dried mangosteen peels (30 g) by using 70 % ethanol to obtain 150 mg alpha-mangostin. The alpha-mangostin was then modified by treating with sodium hydride (NaH) and then reacted with propargyl bromide at 0°C for 5 hours. Further purification and verification by TLC, indicated the formation of two non-polar bands (A and B). The reaction mixture was extracted with ethyl acetate and yielded A as a major product. Result from NMR indicated that the product A was di-propargyl-alpha-mangostin. The modified product (di-propargyl-alpha-mangostin) is more active than the parent alpha mangostin. So it can be easily further modified to have other properties for various suitable applications.

**Keywords:** mangosteen peel, xanthones, alpha-mangostin, modification of alpha-mangostin
PREPARATION AND FUEL PROPERTIES OF MICROEMULSION-BASED BIOFUEL

Tawin Makaraphirom
Suranaree University of Technology, Thailand
Email: tawin2002@gmail.com

Nowadays, searching for an alternative energy from renewable resources is crucial in order to replace the use of fossil fuel. This research project focuses on developing microemulsion-based biofuels. It was formulated from a mixture of vegetable oil and ethanol using mixed surfactants with co-surfactants. The characteristic and fuel properties of prepared microemulsion-based biofuels were investigated. The microemulsion systems were studied via pseudo ternary phase diagram and phase behavior. The enhance of miscibility phase behavior by using span80/tween80 surfactant with co-surfactants (1-octanol and 1-butanol) was evidenced. The long chain co-surfactant (1-octanol) gave closer fuel properties to standard biodiesel and diesel than 1-butanol. The higher content of corn oil than ethanol had higher heating value, viscosity and specific gravity. However, when compared with standard biodiesel and diesel, the heating value was lower whereas viscosity and specific gravity was higher. One of the most comparable properties of microemulsion-based biofuel to the standard biodiesel and diesel which had the highest cetane number (41.38), higher heating value (37.10MJ/kg) and viscosity (14.01mm2/s), consisted of corn oil 50%, ethanol 10%, and surfactant/co-surfactant 40%. This microemulsion-based biofuel will be chosen to be blended with diesel or biodiesel and tested in the standard engine for its fuel performance and emission.

Keywords: microemulsion-based biofuel, surfactant, co-surfactant, pseudo ternary phase diagram, corn oil, ethanol

MELTING ICE AND PICK’S THEOREM

Aelina Savvinova
A.N. Chusovskoy Nyurbinsky Technical Lyceum, Nyurbinsky District, Republic of Sakha (Yakutia), Russia
Email: aelina_savvinova@mail.ru

The article examines the areas of non-polytope polygons with vertices at the nodes of the grid, polygons with one or n holes and polygons with n holes which have one common vertex in the grid node. The area formulas for each case have been analytically derived and proved using the thought experiment of Melting Ice method. Using this method, it is possible to calculate the areas of any polygon on checkered paper more efficiently.

Keywords: melting ice, Pick’s theorem, holes, polygon

AN APPROACH FOR TRAFFIC MITIGATION IN A MATHEMATICAL WAY

Bibek Dhungana
Omega College, Lalitpur, Nepal
Email: bibek1099khanal@gmail.com

This project highlights the potential of graph theory in solving real life problems. Besides ease of algebraic manipulation, the principal benefit of a graph theoretic approach is the ability to detect and thus preserve topological characteristics of map objects such as isolation, adjacency, and connectivity. This article emphasizes the benefits from a map-generalization perspective. There might be various use of the graph theory, but this project majorly co-insides with the idea of traffic management. Graph theory and minimum traverse-time algorithms provide a model of the network. This coupled with minimum cut graph model form a model referred to as the one-way road network model for solving the above-mentioned problem. A real-life case study is used for testing and validating the model. Two-way road networks are represented by undirected graphs and one-way road networks by directed graphs. The problem then becomes one of converting an undirected graph to a strongly-connected directed graph. In order to obtain a true-to-live, efficient one-way road network, the topological aspects of network efficiency incorporating realistic delay times at junctions is explored. The variables in use to manage the traffic from two-way to one-way are found out. The variables then used in formula are used to find the solution. This concept works for the welfare of people in urbanization and making a smart city.

Keywords: adjacency, connectivity, smart city, traffic mitigation, urbanization
Pi is commonly known in the society, as pi has been used in numerous aspects in life. Pi is used for construction of buildings, quantum physics, space travel, music theory, medical procedure, and so on (Atkinson, 2014). Pi is most influential in the field of engineering, especially in calculation containing circular values. Therefore, π is an important factor in our life which are taught to us since elementary. In elementary, pi is taught to students with the value of $3.14$ & $22/7$. In high school, pi is taught to 15 digits of pi. However, in various fields, such as architectural engineering, more accurate digits of pi are needed. Due to Pi’s endless post-decimal digits, a challenge has arisen, to obtain the most accurate digits of Pi. There are various formulas to calculate the digits of pi, from these formulas, 5 different formulas are observed and analysed, such as Bellard's formula, Gregory-Liebniz's formula, & Bailey-Borwein-Plouffe's formula. Time and the amount of iteration are induced as the variables in the observation. Aside from those variables, the accuracy of the digits of pi generated is appointed as a factor in selecting the most efficient & effective formula, by comparison to the real digits of pi. Therefore, this research is intended to investigate the formula that is capable of producing the digits of $\pi$ with the highest accuracy and highest time efficiency.

**Keywords:** Pi, comparative analysis

---

**BASKET TECH - LEADING EDGE BASKETBALL COACHING APP**

Muhammad Amirul Faiz Bin Mohamed Asri  
Sultan Alam Shah School, Malaysia  
Supervisor: Samsiah Binti Radiman  
Email: myso.malaysia@gmail.com

Playing basketball most players have the difficulty in shooting a free throw. Aiming to score precisely and accurately have always been one of the main issues faced by any basketball players especially during free throw. This project is to develop a device added with hand phone apps to measure the accurate angle and velocity of the ball which enabling the player to score better in their free throw based on the mathematical theory of projectile. The buzzer will produce sound after the player made a shot. Based on the data obtained from the gyroscope which calculate angle and accelerometer sensor which calculate velocity of the ball, the device will predict if the ball enters the hoop or not. If the ball enters the hoop or not, the buzzer will produce sound. Therefore, the free throw will be more accurate and precise, thus the skills of the basketball players will be enhanced. With that in mind, by using the calculations behind the theory of projectile motion, it will suggest a perfect angle in free throw for any basketball players and it is able to correct the hand-repositioning during the free throw by using the apps.

**Keywords:** basketball, scoring

---

**FIBONACCI IN MUSIC: INVESTIGATION OF THE FIBONACCI SEQUENCE IN INDONESIA’S TRADITIONAL MUSIC**

Raymond Sean Halim  
Center for Young Scientists, Cita Hati Senior School West, Surabaya, Indonesia  
Email: raymond@kvis.ac.th

The Fibonacci sequence is commonly used in many aspects of life. In school, Fibonacci can be learned with Golden Ratio in music, art (architecture), and physics (engineering). The topic of music instruments and songs with the Fibonacci sequence is generally known around the world. Indonesia itself has researchers that discovered about the use of music intervals and the Fibonacci sequence. Hence, this research focuses further on the connection between the Fibonacci sequence and music songs. A few numbers of journals stated that the Fibonacci sequence can affect the musical values from a song. It is specified that the more Fibonacci pattern a song contains, it will be more pleasing to the human’s ear. Therefore, this research is intended to observe the validity of the statement. 100 traditional songs of Indonesia are observed using the method shown by the journals. The method to calculate the Fibonacci pattern is by using music intervals. The steps are first, find the intervals from every note to the note after. The next step is to identify where there are 2 Fibonacci numbers of the interval beside one another. Then, use the total number of notes to divide the total number of notes with the Fibonacci pattern to calculate the percentage. A table is made to gather the results of the Fibonacci pattern and adding information about which province and what scale is used. From the results table, a graph is then created to analyze the pattern in a more detailed way.

**Keywords:** Fibonacci sequence, golden ratio

---

**CLOSING IN ON PI: COMPARATIVE ANALYSIS FOR DETERMINING PI**

Kenneth Samuel Djasmin  
Center for Young Scientists, Cita Hati Christian School West Campus Indonesia  
Email: kennethdjasmin@gmail.com

The mathematical model of riffle shuffle has been a subject of some studies. Whereas most of these regards the cards as all different, in 2006 Conger and Viswanath treated some of them as identical and investigated the implications. When the initial deck is arranged in alternating reds and blacks, they showed that two outcomes are equally likely if a number of particular transformations can turn one of them into the other. This transformation, which may be viewed as a reversible string rewriting system, partitions the set of outcomes into equivalence classes. They conjectured that the number of such classes is precisely $(n+3)2^{(n-2)}$ where $n$ is the number of cards of each color. In this paper, the assertion is proven true by the method of invariant and derivation of canonical forms.

**Keywords:** transformation, riffle shuffle, alternating cards, equivalence class

---

**CLASSES OF EQUALLY LIKELY OUTCOMES OF RIFFLE SHUFFLES ON AN ALTERNATING DECK OF REPEATED CARDS**

Phunnawat Khampheng  
Kamnoetviya Science Academy, Thailand  
Supervisors: Thanaporn Thanodomdech, Gunaphan Tassanasophon  
Email: phunnawat.k@kvis.ac.th

The mathematical model of riffle shuffle has been a subject of some studies. Whereas most of these regards the cards as all different, in 2006 Conger and Viswanath treated some of them as identical and investigated the implications. When the initial deck is arranged in alternating reds and blacks, they showed that two outcomes are equally likely if a number of particular transformations can turn one of them into the other. This transformation, which may be viewed as a reversible string rewriting system, partitions the set of outcomes into equivalence classes. They conjectured that the number of such classes is precisely $(n+3)2^{(n-2)}$ where $n$ is the number of cards of each color. In this paper, the assertion is proven true by the method of invariant and derivation of canonical forms.

**Keywords:** transformation, riffle shuffle, alternating cards, equivalence class

---

**FIBONACCI IN MUSIC: INVESTIGATION OF THE FIBONACCI SEQUENCE IN INDONESIA’S TRADITIONAL MUSIC**

Raymond Sean Halim  
Center for Young Scientists, Cita Hati Senior School West, Surabaya, Indonesia  
Email: raymond@kvis.ac.th

The Fibonacci sequence is commonly used in many aspects of life. In school, Fibonacci can be learned with Golden Ratio in music, art (architecture), and physics (engineering). The topic of music instruments and songs with the Fibonacci sequence is generally known around the world. Indonesia itself has researchers that discovered about the use of music intervals and the Fibonacci sequence. Hence, this research focuses further on the connection between the Fibonacci sequence and music songs. A few numbers of journals stated that the Fibonacci sequence can affect the musical values from a song. It is specified that the more Fibonacci pattern a song contains, it will be more pleasing to the human’s ear. Therefore, this research is intended to observe the validity of the statement. 100 traditional songs of Indonesia are observed using the method shown by the journals. The method to calculate the Fibonacci pattern is by using music intervals. The steps are first, find the intervals from every note to the note after. The next step is to identify where there are 2 Fibonacci numbers of the interval beside one another. Then, use the total number of notes to divide the total number of notes with the Fibonacci pattern to calculate the percentage. A table is made to gather the results of the Fibonacci pattern and adding information about which province and what scale is used. From the results table, a graph is then created to analyze the pattern in a more detailed way.

**Keywords:** Fibonacci sequence, golden ratio
MAT07

GRAPH THEORY IN SOLVING PROBLEMS OF SECONDARY SCHOOL MATHEMATICS AND INFORMATICS
Stefania Brakk, Polina Vasileva
Gymnasium No 2, Neryungri District, Republic of Sakha (Yakutia), Russia
Supervisor: Elena Sinkina
Email: Brakk.Stesha@gmail.com; vasilevapo12708@gmail.com

The article focuses on the theory of graphs as one of the ways of solving mathematical and informatics problems. We consider that the theory of graphs in maths and informatics lessons helps to achieve the results faster. We used the following research methods: analysis, synthesis, generalizing, questioning, experiment. We learnt the origin and history of graphs, studied the main types of graphs, developed some methods of solving problems, compiled learning resources using graph theory. Also, we created interactive exercises using various programs, in particular the service Web 2.0 LearningApps.org.

Keywords: graph theory, learning resources, interactive exercises

MAT08

INVESTIGATIONS IN PARTITIONS OF INTEGERS
Wattanaboon Chuarod
Technopolis (Science Classroom), Suranaree University of Technology, Thailand
Email: wattanaboon.nes@gmail.com

Partitions of integers consider the number of ways to express an integer n as a sum of smaller integers. For example, 4=3+1=2+2=2+1+1 =1+1+1+1 are the ways of expressing the number 4 as sums. There are a total of 5 partitions for number 4 as sums. Note that we consider distinct partitions up to decreasing order only. Thus 3+1 is equivalent to 1+3. Ferrer’s Graph is a device that illustrates partitions in the form of dot patterns. Sometimes called the graph of a partition, the columns of the diagram represent the size of each term. Considering partitions conjugate to distinct partitions, some partitions were found to be only conjugate to themselves, thus called self-conjugate. We found that if a number has a self-conjugate partition, then it must have at least one partition into distinct odd parts. A generating function is a function that uses its coefficients to count. We found the number of partitions of n having the number 1 and/or 2 and/or ... and/or m as parts by using the generating function, as well as the formula of partitions having only the number 1 and/or 2 as parts and the formula of partitions having only the number 1 and/or 2 and/or 3 as parts in the floor and ceiling functions.

Keywords: partitions, Ferrer’s graphs, self-conjugate, generating functions

PHY01

EXPERIMENTAL RESEARCH OF ELECTRICITY FROM SILT IN YAKUTIA CONDITIONS
Andrei Monastyrev
S.K. Makarov Churapcha Gymnasium, Churapchinsky Ulus (District), Republic of Sakha (Yakutia), Russia
Supervisor: Evdokiya Permyakova
Email: monastyrevandrey14@gmail.com

The goal of our work is to study alternative energy sources, to research and make electricity from silt and to develop project on this research. The relevance of the work we see in necessity to create accessible and simple sources of current from silt in extreme conditions. Using some power stations leads to pollution of our environment, reduction the areas of natural ecosystems. As a result, the climate changes greatly on our planet. Therefore, it is necessary to study and use alternative energy sources. Yakutia is the largest region of Russia with the territory of 3 million square kilometers. There live about 950 thousand people. In summer, the temperature can reach 40°C. There is flowery and fertile land, which can become a good source even for “green” energy. Alternative energy is the complex of perspective ways of making, transferring and using the energy, which are not so widely used as usual ones. However, they are of great interest because they are profitable for using and as a rule have low risk of damaging our environment. The main line of alternative power industry is searching and using alternative (non-traditional) sources of energy. Alternative source of energy is the renewable resource; it replaces traditional sources of energy, which function on oil, natural gas and coal. The reason of searching alternative energy sources is a demand to make it from renewable or practically inexhaustible natural resources. The main reason of it is ecological compatibility and economy. Having studied the works on alternative energy sources, we outlined microbial sources of electricity. In our work, we tried to make electricity from silt. We took silt from the lakes Jarylla and Kuokhara in the village of Churapcha, Churapcha District. Silt is the fine-grained mild geological material from the mixture of mineral and organic substance, which is deposited in water. We studied electrochemical processes, taking place in silt, did an experiment to make electricity from silt in the lake and compared voltage and strength of current.

Keywords: silt, electricity, research, alternative sources
CONSTRUCTION OF THE SMART HOUSE IN PERMAFROST
Anton Danilov
Specialized Educational Scientific Center – University Lyceum of M.K. Ammosov North-Eastern Federal University, Yakutsk, Republic of Sakha (Yakutia), Russia
Supervisor: Olga Lapteva
Email: jayzzers_team@mail.ru

The construction and operation of a smart house in permafrost has strict conditions: it should be accompanied by the use of modern technologies and energy-saving materials. This research focuses on using eco-friendly materials and techniques. The foundation of the house will be built only on one pile, buried into the soil. To prevent heat loss, geodesic dome shape made of SIP-panels will be used, which has low construction cost and overall aerodynamically stable. Automatization of the building will be performed by mechanisms and sensors: ultrasonic sensors, temperature sensors, air pollution sensors, light sensors, biometric panels, dynamo machines, turbines, generators and energy furnaces. System will greatly reduce the power usage and allow stand-alone organizing, being powered by solar panels with prismatic concentrators in summer and generators by the rest of the time. All calculations were made on basis of Batagai’s climate and weather conditions and approved by experts of Yakutsk Permafrost Institute. Furthermore, the layout of the building was made, demonstrating brief characteristics.

Keywords: smart home, permafrost, loose soils

RESEARCH OF COSMIC RAY INTENSITY USING MUON TELESCOPES
Artem Vasiliev
Republican Lyceum Boarding School, Yakutsk, Republic of Sakha (Yakutia), Russia
Supervisor: Sardaana Gerasimova
Email: saryalovich@gmail.com

This paper studies the intensity of the rigid component of cosmic rays using muon telescopes installed on the Earth’s surface, as well as at various depths under the earth. A prototype of a muon telescope is based on 2 Geiger-Muller counters SBM-20. The paper uses data corrected for pressure for the period from 2015 to 2017. Assembled prototype of the muon telescope on the basis of Geiger-Muller counter SBM-20 measured diurnal hourly values of cosmic ray intensity in August and September 2019 and compared to Yakutsk muon telescope data.

Keywords: muon telescopes, Geiger-Muller counter

GRAVITATIONAL WAVES, ITS DETECTION AND POSSIBILITIES
Asthya Shah
St. Xavier College, Maitighar, Kathmandu, Nepal
Supervisor: Sharmila Amatya Pradhan
Email: astha.shah.2060@gmail.com

This paper explores the physics of gravitational waves, the methodology of its detection and how this could bring a new era in astronomy. Albert Einstein first explained gravitational waves as an outcome of his theory of general relativity, which says that gravity is the distortion created in the fabric of space-time. So, when massive objects spiral towards each other and collide, they release huge amount of energy in the form of gravitational waves which is sent around the cosmos like ripples spreading across a pond at the speed of light. This distortion made in space time, when the waves reach us, is smaller than the width of a proton which has been successfully detected by Laser Interferometer Gravitational-Wave Observatory (LIGO). This discovery will change astronomy and answer the biggest questions in physics like the first few moments of the universe, supernovas, black holes and many more.

Keywords: gravitational waves, distortion
AI based traffic management system is an automatically control the lighting system of roads when it is necessary. We will be using photoelectric sensors to detect darkness and brightness level environment to automatically turn on and off the lights. It will be useful to help road accidents. This technology is used for minimizing road traffics by using special technology in junctions. Being based on the density of vehicles in every side the appropriate light is turned on in appropriate direction automatically. Since Parking has been a major problem in populated cities due to which it leads to road traffic so we have come up with this idea of smart parking. In this system we will have mainly focused on the reservation of parking slots through some IOT applications. The parking slots are sensor based system so that if any parking slot is not available or available we can clearly get notified through a mobile application. We have aimed to minimize road accidents by using this system which will warn the vehicles in difficult or U turns by using sensors on either side of the road.

Keywords: AI, IOT, traffic management, parking system

THE SLIP - STICK PHENOMENON
Dhonan Nabil Hibatullah
Center for Young Scientists, SMA Negeri 1 Kayuagung,
Kayuagung - Sumatera Selatan, Indonesia
Supervisor: Akhmad Dafril, M.Pd.
Email: tarogundul00@gmail.com

Slip-Stick Phenomenon is a unique incident that causes a bar-shaped rigid object (or something else that has a flat surface) to remain balanced on two solid similar objects underneath that move towards each other. The two objects, A and B, move alternately (when one is slipped, the other just gets stuck) until they meet at the equilibrium point. That is why this phenomenon is considered to be named as Slip-Stick. It was hypothesized that there was an infinite number of movements of A and B, until they would reach the point. (Note: suppose this happened in perfect condition, meaning that all of the ruler, A and B, particles are homogeneous). Discussion of this phenomenon leads to the alternating movement that arises, thus friction becomes a suspect in this research. So that, the problem of this research are what is behind this phenomenon? And can this phenomenon be useful in our life?

The research was conducted by mathematically proving the phenomenon by combining the two theories that were the main suspects in this research, namely the friction and the torque. By the movement of the phenomenon, it can be seen already that this will be related to kinetic and static friction theory. From the research, it has been proven that the phenomenon always occurs. There is an infinite number of alternating movements in this phenomenon that the sum of all the distances converges into the length of the object. And also, this phenomenon provides a new way to determine the friction coefficient. This phenomenon has a lot of interesting findings and benefits for us, besides to overcome boredom, one can also look for the friction coefficient of one's finger and the ruler. In the future, the next step is to create a machine that applies the “Slip-Stick” phenomenon to find determine a friction coefficient easily.

Keywords: slip-stick, friction, torque

NITINOL ENGINE
Elizaveta Semenyakina, Yakov Andreev
Polytechnic Lyceum, Mirny District, Republic of Sakha (Yakutia), Russia
Supervisor: Pavel Tatarinov, Senior Lecturer, Polytechnic Institute, NEFU Branch in Mirny
Email: liza2003susuman@icloud.com; skvidBard@gmail.com

Shape memory alloys (SMA) are active materials that have special mechanical properties due to temperature and stress. Along with the widespread practical use of such materials today, the issue of studying the physical processes underlying the “memory” of these materials, with studying the theory and conducting experimental research, remains relevant. In this work, the authors present the fundamental studies conducted by them with this material, namely with nitinol wire. In the introductory part of the work, materials with form memory are described and classified, with citation of an extensive literary material. In the available scientific literature found, the authors studied the theory of nonequilibrium thermodynamics of the underlying “memory” of the material. The main part of the work describes the experimental setup created by the authors, which is a nitinol engine - a continuous drive based on a nitinol wire. Measurements of the mechanical power of the drive, estimates of the heat flux power and efficiency of such a drive are described. The measurement results are processed and structured. In the final part of the work, a comparative analysis of theoretical positions and experimental results is carried out.

Keywords: shape memory alloys, nitinol, heat engine, thermodynamics of nitinol.

PRODUCTION OF THREE-LAYER WALL PANELS USING HEAVY-DUTY CONCRETE WITH CARBON SINGLE-WALLED NANOTUBES
Igor Myarikyanov
City Classical Gymnasium, Yakutsk, Republic of Sakha (Yakutia), Russia
Supervisor: Martha Osipova
Email: igor.myarikyanov@gmail.com

In the conditions of the Far North, a construction material is especially needed, with high characteristics of frost resistance, strength and low specific weight of reinforced concrete products. The strength and relatively light weight of reinforced concrete causes the durability of the construction object and the low cost of the material, reducing transportation costs. The tests were carried out in the laboratory of North-Eastern Federal University on a hydraulic press. The tensile strength of the resulting nanobeton for bending and compression was tested. As a result, nano-concrete with characteristics of heavy concrete was obtained. The main task was accomplished: to reduce the amount of cement by 2 times, by increasing the amount of sand, by introducing carbon nanotubes. Heavy-duty, lightweight concrete was obtained, which meets all the requirements of a building material operated in the conditions of the Far North. Further, it was possible to build an experimental structure in the form of a garage, out of three-layer wall panels. The size of the garage was 6x6 m, this garage was provided for 2 cars. The garage was assembled from three-layer wall panels with dimensions of 6x3 m. Panel production took place on the site. After the concrete set, the panels were lifted by a crane and fastened to each other with steel mortgages. Thus, a garage was assembled from 5 panels.
**PHY10**

**BLIMMER – SOLVING BLIND SWIMMER**

Irfan Rozaine Merican Bin Reezal Merican  
Sultan Alam Shah School, Malaysia  
Supervisor: Samsiah Binti Radiman  
Email: myso.malaysia@gmail.com

The world thinks that swimming is only for people who can see. However, there is a category in the Paralympic games that is swimming category for the blind. The swimmers are able to swim straight until the end of the 50m pool. To know when to stop or tumbleturn for them is when the staffs tap their heads when approaching the end of the pool. This is not good because it is controlled by humans and can cause human error. If the swimmer hits the wall, they could suffer from brain damage, concussion, skull fracture or even death. The swimmers are not able to swim confidently and will feel insecure for as long the race is occurring. This also makes it less encouraging for the blind ones to start swimming like other people. To overcome this problem, we invented the Blind Swimmers Sensory Device (BLIMMER) which will send information to the swimmers by vibrations when the swimmers are at a distance of 3m away from the wall. The suitable type of swimming that fit in with our Device during our research is S11 Butterfly and SB11 which is Breastsroke event when the swimmers are at a distance of 3m away from the wall. The suitable type of swimming that fit in with our Device during our research is S11 Butterfly and SB11 which isBreastsroke event which is open turn. This is because the ability for the Ultrasonic sensor to sense the swimmer using its wave is to detect when the swimmers itself taking its breath at the surface of the water. In that split second, the sensor is able to detect in the range of time.

**Keywords:** blind swimmers, sensors

---

**PHY11**

**INVESTIGATION OF THE PROPERTIES OF MAGNETIC FLUID AS A LUBRICANT AND SEALANT IN DRILLING EQUIPMENT**

Ivan Dudarenko  
Aldan Lyceum, Aldansky District, Republic of Sakha (Yakutia), Russia  
Supervisor: Alyona Falina  
Email: ivandudarenko44233@gmail.com

The development of gold deposits in Aldan is conducted by an open-cut mining method. Drill and blast method is produced to create ore stock piles exported for the mining and processing enterprises in future. The main drilling methods of Aldan are roller drilling method, rotational cutting, rotary percussive drilling. The roller drilling predominates in Aldan, but it has one disadvantage. It is the entering of small rock through the black lash between the rock rotary bit and shoe in the bearing cavity, which leads to the pollution of footing and increase bearing run out, reduce bearing resistance and its blocking. The method of using grease with its high performance properties can improve indices of drilling. This material can be magnetic fluids. We studied drilling methods and their disadvantages in Russia, the composition and methods of preparing magnetic fluid, the history of industrial application of magnetic fluid, research the properties of magnetic fluid experimentally. We proved the possibility of using magnetic fluid like a grease and a sealant in the roller drilling setups.

**Keywords:** drilling equipment, magnetic fluids, friction, lubrication

---

**PHY12**

**TUNING BALINESE GAMELAN**

Jonathan Sebastian Nilam, Angeline Felisca Tanujaya  
Santa Laurensia Senior High School, Indonesia  
Supervisor: Inge Direjda  
Email: jonathan.nilam18@gmail.com

There are many traditional musical instruments from Indonesia that are recorded as the world heritage, one of them is Balinese Gamelan. To tune this gamelan there are several people who are experts in making and tuning this gamelan. The tuning process cannot be done by any person. These experts do not use any kind of tool such as tuner to tune the gamelan, but they use their ear as the standard frequencies for the tone of the gamelan. This ability is passed from generation to generation so the gamelan still can be tune until 20 to 30 years later in the future. This research is to purpose the tuner frequency that suitable and can be used in a tool for tuning gamelan Bali. This research is done by identifying the type of gamelan first that will be used to take a data (Pengumbang type and Pengisep type). After that, the data collecting was done using the laptop, microphone and the software in the laptop to help us analyze the data. The program named Matlab (Matrix Laboratory) to help convert the complex soundwave into the simpler one using FFT.

The result of this research is the difference between these 2 types of gamelan are the frequency of the notes, where pengumbang have higher frequency than the pingisep. The maker of the gamelan intentionally makes these 2 types of Pemade with different frequencies, so when they are played together they can complete each other from their frequencies. As for the tuning process, we can see the difference between those frequencies are in the range of 4 Hz until 9 Hz. When we want to develop the tuner we can make the 4-9 Hz difference for the pemade types. What makes these special are when people hear the gamelan orchestra (when all the gamelan are played together,) it create a beat (when there are 2 or more different frequencies are played tighter in a room) which means there is a combination of many frequencies that our ear can catch.

**Keywords:** tuning gamelan, frequency
THE EXPERIMENTAL RESEARCH OF OPTIMAL METHODS FOR WOOD STRENGTHENING
Naina Platonova
S.K. Makarov Churapcha Gymnasium, Churapchinsky Ulus (District), Republic of Sakha (Yakutia), Russia
Supervisor: Maria Khoyutanova, Pyotr Feofanov
Email: nainaplat@gmail.com

In rural areas of the Republic of Sakha (Yakutia) wood is used in many industries. It has been used since ancient times in the construction of houses, bridges, pillars, in the manufacture of furniture and household items. But the service life of wood is not long. Since ancient times, the method of impregnation has been used, but this method requires a lot of time. Therefore, it is necessary to look for more effective and fast-acting methods. The work aims to study the properties of woodsodden and boiled in different liquids to identify the optimal method of wood strengthening. The object of research: larch, pine, birch, oil, urea, lake silt, silor-ultra, homemade vacuum device. The conducted experiments: determination of density of wood sodden in different liquids: measurement of water absorption during soaking; determination of the mass absorption of liquid wood digested in different materials; determination of the strength of wood boiled in different liquids; the hardness of wood by the method of Vickers; the study of samples impregnated with vacuum method; test of static bending; the study of the depth of impregnation with a digital microscope; the research of the vacuum impregnation of wood with a homemade device Having studied ways of wood strengthening by method of sodding, boiling down and by a vacuum method we experimentally checked density, hardness, mass and volume absorption of the liquids sodding in different ways and compared them. The wood density sodden with urea is more than the wood density sodden with other solutions. Durability of the boiled-down wood is more than durability of soddenwood. And samples harden the stored 11 months and become stronger. In both experiments on durability the best result is shown by a birch. Hardness becomes more for birch, but it is less than wood in the south at the expense of density and bigger moisture. The static bend showed that at sodding by a silor-ultra of wood birch. Hardness becomes more for birch, but it is less than wood in the south at the expense of density and bigger moisture. The project is as follows: A simple backpack will be the support structure of our device along with a custom rigid structure. There will be 2 ultrasonic sensors above the shoulders and 2 near bottom of the backpack. The P-Brick would be kept inside the backpack since it is a large component of our device. Our custom-made structure will hold the sensors in place and provide rigidity. The ultrasonic sensors send out high frequency sound waves which bounce back after hitting an object in front of them and then vocally informing the user about the incoming object. This concept is loosely based on whales and bats, who use echolocation to navigate through darkness and deep underwater.

Keywords: identify the optimal method of wood strengthening

EvWE (EVOLUTION WITHOUT EYES)
Raghavendra Ranbir Singh Bisht, Ronit Gupta
Foundation for Glocal Science Initiatives, India
Email: piyush.madhav@gmail.com

Our project is a device which is meant to make the lives of people who suffer from loss of sight easier. It uses ultrasonic sensors from a robotics kit known as Lego Mindstorms along with the P-brick that comes with it. The material that we’ll be using is as follows: 1. A backpack: INR 200 2. 4 ultrasonic sensors. INR 2296*4 3. Lego components. INR - 4. A P-Brick. INR 14271 The framework is as follows: A simple backpack will be the support structure of our device along with a custom rigid structure. There will be 2 ultrasonic sensors above the shoulders and 2 near bottom of the backpack. The P-Brick would be kept inside the backpack since it is a large component of our device. Our custom-made structure will hold the sensors in place and provide rigidity. The ultrasonic sensors send out high frequency sound waves which bounce back after hitting an object in front of them and then vocally informing the user about the incoming object. This concept is loosely based on whales and bats, who use echolocation to navigate through darkness and deep underwater.

Keywords: EvWE

THE CORRELATION BETWEEN THE INPUT POWER AND THE COP IN A DEHUMIDIFIER
Soomin Lee
St. John's School, Guam
Supervisor: Dr. Patil
Email: isumin876@gmail.com

High humidity leads to corrosion of buildings, especially the ones made out of hygroscopic materials. In previous works, engineers invented double-stud walls. However, most buildings, especially on Guam, do not have these walls to prevent problems caused by moisture. Not only that, but poor indoor air quality also causes many illnesses such as upper respiratory congestion, wheezing, dizziness, and watery eyes. According to the National Oceanic and Atmospheric Administration, the heat index and the potential for heat-related illnesses are correlated to each other. Peltier dehumidifier, also known as Thermoelectric cooling dehumidifier, is dehumidifying the moist air using the temperature difference across a Peltier module. One side of the module heats up when the other side cools down. This temperature difference facilitates dehumidification by creating electricity. One way to provide electricity is to use a solar panel which generates about 380 Watts. The thermo-electric cooling dehumidifier is composed of a heatsink and a fan. According to Fourier’s law of heat conduction, if the temperature gradient is present in a body, then the heat will transfer from a high-temperature region to a low-temperature region. Conduction occurs causing the fast-moving molecules of the high-heat object to collide with the slow-moving molecules of the cooler objects, and thus, transfers thermal energy to the cooler object, and this is termed as thermal conductivity.

Keywords: thermoelectric dehumidifier, humidity, Peltier, eco-friendly
**Amplitude Changes of VLF Radio Signals Propagated Over the Pacific Region During Geomagnetic Disturbances on August 31 - September 6, 2019**

**Diana Nechaeva**
Mokhsojoolok Secondary School, Khangalassky Ulus, Republic of Sakha (Yakutia), Russia
Supervisors: Galina Perevalova, Alexey Korsakov
Email: slava.kon.2002@gmail.com

The goal of the work is to detect the effects of geomagnetic disturbances. A radio physical method for the ionosphere and magnetosphere diagnosing is used. The method consists in recording amplitude changes of radio signals in the very low frequency range (VLF) from remote transmitter. The signals are received by a vertical whip antenna located on the roof of the Mokhsojoolok Secondary School (61° 24' N 128° 56' E). NPM radio signals are received (Hawaii, 21° 25' N 158° 9' W, frequency: 21.4 kHz) for monitoring the space over the Pacific region. The length of the NPM - Mokhsojoolok propagation path is 7030 km. The recurrent magnetic storm effects were identified in VLF amplitude changes on August 31 - September 6, 2019. It is noted the amplitude decrease of the recorded radio signal during increasing geomagnetic activity. The VLF radio signal propagation in the nighttime Earth - ionosphere waveguide is more sensitive to geomagnetic disturbances.

**Keywords:** radio signals, geomagnetic disturbances

---

**Use of Micro Satellites for Global Connectivity, High Speed Transmission & Data Analysis**

**Swaraj Sagar Pradhan**
Southwestern State College, Basundhara, Kathmandu, Nepal
Supervisor: Madan Khanal
Email: swarajsagarpradhan@gmail.com

This is a phase by phase developmental project of the project “Use of micro satellites for rural connectivity and data analysis”. The main theme of this project revolves around the use of cube-based satellites in Very Low Earth Orbit in order to provide global connectivity, high rates of connectivity speed using quantum qubit data packets for compressed and fast connectivity as well as data analysis such as weather, disaster alarming and scientific data analysis. This project depends a on relative planned swarming system of inter-connected cube satellites, these satellites will be connected and will drift relative to each other which means that the level of coverage and service will change with time. The governing parameter of the drift is the relative velocity difference received at the time of deployment. These mobile and portable satellites will be able to connect practically each and every part of the making global connectivity possible. Not just that but already connected urban areas too can enjoy very fast and easy to afford high speed connections and accurate weather data. Technologies like these can signal wildfires and flood etc. and can help reduce loss of property and life in a natural accident etc.

**Keywords:** cube satellites, velo, het, 1u, satellites, connectivity, data analysis