ITSF INDONESIA TORAY SCIENCE FOUNDATION

27th PRESENTATION CEREMONY

Science and Technology Award
Science Education Award
Science and Technology Research Grant

JAKARTA

WEDNESDAY, 17 FEBRUARY 2021

26th PRESENTATION CEREMONY

THE DHARMAWANGSA HOTEL, 13 FEBRUARY 2020

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MESSAGE FROM L.T. HANDOKO
THE CHAIRMAN OF INDONESIA TORAY SCIENCE FOUNDATION

In this great occasion, first of all, on behalf of the Board of Director Indonesia Toray Science Foundation (ITSF), allow me to welcome all the honorable and distinguished guests and audiences. I am very pleased that all of us are being able to attend this event in good health even tough virtually. Your presence indicates our commitment and enthusiasm for the advancement of science in Indonesia.

I would like to take this opportunity, on behalf of ITSF, to convey our deepest sorrow for the various disasters that have afflicted the whole world throughout the years since the beginning of 2020, in particular the COVID-19 pandemic. May we all be given health, strength and confidence that we could overcome this pandemic by optimizing our current and future knowledge. I do hope that hard work and extraordinary efforts made by all of researchers across the globe, including someone supported by ITSF, contribute in controlling the pandemic in the near future.

ITSF, since its establishment in December 1993 by Toray Indonesia, with full endorsement from the Ministry of Education and Culture and the Indonesian Institute of Sciences (LIPI), has been aiming to contribute in the development of science education and research in Indonesia. This program is definitely inline with our national development plan, and also the global sustainable development goals (SDGs) as well. From our national perspective, science education and research are the most important key factors to achieve future prosperity of Indonesian people through science based economy. The science based economy is a necessary condition to realize sustainable development in the current era.

In order to realize those goals, ITSF has established several schemes to support Indonesian science educators and researchers through research grants and scientific awards. The application is open for all Indonesian, and has been conducted in a transparent and competitive way steered by committees consisting of prominent scientists in the fields. These grants are intended to motivate and support scientists and educators across Indonesia to continue improving the quality of their research and teaching.

On behalf of Indonesian science community, we would also like to express our highest gratitude to Toray Indonesia for continuous support since the initial establishment of ITSF. ITSF has so far been awarding more than 200 Science Education Awards to science educators in the fields of biology, physics and chemistry; Science and Technology Award to 25 researchers across the fields; and providing research grants to more than 478 researchers. In 2020, ITSF has awarded 7 Science Education Awards, 1 Science and Technology Award, and disbursed 18 grants for the Science and Technology Research Grant. My personal appreciation also goes to the Selection Committees for their hard work and dedication for the success of this program. Congratulations to awardees. Hopefully these would contribute significantly to the science development in this country.

Finally, I am very grateful to the Government of the Republic of Indonesia and Japan for their encouraging supports to the ITSF program since the very beginning. My sincere gratitude particularly are addressed to the Honorable Minister of Education and Culture of Indonesia, the Honorable Minister of Research and Technology of Indonesia, and also to His Excellency the Ambassador of Japan to the Republic of Indonesia.

Thank You,

L.T. Handoko

MESSAGE FROM MR. AKIHIRO NIKKAKU
THE PRESIDENT OF TORAY INDUSTRIES, INC., JAPAN

Good morning everyone. Selamat pagi.

First of all, I would like to convey my good wishes and warmest congratulations to all the respective awards and research grants recipients.

Unfortunately, I cannot attend the ceremony due to the influence of COVID-19, so I would like to say a few words in the video.

Toray Group has corporate philosophy, “Contributing to society through the creation of new value with innovative ideas, technologies and products”.

To promote basic scientific research and education, guided by this corporate philosophy, Toray established the Toray Science Foundation of Japan in 1960. Having succeeded the Toray Science Foundation in Japan, Toray subsequently set up the Science Foundation in Indonesia, Malaysia, Thailand and Korea with the aim of building good relationship with each country and region while contributing to society through business activities.

Over the last 26 years, ITSF has given awards and grants accumulated total amount of almost 24 billion Rupiah to 770 educators and researchers for their outstanding achievements related to technology and science education, and for their contributions in natural science and basic research.

I am greatly proud that we, through the activities of the ITSF, have made a contribution to the progress and advancement of science and technology in Indonesia.

ITSF could not have carried out its activities successfully without the strong teamwork and earnest participation of everyone involved. Our sincere appreciation to ITSF Chairman, Dr. Handoko for his leadership, the hard working Board and Committee members secretariat staff and all other individuals and institutions who had rendered their invaluable assistance in one way or another to ITSF.

I would like to thank everyone here today again for your continued cooperation and support in developing activities of the ITSF. I wish everyone all the best in your future endeavors.

Thank You,

Akihiro Nikkaku

REPORT FROM THE SELECTION COMMITTEE FOR SCIENCE EDUCATION AWARD

For the year of 2020, the SEA proposals (nominees) received thru online media were 69 proposals. The number of applicants has decreased about 43% compared to the previous year, mainly due to the impact of covid-19 pandemic. During the pandemic, ITSF experiencing communication obstacles, and the only way to reach science teachers and schools are using ITSF website and e-mail. It seems that this mode of communication is not too effective. In the future, the SEA selection committee suggest to conduct a series of webinars to promote ITSF Science Education Award Program, and closely collaborate with related organizations (such as National Youth Camp program organized by LIPI) to reach more teachers.

The ratio of applicants from Java and outside Java is 36 : 33, and the ratio of applicants from senior high schools (SMA), junior high schools (SMP) and vocational schools (SMK) is 43 : 15 : 11. As previous years, the criteria used for selecting the awardees were innovation, originality, the simplicity, reproducible, and the use of local materials or local context.

On October 8th and 12th, 2020 the selection committee had conducted an online meeting and decided to invite 15 nominees to be interviewed. On November 9th and 10th 2020, the online interviews for the 15 nominees were held. Based on the interview results, the selection committee has selected and approved by BOD 7 nominees to receive the 2020 ITSF Science Education Award (SEA). The awardees in alphabetical order, are:

1. **Ahmad Mukhlis Anshori,** a physics teacher from SMA Negeri 2 Ponorogo, Province of East Java, who developed a teaching aid to teach inertial moments in mechanics.
2. **Arif Darmadiansah, S. Pd. Gr,** a biology teacher from SMA Negeri Probura Alor, Province of East Nusa Tenggara, who developed a simple solar powered digital lens microscope to teach structures of plant tissues.
3. **Dradjat Tri Atmadja, S. TP,** a biology teacher from SMK Negero 5 Jember, East Java, who used probiotic bacterial suspension to teach the structure of bacteria.
4. **Febri Prasetyo Adi, S. Pd. I,** a physics teacher from SMP Negeri 3 Mrebet - Purbalingga, Province of Central Java, who used kitchen wares as teaching aids to study physical quantities and measurements.
5. **Teguh Soeharto, Drs., M. Pd,** a biology teacher from SMP Negeri 3 Babelan - Bekasi, Province of West Java, who used sticky powder to develop human skeleton teaching aids.

6. **Tri Hastuti, S. Pd., MM. Pd,** a biology teacher from SMP Negeri 1 Wonosobo, Province of Central Java, who developed a nerve system model from wasted cables.
7. **Yeni Triani, S. Pd,** a chemistry teacher from SMK Negeri 7 Bengkulu, Province of Bengkulu, who developed a set of teaching aids to teach chemical bonds and hydrocarbon compounds.

ITSF congratulate to all awardees and hope they are continue their science innovation teaching. The ITSF also wish that these innovation stimulate other teachers to innovate their teaching using local context and local wisdom.

In addition, I would like to report that ITSF has conducted a Webinar or National Seminar for Science Teachers with the theme: "Innovation of Science Teaching in Pandemic Era". This seminar was conducted on Saturday, February 6th, 2021. The seminar is the continuing event from previous years, the different is this year national seminar conducted using online media. When we were conducted direct interaction or face to face seminar, the attendance were around 150 teachers. Surprisingly, there was more than 400 teachers registered to joint the seminar. We were limited the number of the participants due to the maximum quota of the zoom webinar. This year webinar runs very well with very high enthusiasm of all participants.

Thank you.

On behalf of the Selection Committee,

Herwindo Haribowo, Ph. D (Chairman)
Paulus Cahyono Tjiang, Ph. D (Member)
Dr. Eng. Agus Haryono (Member)

REPORT FROM THE SELECTION COMMITTE FOR SCIENCE AND TECHNOLOGY

On behalf of the ITSF Selection Committee for Science and Technology, it is a great pleasure for me to present to you the report of two ITSF programs which are the 27th Science and Technology Award and the 27th Science and Technology Research Grant. In addition, the Selection Committee would like also to report another ITSF activity which is the ITSF Science and Technology Seminar held on-line on February 16, 2021. Covid-19 pandemic has changed the way ITSF processes the submission of Science and Technology Research Grant (STRG) proposals and Science and Technology Award (STA) nomination documents from physical delivery to on-line mailing. Supported by high speed internet line, ITSF secretariat and the selection committee members received all necessary documents with no difficulties.

Science and Technology Award

The Selection Committee received 14 nominations for Science and Technology Award program from 11 universities, and 3 research institutes this year. Selection process to determine the three best nominees for further interview session was done based on specific selection criteria which includes among others number and quality of paper published in scientific journals, the quality of scientific journals for publication, and scientific breakthrough accomplished. The STA Interview Process was held on-line in a zoom meeting on Tuesday, November 17, 2020. Based on evaluation on their achievements in particular, their breakthrough in specific field of study, quantity, quality, and consistency of their scientific publications in peer-review international journals, as well as, results of preliminary evaluation and final interview process, the Selection Committee decided to select Prof. Dr. Freddy Permana Zen from Institute of Technology Bandung as the winner of the STA program this year. Prof. Zen has shown his consistency and leadership as a professional researcher in the field of theoretical physics, in particular, his focus in the last ten years on *Quantum Transport in Open Systems for Developing Future Quantum Technology*. On behalf of the Selection Committee I would like to congratulate Prof. Zen for his consistent dedication to science and technology. To other scientists ITSF always encourage them to be more productive and innovative in giving significant scientific breakthrough in their field of study.

Science and Technology Research Grant

As many as 247 research proposals were received nationwide for Science and Technology Research Grant. ITSF received 131 proposals from universities and 116 proposals from research institutes. ITSF will provide the total grant of Rp. 744.670.000,00 to 18 research proposals this year, as indicated in the following Table.

The Selection Committee would like to congratulate the grantees and hope these grants will provide valuable support to help them in finishing their high quality research. The Selection Committee would like also to encourage those who are not fortunate this time to continuously write and submit a better research proposal to ITSF next year.

Table. List of Science and Technology Research Grant Recipients

No	NAME	UNIVERSITY	APPROVED
1	**Ika Dewi Wijayanti, ST., M. Sc., Ph. D**	Institute of Technology Sepuluh Nopember Surabaya/ITS	41,350,000
2	**Marcelinus Christwardana, ST., MT., Ph. D**	Institut Teknologi Indonesia	41,350,000
3	**Adisyahputra, S. Si., M. Sc**	Bangka Belitung University	36,000,000
4	**Hendris Wongso, Ph. D**	National Nuclear Energy Agency	42,000,000
5	**Pandu Hariyono, S. Farm**	Sanata Dharma University	43,250,000
6	**Ade Yamindago, S. Kel. MP, M. Sc., Ph. D**	Brawijaya University	41,877,400
7	**Ade Erma Suryani, DVM, M. Sc**	Indonesian Institute of Sciences	42,600,000
8	**Apt. Raden Leonny Yulita Hartiadi, S. Si., M. Si., Ph. D**	Indonesia International Institute for Life Sciences (i3L)	41,000,000
9	**Anjar Tri Wibowo, S. Si., M. Sc., Ph. D**	Airlangga University	41,500,000
10	**Dr. Siti Nurul Aisyiyah Jenie**	Indonesian Institute of Sciences	42,350,000
11	**Khairul Hadi Burhan, ST., MT**	Institute of Technology Bandung	43,500,000
12	**Dr. rer. Nat. Hendradi Hardhienata, S. Si., M. Si**	IPB University	40,350,000
13	**Dr. Wa Ode Sukmawati Arsyad**	Halu Oleo University	42,350,000
14	**Tristia Rinanda, DSR. M. Si**	Universitas Syiah Kuala	42,500,000
15	**Watumesa Agustina Tan, Ph. D**	Atma Jaya Catholic University of Indonesia	37,500,000
16	**Fina Amreta Laksmi, M. Sc., Ph. D**	Indonesian Institute of Sciences	43,542,600
17	**Dr. Ahmad Ridwan Tresna Nugraha**	Indonesian Institute of Sciences	39,350,000
18	**Dr. Deden Derajat Matra, SP., M. Agr**	Bogor Agricultural University (IPB)	42,300,000
TOTAL			**744,670,000**

Science and Technology Seminar

The Selection Committe would like also to report that the Science and Technology Seminar was carried out successfully on-line on February 16, 2021. As many as 18 recepients of the Science and Technology Research Grant year 2019 reported and presented their research results at the Seminar. This Seminar is an event usually carried out as a forum for research information exchange among scientists, in particular those who received Science and Technology Research Grant. This is a forum where invited experts in selected fields get together to review research results reported and presented by all researchers who receive the grant a year before. The Seminar is also a learning forum not only for the presenters but also

for all seminar participants who commonly come from universities and research institutes. This year, Three best presenters, one from each group of presentation were selected by the reviewers and each of them would be given a prize as a token of appreciation.

I would like to take this opportunity to thank all members of the Selection Committee for their continuous solid cooperation in the process of selection and to the ITSF Executive Boards of Directors for giving us a chance to execute this important and difficult assignment.

Finally I conclude the report of the ITSF Selection Committee for Science and Technology Year 2020 and thank you very much for your kind attention.

Jakarta, February 17, 2021

On behalf the Selection Committee,

Prof. Dr. Ir. Dedi Fardiaz, M. Sc.	(Chairman)
Prof. Dr. Debbie S. Retnoningrum	(Member)
Dr. M. Aziz Majidi	(Member)

IINDONESIA TORAY SCIENCE FOUNDATION
SCIENCE EDUCATION AWARD'S RECIPIENTS
27th PROGRAM - YEAR 2020

NO	NAME	TITLE	AMOUNT
1	**Ahmad Mukhlis Anshori, S. Pd** SMA Negeri 2 Ponorogo East Java Phyisics	Moment of Inertia Props Encourage Students to Observes the Quantities Influence the Moment of Inertia	25,000,000
2	**Arif Darmadiansah, S. Pd. Gr** SMA Negeri Probur Alor - NTT Biology	Development of MILLEA (Digital Microscope Solar Laser Lens) in Learning Biology of Plant Tissue Structure Material	25,000,000
3	**Dradjat Tri Atmadja, S. TP** SMK Negeri 5 Jember East Java Biology	The Use of Probiotic Bacterial Suspension As Real Learning Media To Analyze Bacteria Form By Staining Method	25,000,000
4	**Febri Prasetyo Adi, S. Pd. I** SMP Negeri 3 Mrebet Purbalingga - Central Java Physics	Kitchen-based Science Learning with the PjBCL Method for Grade 7 Students on Quantities, Unit and Measurements at SMPN 3 Mrebet	25,000,000
5	**Drs. Teguh Soeharto, M. Pd** SMP Negeri 3 Babelan Bekasi, West Java Biology	"Human Skeleton Teaching-Aids 'Te-Leng' (Sticky Flour) to Improve Learning Outcomes at SMP Negeri 3 Babelan, Kabupaten Bekasi"	25,000,000
6	**Tri Hastuti, S. Pd., MM. Pd** SMP Negeri 1 Wonosobo Central Java Biology	Engineering Model of Nerve Cells	25,000,000
7	**Yeni Triani, S. Pd** SMK Negeri 7 Kota Bengkulu Bengkulu Chemistry	"The Development of Simple Teaching Chemistry 1. KITAMIA (KIT Ikatan KImia) 2. PIN A3 (Pin Alkana, Alkena, Alkuna)"	25,000,000
TOTAL			**175.000.000**

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE AND TECHNOLOGY AWARD'S RECIPIENTS
27th PROGRAM - YEAR 2020

NO	NAME	TITLE	AMOUNT
1	**Prof. Freddy Permana Zen, D. Sc** Institute of Technology Bandung	Quantum Transport in Open (Dissipative) Systems for Developing Future Quantum Technology	100,000,000

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE AND TECHNOLOGY RESEARCH GRANT'S RECIPIENTS
27th PROGRAM - YEAR 2020

NO	NAME	RESEARCH TITLE	AMOUNT	FUNDED BY
1	**Ika Dewi Wijayanti, ST., M. Sc., Ph. D** Institute of Technology Sepuluh Nopember Surabaya	In-house Manufacturing and Developing of Electrospinning Machine for Producing Nanofibers to be utilized as the Negative Electrode of Ni-MH Battery	41.350.000	Toray Science Foundation Japan
2	**Marcelinus Christwardana, ST., MT., Ph. D** Institute of Technology Indonesia	Hybrid Photo-Biocatalyst Consisting of Titanium Dioxide, Chlorophyll, and Carbon Nanotubes on Flexible Cellulose Nanopaper, and Its Utilization in a Photo-Bioelectrochemicals Cell for Energy Generation	41.350.000	Toray Science Foundation Japan
3	**Adisyahputra, S. Si., M. Sc** Bangka Belitung University	MIPs Electrode Based Oil / Lard Detector on Food Products	36.000.000	Toray Science Foundation Japan
4	**Hendris Wongso, Ph. D** National Nuclear Energy Agency	Visualization of Cancer Cells using a New Light: Novel Benzothiazole (BTA)-Based Fluorescent Probes and Hybrid Molecules for Image-Guided Cancer Surgery	42.000.000	Toray Science Foundation Japan
5	**Pandu Hariyono, S. Farm** Sanata Dharma University	Design and Synthesis of Peptidomimetics as COVID-19 3CL Protease Inhibitors	43.250.000	Toray Science Foundation Japan
6	**Ade Yamindago, S. Kel. MP, M. Sc., Ph. D** Brawijaya University	Impacts of Cleaning Agent (Benzalkonium chloride) on Marine Shellfish (Potamocorbula fasciata)	41.877.400	Toray Science Foundation Japan
7	**Ade Erma Suryani, DVM, M. Sc** Indonesian Institute **of** Sciences	Enzymatic Hydrolysis of Food Processing Waste by Xylanase from Trichoderma sp. as an Alternative Poultry Feed Material	42.600.000	Toray Science Foundation Japan
8	**Apt. Raden Leonny Yulita Hartiadi, S. Si., M. Si., Ph. D** Indonesia International Institute for Life Sciences (i3L)	Investigation of Anti-Alzheimer's Activity of Coriander Leaves Extract: Mechanism Elucidation on GABAA Receptors	41.000.000	Toray Science Foundation Japan

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE AND TECHNOLOGY RESEARCH GRANT'S RECIPIENTS
27th PROGRAM - YEAR 2020

NO	NAME	RESEARCH TITLE	AMOUNT	FUNDED BY
9	**Anjar Tri Wibowo, S. Si., M. Sc., Ph. D** Airlangga University	Integrated Microbiome and Metabolomic Analysis of Indonesian Medicinal Plants to Identify Key Factors in Plant-Microbe Interactions	41.500.000	Toray Science Foundation Japan
10	**Dr. Siti Nurul Aisyiyah Jenie** Indonesian Institute of Sciences	Surface Modification of Natural-based Bifunctional Silica Nanoparticles with Enzyme Receptor for Higher Sensitive Point-of-Crse of Covid-19	42.350.000	Toray Science Foundation Japan
11	**Khairul Hadi Burhan, ST., MT** Institute of Technology Bandung	Diversification of Hermetia illucens (Black Soldier Fly) Larvae Product and By-product Rearing in Traditional Herbal Medicine Residue: Biodiesel, Lipase (Enzyme) and Protein Hydrolysate	43.500.000	Toray Science Foundation Japan
12	**Dr. rer. Nat. Hendradi Hardhienata, S. Si., M. Si** Bogor Agricultural University	Investigation of 2D Halide Perovskite Surfaces to Enhance Solar Cell Sustainability	40.350.000	Toray Science Foundation Japan
13	**Dr. Wa Ode Sukmawati Arsyad** Halu Oleo University	Efficient Inorganic-Organic Hybrid Perovskite Solar Cell with Aluminium-doped Zinc Oxide as the Electron Transport Layer	42.350.000	Toray Science Foundation Japan
14	**Tristia Rinanda, dr. M. Si** Syiah Kuala University	Gut Microbiota Profiling of the Healthy Toddlers in Aceh using Metagenomic Analysis: Preliminary Study to Define the Window of Opportunity in Health Promotion and Diseases Prevention	42.500.000	Toray Science Foundation Japan
15	**Watumesa Agustina Tan, Ph. D** Atma Jaya Catholic University	Application of Bacteria in the Decomposition of Biodegradable Plastics: Genetic Perspective towards Environmental Sustainability	37.500.000	Toray Science Foundation Japan
16	**Fina Amreta Laksmi, M. Sc., Ph. D** Indonesian Institute of Sciences	Development of D-Allulose 3-Epimerase for Bioconversion of D-Allulose: A Potential Non-Caloric Sweetener for Dietary Supplement	43.542.600	Toray Science Foundation Japan
17	**Dr. Ahmad Ridwan Tresna Nugraha** Indonesian Institute of Sciences	Efficient Simulation of Quantum Many-particle Systems using Classical Computers	39.350.000	Toray Science Foundation Japan
18	**Dr. Deden Derajat Matra, SP., M. Agr** Bogor Agricultural University	Effect of LED Artificial Light on Plant Growth and Fruit Quality in Lowland Strawberry	42.300.000	Toray Science Foundation Japan
TOTAL			**744,670,000**	

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Moment of Inertia Props Encourage Students to Observes the Quantities Influence the Moment of Inertia

1. **Subject** : Physics
2. **Receiver**

Name : **AHMAD MUKHLIS ANSHORI, S. Pd**
Sex : Male
Place/Date of Birth : Tulungagung, 5th April 1988
School : SMA Negeri 2 Ponorogo
School Address : Jl. Pacar No. 24, Tonatan, Ponorogo, Jawa Timur 63418
Phone/Fax Number : (0352) 481268 Fax No: (0352) 462166
Email Address : anshorifis@gmail.com

3. **Proposal Summary** :

One of the physics learning materials is the dynamics of rotation. In a discussion of rotational dynamics, students are introduced to the quantities that cause the inertia of objects. The quantities called moment of inertia. In learning before, the moment of inertia of objects is presented in formula, students just use it. Therefore, it is necessary to find a way so that students can observe quantities affecting the moment of inertia.

Based on this reason, a simple tool was made with which the students were expected to find the influence of the mass and radius of rotation on the moment of inertia of the object. This tool is made from materials that are easy to find and affordable, making it easy to reproduce for learning. The materials needed include wood as a base, a DVD motor, battery, a battery holder, cables, iron rods, loads.

The result, it is found that the moment of inertia is directly proportional to the mass and the radius of rotation of the object. The greater the mass and radius of rotation, the greater the object's moment of inertia is observed from the time it takes for the object to stop rotating.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Development of MILLEA (Digital Microscope Solar Laser Lens) in Learning Biology of Plant Tissue Structure Material

1. **Subject** : Biology
2. **Receiver**

Name	: **ARIF DARMADIANSAH, S.Pd., Gr**
Sex	: Male
Place/Date of Birth	: Wonogiri 21 May 1988
School	: SMAN Probur
School Address	: Jl. TH Loban, Desa Probur, Kec. Alor East Nusa Tenggara 85861
Phone/Fax Number	: 085328938151 Fax No: -
Email Address	: darmadiansah.arif@gmail.com

3. **Proposal Summary** :

Biology is a subject that is considered boring and memorized a lot by students because of the monotonous delivery, and it focuses on the teacher as a learning resource. Biology cannot be separated from practicum activities. About 40% of biological material is applied in the form of practicum or experiment. One of the supporting media for practicum is a microscope. The absence of a microscope at school means that the practicum cannot be carried out.

Millea is a simple microscope the author has developed to solve this problem. Millea is a digital microscope that comes from a smartphone, using a toy laser lens as an ocular lens and an objective lens with the help of solar power as power.

The learning steps include dividing students into four groups, distributing LDS, giving perceptions, giving students the opportunity to make preparations and observe them using Millea. After that the students presented their observations from the group discussion. Finally, the teacher provides reinforcement and tests for evaluation.

The result Biology learning in plant tissue material takes place in an interesting and fun way. Student activeness and curiosity are high, they get new experiences in learning.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

The Use of Probiotic Bacterial Suspension as Real Learning Media to Analyze Bacteria form by Staining Method

1. **Subject** : Biology
2. **Receiver**

Name	: **DRADJAT TRI ATMADJA, S. TP**
Sex	: Male
Place/Date of Birth	: Trenggalek, 29 July 1975
School	: SMK Negeri 5 Jember
School Address	: Jl. Brawijaya No. 55 Jember, Jawa Timur 68151
Phone/Fax Number	: (0331) 487535 No. Fax: (0331) 422695
Email Address	: triatmaja2009@gmail.com

3. **Proposal Summary** :

Observations on the form of bacteria at the SMA and SMK levels are generally carried out by observing pictures or photos of bacteria, not on actual bacteria. Reality media will provide meaningful learning experiences for students. Probiotic products can be used as a learning resource for observing the shape of bacteria.

In addition to containing bacteria, probiotic drinks contain protein. The presence of protein can hinder the observation of bacterial shape, therefore protein needs to be separated by deposition. Protein was precipitated by adding half-alkaline Pb acetate. The suspension formed is ready to be used to make a bacterial smear.

Bacterial smears are made by taking 2-3 osees of bacterial suspension. Then it was fixed and carried out simple staining using crystal violet dye. The results of simple staining were observed under a microscope and documented by a mobile phone camera.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Kitchen-based Science Learning with the PjBCL Method for Grade 7 Students on Quantities, Unit and Measurements at SMPN 3 Mrebet

1. **Subject** : Physics
2. **Receiver**

Name	: **FEBRI PRASETYO ADI, S. Pd. I**
Sex	: Male
Place/Date of Birth	: Purbalingga, 27 Februari 1982
School	: SMP Negeri 3 Mrebet
School Address	: Jl. Raya Cipaku, Mrebet, Purbalingga, Jawa Tengah 53352
Phone/Fax Number	: 082225936452 No. Fax: -
Email Address	: febriprasetyoadi2@gmail.com

3. **Proposal Summary** :

This kitchen-based learning method utilizes the kitchen which is usually used for cooking, optimized as a place for student's learning.

The idea of this learning concept arose because of the limited facilities and infrastructure of science laboratories in the school. I have applied this learning concept since 2019 until now and has become a fairly effective learning method during the Covid-19 pandemic.

I apply this kitchen-based learning method in Science Learning such as making conventional biotechnology soybean tempe in the kitchen; measuring spices for cooking fried rice with a spoon; classifying living things with vegetables and fruits; testing the friction force of eggs with the surface of flour, sugar and rice; prove the symptoms of static electricity between a plastic plate rubbed with a rag with rice flakes and others.

The concept of kitchen-based learning changes the learning habits of the students who were previously more often in the bad room to be in the kitchen. Students do not have difficulty adapting because they are used to knowing, understanding and utilizing various equipment in the kitchen.

The advantages of kitchen-based learning are, that it can be done in their homes, there are many science experiments that can use kitchen utensils, tools and material are available at home, learning is more meaningful because it can be applied in daily life and it is attractive to the students because it is factual, meaningful and on certain materials can produce products.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Human Skeleton Teaching-Aids 'TeLeng' (Sticky Flour) to Improve Learning Outcomes at SMP Negeri 3 Babelan, Kabupaten Bekasi

1. **Subject** : Biology
2. **Receiver**

Name	: **Drs. TEGUH SOEHARTO, M. Pd**
Sex	: Male
Place/Date of Birth	: Jakarta , 27 February 1969
School	: SMP Negeri 3 Babelan, Bekasi
School Address	: Jl. Candrakirana Blok AD no. 32, Bahagia, Babelan, Kab. Bekasi, Jawa Barat 17612
Phone/Fax Number	: (021) 88989009 Fax No: -
Email Address	: teguhsoehartompd@gmail.com

3. **Proposal Summary** :

This study aims to determine the improvement of science learning outcomes on the subject of Human Motion System using 'TeLeng' props. The study was conducted on Grade VII students at SMP Negeri 3 Babelan, Bekasi Regency. This study uses Classroom action research and the developmental data is obtained through observation of performance and evaluation of learning outcomes. The student worksheet intruments and the learning outcome evaluation sheets are used for the main intrument on this study.

The human skeleton with the aid of 'TeLeng' or sticky flour is made out of wheat flour that shaped and preserved. The shape is designed to resemble parts of the human skeleton (such as upper arm bones, finger bones, etc.) which are used to deepen the material of the human motion system. This teaching aid is used in order to improve students' understanding and learning outcomes. Flour is an option for making this teaching aids because it is easy to obtain, cheap, harmles, and easy to shape. Flour will be processed in such a way with several additional ingredients and formed according to the material that about to be thaught.

The learning outcomes reached an average of 81.83 and the completeness of the stdents reached up to 29 students. So, it can be concluded that the science learning outcomes can be improved by using the 'TeLeng' teaching aid. The result of this study can be used as reference to improve improve student learning oucomes and able to be developed.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Engineering Model of Nerve Cells

1. **Subject** : Biology
2. **Receiver**

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3. **Proposal Summary** :

Based on the interviews with students, nerve cell lessons are difficult to memorize and imagine. The teacher's efforts are explaining and redrawing the picture of nerve cells. However, the result is not as good as expected.

Therefore, the idea arose to make an engineering model of nerve cells using cables. Tools and materials needed: ruler, cable, cutter, tapes. How it works: (1) cut the 12 cm long cable, this models one nerve cell, (2) cut the cord skin every 1 cm, this models the Schwann and Myelin cells, (3) remove the skin at both ends of the cable, this models the appearance of fibers axons, (4) stretch each cut, this models Nodus Renvier, (5) at one end, we insert a piece of cable skin on some of the fibers and form a circle, this models the cell nucleus and body, (6) paste the nerve cell model on the Student Activity Sheet.

The advantages of this model are: it is cheap, easy to obtain and easy to make, in the learning process students become interested and active.

It can be concluded that the neural cell model can improve understanding of the concept of nerve cells and can improve daily assessment results.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

The Development of Simple Teaching Chemistry
1. KITAMIA (KIT Ikatan KImia)
2. PIN A3 (Pin Alkana, Alkena, Alkuna)

1. **Subject** : Chemistry
2. **Receiver**

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3. **Proposal Summary** :

The aim of creating KITAMIA and PIN A3 as a teaching Chemistry as a point of creativity and innovation. This teaching chemistry is an expected to make an impact on increasing student motivation and learning out comes.

The advantages of this teaching chemistry are student can see concretelybthe arrangement of electron configuration how the ionic bond and ionic covalent is formed. And students can easily arrange and name the structural formulas of *Alkana, Alkena, Alkuna*. KITAMIA and PIN A3 are very cheap and easy to make, because they are made from simple materials around us.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Quantum Transport Dynamics in Open (Dissipative) Systems for Developing Future Quantum Technology

1. Receiver

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2. Proposal Summary :

Theory of open quantum systems, a study of a quantum-mechanical system interacting with its external environment, is a fundamental building block for emerging quantum technologies such as quantum computers, quantum sensors, and quantum communications. Understanding how dissipation and decoherence play role in quantum systems is essential for the experimental realization of a quantum device—since the biggest challenge is avoiding dissipation as much as possible.

F.P. Zen contribution includes the discovery of new phenomena in dissipative quantum transport and nonlinear effects in presence of thermal bath. For the excitation transport in presence of environmental dissipation, it is found that external periodic driving force could enhance the transport efficiency and control its propagation; the environmental noise itself could also increase the efficiency. On the other hand, nonlinear effects in open-system quantum oscillators may neutralize the heat capacity anomaly, which roots from the system interacting with environment.

These findings could be important for developing efficient nanoscale quantum engines in the near future. The dynamical aspect of F.P. Zen studies is also important for developing future quantum computers. Several experimental realizations for the model are presently available, including the quantum simulation with ion traps, ultracold atoms, and Bose-Einstein condensates.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

In-house Manufacturing and Developing of Electrospinning Machine for Producing Nanofibers to be utilized as the Negative Electrode of Ni-MH Battery

1. Research Team Leader

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2. Research Field : NiMH battery, EIS, rapid solidification, electrospinning, SOFC, metal-gas interaction

3. Number of Researcher(s) : 5

4. Research Location : Department of Mechanical Engineering ITS Surabaya

5. Time Allocation : 12 months

6. Research Grant : Rp. 41,350,000.00

7. Summary of Research Proposal :

Electrospinning is a method to fabricate nanofiber by charging and ejecting a polymer solution through a syringe under a high-voltage electric field. Compared to other methods, electrospinning offers the simpler and easier techniques to apply. Considering the fact that the commercial electrospinning machine is not affordable, a complex process, and still rarely available especially in Indonesia, in-house manufacturing and developing of simpler, cheaper, more economic, more adjustable parameter electrospinning machine for producing nanofibers while maintaining their excellent properties is tremendously needed.

Electro-spun nanofibers have the remarkable features such as lightweight, high surface area, and high porosity, which are commonly used in energy storage, biotechnology, health and medical, and tissue engineering applications. When it comes to the method developing the machine, preliminary design will be drawn based on the commercial machine and literature review of the previous publications, parts of electrospinning machine will be bought and then self-assembled according to the commercial electrospinning, hence the design and arrangement of the machine will be clearly validated. Furthermore, evaluation and refinement will be afterwards carried out by fabricating the nanofiber through the machine. Indeed, an investigation on the characterization of nanofiber quality will be performed to confirm the end-product of the machine.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Hybrid photo-biocatalyst consisting of titanium dioxide, chlorophyll, and carbon nanotubes on flexible cellulose nanopaper, and its utilization in a photo-bioelectrochemical cell for energy generation

1. Research Team Leader

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2. Research Field : Energy
3. Number of Researcher(s) : 3
4. Research Location : Institut Teknologi Indonesia and Research Center for Chemistry - LIPI
5. Time Allocation : 12 months
6. Research Grant : Rp. 41,350,000.00
7. Summary of Research Proposal :

The need for renewable energy as an alternative fuel to replace fossil fuels has grown rapidly in recent years, along with increasing world demand and environmental problems. One of the relatively new systems for future applications is photo-bioelectrochemical cells, which are a combination of photo- and bio-catalysts, which can split water into oxygen, protons, and electrons by utilizing visible light. Indonesia, as a tropical country, has the potential to apply photo-biofuel cells due to the availability of abundant sunlight. Titanium dioxide (TiO2) is a photo-catalyst that is often used because of its benefits such as stable, non-corrosive, inexpensive, and environmentally friendly. However, large band gaps and fast recombination of electron holes are a problem. Modification of TiO2 with chlorophyll via chemical and physical bonding is claimed to increase the efficiency of photoconversion so that the performance of photo-biofuel cells increases. Hybrid photo-biocatalyst will be deposited on carbon nanotubes (CNT) with the Layer-by-Layer (LbL) method, then coated on transparent cellulose nanopaper as a flexible supporting anode material. Then, the catalyzed nanopaper anode will be applied to the photo-bioelectrochemical cell system to determine its performance. Various anode structure of hybrid photo-catalyst will be studied to get the best performance on photo-bioelectrochemical.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

MIPs Electrode Based Oil / Lard Detector on Food Products

1. Research Team Leader

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2. Research Field	: Chemistry
3. Number of Researcher(s)	: 3
4. Research Location	: Laboratory of UBB and UNP/LIPI
5. Time Allocation	: March 2021 – January 2022
6. Research Grant	: Rp. 36,000,000.00
7. Summary of Research Proposal	:

To identify the presence or absence of oil / lard content in a food product for halal authentication requires a fairly long and expensive testing process because testing must be carried out in a laboratory such as. Therefore we need equipment that can analyze fast, inexpensive lard, namely the use of Molecularly Imprinted Polymer (MIP) which can identify specifically the target compound you want to know.

MIP is prepared by reacting lard monoglycerides with the monomer Benzo-15-crown-5-acrylamide, ethylene glycol dimethacrylate (EGDMA) as the crosslinker, and benzoyl peroxide as the initiator. In this study also used carbon nanopores because they are inert and have high conductivity, the result is a working electrode. Furthermore, the working electrode is carried out optimization and validation using standards and disturbing compounds (cooking oil, animal oil / fat such as chicken, cow and goat) and optimization factors (pH, temperature, composition). It is hoped that the modification of the carbon nanopore / MIP electrode can provide optimum results including the Nersnt factor, measurement range, detection limit, accuracy, precision and selectivity.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Visualization of Cancer Cells Using a New Light: Novel Benzothiazole (BTA)-Based Fluorescent Probes and Hybrid Molecules for Image-Guided Cancer Surgery

1. Research Team Leader

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2. Research Field	: Medicinal Chemistry
3. Number of Researcher(s)	: 5
4. Research Location	: National Nuclear Energy Agency
5. Time Allocation	: 15 hours/week
6. Research Grant	: Rp. 42,000,000.00
7. Summary of Research Proposal	:

Fluorescence image-guided surgery (FIGS) plays a pivotal role in the detection, diagnosis, and resection of a variety of cancers. This study aims to synthesize novel benzothiazole (BTA)-based fluorescent probes and hybrid molecules (molecules containing fluorophore and radioisotope), and investigate their potential as FIGS agents.

Due to its anticancer activities, the BTA was chosen as a building block for the synthesis of fluorescent probes **11-12** and hybrid molecules **13-14**. The 4-chloro-7-nitrobenzofuranzan **10** (NBD) was selected as the fluorophore as NBD-containing molecules typically exhibit spectroscopic properties suitable for cell imaging. Taken these together, we hypothesized that BTA/NBD-containing molecules may exhibit anticancer and favorable fluorescence properties, and therefore can be potentially employed in FIGS.

The synthesis of probes **11-12** will be accomplished in a four-step procedure, starting with hydrolysis, followed by peptide coupling and Boc-deprotection. The final step will involve the conjugation of ligands **8-9** with NBD 10 to generate probes **11-12,** which can be radiolabeled with ^{131}I to produce hybrid molecules **13-14.** Spectroscopic properties of probes **11-12** will be determined using a spectrophotometer in different solvents. Biological evaluations will include in vitro assay for evaluation of antiproliferative (anticancer) activity in different cancer cell lines and in vitro fluorescence imaging studies.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Design and Synthesis of Peptidomimetics as COVID-19 3CL Protease Inhibitors

1. Research Team Leader

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2. Research Field	: Drug Discovery and Design
3. Number of Researcher(s)	: 2
4. Research Location	: Yogyakarta
5. Time Allocation	: February 2021 to December 2021
6. Research Grant	: Rp. 43,250,000.00
7. Summary of Research Proposal	:

3CL protease is one of the key proteins expressed by SARS-Coronavirus-2 cell, the potential to be targeted in the discovery of antivirus during this COVID-19 pandemic. This protein regulates the proteolysis of viral polypeptide essential in forming RNA virus. 3CL protease was commonly targeted in the previous SARS-Coronavirus including bat and MERS, hence, by blocking this protein activity, the coronavirus should be eradicated.

This study aims to computationally design and synthesize five peptidomimetics compounds to be evaluated as 3CL protease inhibitors, followed by studying the molecular mechanism in depth. There should be at least one compound active against the protease due to the pharmacophore mimicking with the published SARS-Coronavirus-2 inhibitor. The in silico design will use molecular docking as the tool, whereas the synthesis will be carried in four steps through nucleophilic acyl as well as alkyl substitution reactions. The in vitro inhibition against 3CLpro will be conducted using FRET-based assay, whereas the insight mechanism on how the active compound blocking the protease will be performed using molecular dynamics simulation.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Impacts of cleaning agent (Benzalkonium chloride) on marine shellfish (*Potamocorbula fasciata*)

1. Research Team Leader

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2. Research Field	: Marine Biotechnology
3. Number of Researcher(s)	: 3
4. Research Location	: East Java
5. Time Allocation	: 7 months
6. Research Grant	: Rp. 41,877,400.00
7. Summary of Research Proposal	:

Disinfectants and antiseptics are massively used to prevent the spread of covid-19 worldwide. These cleaning products mostly contain Benzalkonium chloride (BZK) that functions to eliminate and prevent growth of microorganisms. Massive application of these products potentially increases concentration of BZK in the environments, and threatens aquatic organisms. This study will investigate the potential toxic effects of BZK in a marine shellfish with economic values, 'kerang kupang' (*Potamocorbula fasciata*), through several endpoints. The median lethal concentrations and bioconcentrations of BZK in *P. fasciata* will be determined by performing acute toxicity test. Molecular physiological effects of BZK in *P. fasciata* will be predicted by transcriptomic analysis. In addition, morphological characteristics, genetic variations and phylogenetic relationships of *P. fasciata* will be evaluated by DNA barcoding analysis. This study will provide insight on the potential effects of BZK in aquatic organism.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Enzymatic Hydrolysis of Food Processing Waste by Xylanase from *Trichoderma* sp. as an Alternative for Poultry Feed Material

1. Research Team Leader

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2. Research Field : Bio-Feed Additive Technology
3. Number of Researcher(s) : 2
4. Research Location : Bio-Feed Additive Technology Laboratory, Research Unit for Natural Product Technology, Indonesian Institute of Sciences
5. Time Allocation : 12 month
6. Research Grant : Rp. 42,600,000.00
7. Summary of Research Proposal :

High concentrations of non-starch polysaccharide in feed are associated with increased digestive viscosity thereby reducing digestion and absorption of nutrients. Xylanase is one of the important NSP-degrading enzymes that hydrolyze β-1,4 glycosidic bonds in heteroxylans randomly to xylooligosaccharides (XOS) as prebiotic.

Generally the industrial application of this enzyme as an additive is mixed into poultry feed material (wheat, soybean meal, etc). Food processing waste i.e flour dregs palm, sago dregs, and cassava pulp are potential as an alternative feed material as an energy source due to their high starch. However, the fiber content causes difficulty in feed digestion due to no fiber-degrading enzyme in the poultry digestive tract. Therefore, the application of enzymatic hydrolysis to hydrolyze complex polysaccharides and produce XOS is necessary to solve this problem.

A previous study revealed that mutant fungi *Trichoderma* sp. produced extracellular xylanase. This study was conducted to produce crude xylanase from this fungi with the fermentation method using a lab-scale bioreactor then partially purified and use it for hydrolysis of the food processing waste. The hypothesis in this study is that *Trichoderma* sp. produces high xylanase activity to hydrolyze food processing waste and reduce the xylan-rich hemicellulose content and produce XOS.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Investigation of Anti-Alzheimer's Activity of Coriander Leaves Extract: Mechanism Elucidation on $GABA_A$ Receptors

1. Research Team Leader

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2. Research Field	: Neuropharmacology
3. Number of Researcher(s)	: 2
4. Research Location	**:** i3L, Jakarta, Indonesia
5. Time Allocation	: 11 months
6. Research Grant	: Rp. 41,000,000.00
7. Summary of Research Proposal	:

Alzheimer's Disease (AD) is a neurodegenerative disease impairing memory and causing mental and behavioral problems. By 2050, It is predicted that AD could affect 106.8 million people if there is no breakthrough in AD drug discovery. Novel drug for AD is urgently required as the current drugs targeting cholinesterase and N-Methyl-D-aspartate receptor fail to stop or prevent AD progression and have dose-dependent side effects. Previous studies suggest the promising effect of coriander leaves to improve memory and protect from AD. Coriander leaves contain quercetin, apigenin and linalool which are known to bind to potential novel target of AD, namely γ-aminobutyric acid A receptors (GABAARs). In this study, coriander leaves will be extracted and evaluated in AD mouse model. Memory function will be assessed using Y maze and novel object recognition and gene expression of neurogenesis markers, brain-derived neurotrophic factor (BDNF) and c-AMP response element-binding 1 (CREB1), will be monitored. The correlation of GABAARs with anti-alzheimer's activity of the extract will also be investigated by administering GABAARs blocker. Further, the expression of GABAARs subunits and GABA level in the brain will be evaluated. The outcome of the research will give fundamental evidence for developing coriander as herbal medicine product for AD.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Integrated Microbiome and Metabolomic Analysis of Indonesian Medicinal Plants to Identify Key Factors in Plant-Microbe Interactions

1. Research Team Leader

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2. Research Field	: Plant Biotechnology
3. Number of Researcher(s)	: 2
4. Research Location	: Mojokerto and Surabaya, East Java
5. Time Allocation	: 12 months
6. Research Grant	: Rp. 41,500,000.00
7. Summary of Research Proposal	:

Recent advances in sequencing technology have been enabling the characterization of highly-complex microbial communities residing in plant's tissue. Current evidence suggests that these plant-associated microbes could modulate plant growth and health. While many studies have revealed the microbiome composition in model plants and crops, little is known about microbiome composition in tropical medicinal plants. Medicinal plants produce various metabolites in their tissue, many of them are known to have strong anti-microbial activities. One interesting hypothesis is that these metabolites might shape microbial communities in plant tissue. On the other hand, certain microbes might induce the production of specific metabolites. In this work we aim to characterize the root and leaf microbiome of two widely used Indonesian medical plants *Tinospora cordifolia* (brotowali) and Gynura procumbens (*sambung nyawa*).

We will also characterize the root and leaf metabolomic profiles in these two plant species. Further, to represent two different environmental settings that might affect microbiome and metabolomic composition in plants, we are collecting samples from plant grown in nursery and from wild growing plants found in the forest area of Pacet, Mojokerto, Indonesia. We will correlate these three factors (microbes, metabolites, and environment) to elucidate key factors that regulate plant-microbe interactions.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Surface Modification of Natural-based Bifunctional Silica Nanoparticles with Enzyme Receptor for Highly Sensitive Point-of-Care of COVID-19

1. Research Team Leader

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2. Research Field	: Material Science/ Nanotechnology
3. Number of Researcher(s)	: 4
4. Research Location	: Research Centre for Chemistry -LIPI
5. Time Allocation	: 12 months
6. Research Grant	: Rp. 42,350,000.00
7. Summary of Research Proposal	:

Currently, the race towards the development of a rapid, simple and cost-effective point-of-care (POC) diagnostics to accurately detect the SARS-nCov-2 virus or its antibody is emerging in numerous countries. The availability of these types of POC tests is critical to triage patients simply and prevent further spread of the virus. The development of such POC diagnostics for this COVID-19 pandemic with high performance can be significantly achieved using nanomaterials as the basic platform of the diagnostics system, outperforming those of classical methods, hence generating low cost applications for frontline diagnostics tools. In this research proposal, we focus to overcome the limitations of current lateral flow assay (LFA)-based diagnostic tests for COVID-19 by enhancing the sensitivity performance of the LFA device which conventionally uses gold nanoparticles.

Herein, we apply the angiotensin converting enzyme 2 (ACE2) receptor due to its high affinity towards SARS-nCov-2 virus as the entry channel. The ACE2 receptor is further modified onto novel bi-functional fluorescence-magnetic nanoparticles of natural sources in which properties can be fine-tuned. The fluorescence-magnetic modified nanoparticles will be applied to the LFA matrix thus leading to sensitivity and selectivity enhancement by the increased amount of analyte that has been captured.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Diversification of *Hermetia illucens* (Black Soldier Fly) Larvae Product and By-product Rearing in Traditional Herbal Medicine Residue: Biodiesel, Lipase (Enzyme) and Protein Hydrolysate

1. Research Team Leader

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2. Research Field	: Bioconversion and Bioproduct
3. Number of Researcher(s)	: 3
4. Research Location	: Institute of Technology Bandung, Jatinangor
5. Time Allocation	: 1 year
6. Research Grant	: Rp. 43,500,000.00
7. Summary of Research Proposal	:

Rearing of black soldier fly larvae in organic waste is an emerging trend to encounter food, fuel and environmental problem in more efficient. The conventional method of its application is directly fed to animal once it achieves pre-pupae state. However, direct use has several disadvantages i.e. inappropriate nutrition content and other waste. Applying biorefinery concept to the product and by-product of bsfl rearing is a potential alternative to increase the function and value.

The substrate will be used is the traditional herbal medicine (Jamu) residue in combination with used cooking oil as biomass lipid content booster due to the study on the potential of these abundant wastes is still rare. The study proposed is to convert the biomass to biodiesel from its lipid and produce the protein hydrolysate from the defatted biomass. The residue consisting of larvae frass/feces and undigested substrate will be fermented using *Rhizopus oryzae* to produce lipase.

The objectives of this study are to determine the optimum composition of the substrate i.e. the oil to solid ratio which results to high lipid and biodiesel yield as well as amino acids profile and to observe the residue as the potential feed in the enzyme production.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Investigation of 2D Halide Perovskite Surfaces to Enhance Solar Cell Sustainability

1. Research Team Leader

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2. Research Field	:	Advance material, Nanophysics
3. Number of Researcher(s)	:	4
4. Research Location	:	IPB University
5. Time Allocation	:	3-4 months
6. Research Grant	:	Rp. 40,350,000.00
7. Summary of Research Proposal	:	

Perovskite solar cell has become due to their relatively easy and cheap fabrication one of the foremost candidates in future photovoltaic energy harness. Especially 2D halide perovskite materials have recently gained much interest due to their high efficiency and durability prospect. The objective of this research is to synthesize and enhance the 2D halide perovskite material sustainability by investigating their structural and electronic properties at the surface via state-of-the-art nonlinear optical models and density functional theory (DFT).

The outcome (or hypothesis) of this investigation is to produce rigid models that allow us to better understand and control the surface properties of the designed solar cells at the nanoscale such as measurement and control of the in-pane surface chemistry in real time as well as obtaining the electronic density configuration which is crucial in competing with current more expensive yet more durable silicon based solar cells. These models are build based on nonlinear and ab-initio optical methods, in particular applying the nonlinear bond hyperpolarizability bond model (NBHM) and local density of state (LDOS) calculation via DFT.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Efficient Inorganic – Organic Hybrid Perovskite Solar Cell with Aluminum-doped Zinc Oxide as the Electron Transport Layer

1. Research Team Leader

Name	: **Dr. WAODE SUKMAWATI ARSYAD**
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2. Research Field	: Solar Cell
3. Number of Researcher(s)	: 2
4. Research Location	: Fundamental Physics Laboratory, Halu Oleo University
5. Time Allocation	: 9 Months
6. Research Grant	: Rp. 42,350,000.00
7. Summary of Research Proposal	:

The purpose of this research is to fabricate an efficient organic-inorganic hybrid perovskite solar cell, by investigating the parameters that influence the performance of the perovskite solar cell (PSC), regarding the utilization of the Al2O3 layer, and the aluminum-doped zinc oxide as a mesoporous layer and an electron transport layer, respectively.

This research will be focusing on the 1) preparation of Al2O3 thin-film and synthesize of Zinc Oxide nanocrystal with the sol-gel method (by varying the Aluminum concentration as the dopant). 2) Characterization of the dopant concentration effect on the optical properties, crystal structure, and electrical properties of Zinc Oxide nanocrystal with UV-Visible spectroscopy, X-ray Diffraction spectroscopy, and LCR meter, respectively. 3) Fabrication and characterization of the PSC with Gratzel method, and the current-voltage measurement, respectively. 5) Estimation of the cell's internal parameters (series resistance, shunt resistance, and ideality factor) using computational programming with Borland Delphi 7.0.

This research results will be published in the international journal indexed by Scopus.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Gut Microbiota Profiling of Healthy Toddlers in Aceh using metagenomic analysis: Preliminary study to define the window of opportunity in health promotion and diseases prevention

1. Research Team Leader

Name	:	**TRISTIA RINANDA, dr., M. Si**
Sex	:	Female
Place/Date of Birth	:	Meulaboh/21 September 1982
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2. Research Field : Molecular Microbiology
3. Number of Researcher(s) : 2
4. Research Location : Aceh
5. Time Allocation : 10 months
6. Research Grant : Rp. 42,500,000,00
7. Summary of Research Proposal :

Gut microbiota plays a pivotal role in maintaining children's health and wellbeing. The disruption of microbiota ideal succession in early life can inhibit the optimal growth and development during childhood, decrease quality of health and cause various chronic diseases in later life. The gut microbiota profiling of healthy children under five years old will generate beneficial information about the ideal shape of gut microbiota within the critical window period. This information will provide a window of opportunity for a better intervention and treatment such as microbiome-based therapy in order to promote health and prevent future complications.

The study is a preliminary study aimed to determine the profile of gut microbiota of healthy toddlers in Aceh, Indonesia using metagenomic analysis namely Next Generation Sequencing. This is a cross sectional study encompassing 96 study subjects which will be recruited using purposive sampling method. The DNA of the fecal specimens will be proceeded to NGS (Illumina NovaSeq 6000) that targets the 16S rDNA gene as a basis for identification. The metabolic pathway of profiling result will be analyzed using Phylogenetic Investigation of Communities by Reconstruction of Unobserved States (PICRUSt) and Kyoto Encyclopedia Genes and Genomes (KEGG).

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Applications of Bacteria in the Decomposition of Biodegradable Plastics: Genetic Perspective towards Environmental Sustainability

1. Research Team Leader

Name	:	**WATUMESA AGUSTINA TAN, Ph. D**
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2. Research Field	:	Microbiology
3. Number of Researcher(s)	:	2
4. Research Location	:	BSD Campus Jalan Raya Cisauk Lapan no. 10 Tangerang Selatan, Banten 15345
5. Time Allocation	:	March 2021 – January 2022
6. Research Grant	:	Rp. 37,500,000.00
7. Summary of Research Proposal	:	

In response to global plastic waste issues, the use of biodegradable plastics to substitute petroleum-based ones is becoming more common. However, the extent to which commercially available biodegradable plastics can be degraded and which microbes are responsible for this process is generally unclear. Our previous study demonstrated the increased abundance of thermophilic and carrageenan catabolizing microorganisms in soil during the degradation of biodegradable plastic made of seaweed. We hypothesize that different types of bacteria are required to degrade the organic components of various biodegradable plastics. Therefore, we propose to identify specific bacterial groups that may be involved in the decomposition of two types of commercial plastic bags claimed as biodegradable: starch-based- and oxo-biodegradable plastic. We will use high-throughput sequencing of the V3-V4 region within the 16S rDNA to evaluate changes in bacterial composition in biodegradable plastic-introduced soil over 90 days. Bioinformatics analysis will be conducted to identify bacterial genera that thrive as the above plastics are being degraded over time, highlighting their potential role in the process. The long-term goal is to formulate a mixture of microbial additives to accelerate biodegradable plastic waste degradation, as part of our mission to fight plastic waste issues and to promote sustainable environment.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Development of D-Allulose 3-Epimerase for Bioconversion of D-Allulose: A Potential Non-Caloric Sweetener for Dietary Supplement

1. Research Team Leader

Name	: **FINA AMRETA LAKSMI, M. Sc, Ph. D.**
Sex	: Female
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2. Research Field	: Applied Biotechnology
3. Number of Researcher(s)	: 4
4. Research Location	: Research Centre for Biotechnology, LIPI
5. Time Allocation	: 10 months
6. Research Grant	: Rp. 43.542.600.00
7. Summary of Research Proposal	:

D-Allulose is one of the most important rare sugars as it has been well studied in terms of its efficacy, safety, distribution, and production. D-allulose has received the generally recognized as safe (GRAS) status from FDA in 2014. D-Allulose is not only known as a non-caloric sweetener, but also exhibits numerous benefits for human health. It serves as antioxidant enhancement, strong anti-hyperlipidemic and anti-hyperglycemic, improving insulin resistance, anti-inflammatory, preventing obesity and type-2 diabetes mellitus, anti-hypertension and also functions as therapeutic effect against atherosclerosis. Due to its excellent health benefits, D-allulose is a promising candidate for dietary supplement. D-Allulose can be produced by D-allulose 3-epimerase (DAEase) from the substrate D-fructose, which is cheap and widely available in Indonesia. Despite its potential for D-allulose production, there are few studies on DAEase enzyme characterization in Indonesia. Thus, we intend to isolate DAEase from Arthrobacter psychrolactophilus and overexpressed in Escherichia coli system. The purified DAEase will be used for the investigation on its biochemical properties and the bioconversion of D-allulose from D-fructose. Hopefully, this research can provide a valuable contribution to the development of DAEase for industrial production of D-allulose and thereby eventually ensuring the availability of D-allulose as dietary supplement in Indonesia.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Efficient Simulation of Quantum Many-Particle Systems using Classical Computers

1. Research Team Leader

Name	:	**Dr. AHMAD RIDWAN TRESNA NUGRAHA**
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2. Research Field	:	Theoretical and Computational Physics
3. Number of Researcher(s)	:	2
4. Research Location	:	LIPI Research Center for Physics
5. Time Allocation	:	12 months (1 February 2021 – 31 January 2022)
6. Research Grant	:	Rp. 39,350,000.00
7. Summary of Research Proposal	:	

We investigate the possibility of simulating the physical properties of quantum many-particle systems within the classical yet unconventional statistical mechanics in epistemically-restricted (ER) phase space representation. Instead of using quantum computers, we will develop algorithms for efficient simulation of quantum many-particle systems using existing (classical) computers.

The main physical property to be calculated is the average energy of the quantum many-particle systems. We will calculate the average energy within the ER phase space representation combined with the Monte Carlo sampling technique. We will compare the result with the conventional quantum Monte Carlo (QMC) simulation.

We expect our simulation scheme is faster than and challenging the conventional QMC method. Our study will thus pave the way towards using the ER phase representation as a basis for future quantum technologies.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Effects of LED Artificial Light on Plant Growth and Fruit Quality in Lowland Strawberry

1. Research Team Leader

Name	: **Dr. DEDEN DERAJAT MATRA, SP, MAGR**
Sex	: Male
Place/Date of Birth	: Bandung, 6 March 1987
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2. Research Field	: Agriculture
3. Number of Researcher(s)	: 3
4. Research Location	: Leuwikopo Experimental Field, IPB
5. Time Allocation	: March 2021 – February 2022
6. Research Grant	: Rp. 42,300,000.00
7. Summary of Research Proposal	:

The development of artificial light technology with LED (light emitting diode) in Strawberry cultivation in tropical lowland encourages optimum production by manipulating the juvenile period and improving the quality of nutritional values. The aim of this study is to optimize and validate the different spectrum waves of light sources and their intensity on the quality of strawberry fruit.

This research hypothesized that differences of light spectrum increasing the plant growth cycles and the nutritional value of strawberry fruit grown in tropical lowland. In this study, the experimental factors use differences in type of light spectrum (blue, red, blue-red combination, and halogen/white lamp as controls) and also their light intensity. The research was carried out at the Leuwikopo Experimental Field of Dept. AGH-IPB.

The physiological and molecular observations were analyzed measuring photosynthesis rate with Li-6800, starch and sugar content (Sucrose, Fructose, and Glucose) with LC-MS / MS and analysis of gene expression of Flowering Locus (FT) and Suppressor of Overexpression of Constans 1 (SOC1) with qRT-PCR. All physiological and molecular parameters for observation are carried out at the Science Molecular lab, IPB Advanced Laboratory.

OUTLINE OF
THE INDONESIA TORAY SCIENCE FOUNDATION

FOUNDATION HISTORY

The Indonesia Toray Science Foundation was established in 1993 through 3 billion rupiah endowment by Toray Industries, Inc. The foundation is registered with and recognized by the Indonesian authority as an organization formed to advance the objective of promoting Science and Technology in Indonesia.

FOUNDATION OBJECTIVE

The object of the foundation is to contribute to the progress of "Science and Technology" in Indonesia. Science and Technology will be limited in to the fields of natural science, including environment, but excluding clinical medicine and mathematics.

FOUNDATION ACTIVITIES

In order to achieve the objectives, the Foundation will endeavor to undertake the following activities

1. The awarding of the Science Education to recognize creative and innovative contributions to effective science education in vocational school, junior high school, senior high schools
2. The awarding of the Science and Technology, to recognize outstanding achievements in their field
3. The Science and Technology Research Grant, to provide to young scientist financial assistance for basic research in science and technology
4. All other activities related to the science

SCALE OF FOUNDATION OPERATIONS

The annual scale of operations will be approximately Rp 1 billion supplied from operating income from corporate contribution

AWARDS AND GRANTS

1. Science Education Award
2. Science and Technology Award
3. Science and Technology Research Grant

HONORARY CHAIRMAN OF ITSF (Non Board of Directors):
Mr. Akihiro Nikkaku

President of Toray Industries, Inc., Japan
Honorary Chairman of Indonesia Toray Science Foundation

BOARD OF DIRECTOR MEMBERS:

Chairman	:	**Dr. L. T. Handoko**
Managing Director	:	**Mr. Hirofusa Yamamoto**
Director	:	**Prof. Dr. Dali Santun Naga**
		Prof. Dr. Ir. Bambang Soehendro, M. Sc
		Prof. Dr. Satryo Soemantri Brodjonegoro
		Mr. Kenichi Matsui, PT. TIN

SELECTION COMMITTEE

1. The Examination Selection Committee for Science Education Award:
   - **Herwindo Haribowo, Ph. D** (chairman)
   - **Paulus Cahyono Tjiang, Ph. D** (member)
   - **Dr. Eng. Agus Haryono** (member)

2. The Examination Selection Committee for Science and Technology Award and Science and Technology Research Grant:
   - **Prof. Dr. Ir. Dedi Fardiaz, M. Sc** (chairman)
   - **Prof. Dr. Debbie Soefie Retnoningrum** (member)
   - **Dr. M. Aziz Majidi** (member)

SUPPORTER

NO	NAME	LOCATION	DESCRIPTION
1	**TORAY INDUSTRIES, INC**	Tokyo, Jepang	Established in 1926, Toray is Japan's largest manufacturer of synthetics fiber, textiles high performance films, plastic that biggest in Japan The annual sales of ¥ 2214,6 billion in March 2020 Toray leads the world in develop production of carbon fibers & other advanced composite materials. Building on its extraordinary technological strength, Toray is diversifiying into chemicals, pharmaceuticals, medical supplies, electronic materials, housing, and construction materials.
2	**TORAY SCIENCE FOUNDATION**	Chiba, Jepang	Toray Science Foundation established in 1960, through ¥ 1,000 million endowment by Toray Industries, Inc. to contribute to the progress of science by supporting basic research in science & technology

SUPPORTING COMPANY
TORAY GROUP INDONESIA

NO	COMPANY	LOCATION	MAIN BUSINESS
1	**PT Indonesia Toray Synthetics** (PT ITS)	Jakarta	Manufacturer of polyester staple fiber, nylon, polyester filament yarn & resin
2	**PT Indonesia Synthetics Textile Mills** (PT ISTEM)	Jakarta	Spinning, weaving, dyeing of polyester based textiles
3	**PT Acryl Textile Mills** (PT ACTEM)	Jakarta	Spinning and dyeing of acrylic fibers
4	**PT Century Textile Industries, Tbk** (PT CENTEX)	Jakarta	Spinning, weaving, dyeing of industry blended dyeing of blended polyester & cotton textiles
5	**PT Easterntex** (PT ETX)	Pandaan, Jawa Timur	Spinning, weaving of blended polyester & cotton textiles
6	**PT Toray Polytech Jakarta** (PT TPJ)	Jakarta	Nonwoven polypropilene
7	**PT TAK Textile Indonesia** (PT TATI)	Jakarta	Spinning, weaving, dyeing of polyester based textiles
8	**PT Toray International Indonesia** (PT TIIN)	Jakarta	Trading company
9	**PT TI Matsuoka Winner Undustry** (PT TIMW)	Semarang	Garment