JAKARTA
MONDAY
MARCH 6
2023

ITSF INDONESIA TORAY SCIENCE FOUNDATION

PRESENTATION CEREMONY

29th

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

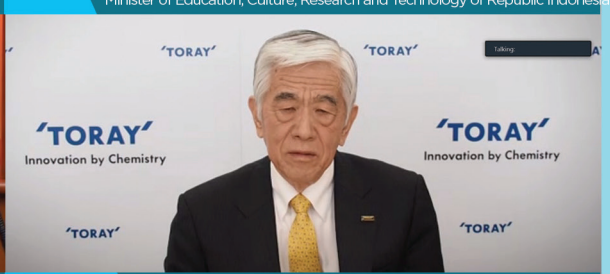
Online Ceremony ITSF 28th

Wednesday, March 16, 2022

Dr. LT. Handoko
Chairman of The National Research and Innovation Agency

Nadiem Anwar Makarim, B.A., M.B.A
Minister of Education, Culture, Research and Technology of Republic Indonesia

HE Mr. Kenji Kanasugi
His Excellency Ambassador of Japan



Mr. Akihiro Nikkaku
President of Toray Industries, Inc., Japan

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CEREMONY PROGRAM
29th ITSF PRESENTATION CEREMONY

09.30 - 09.55	Mr. Mitsuo Ohya meets Mr. Nadiem Makarim, Dr. L.T. Handoko, and HE. Mr. Kenji Kanasugi at VIP Room, Hotel Mulia Senayan Jakarta
09.30 - 09.55	All the guests are waiting in Ballroom
09.56 - 10.00	Opening Ceremony
10.01 - 10.06	**Speech by Prof. Dr. Bambang Soehendro** Director of Indonesia Toray Science Foundation
10.07 - 10.12	**Speech from HE Mr. Kenji Kanasugi** His Excellency Ambassador of Japan
10.13 - 10.18	**Speech from Dr. Laksana Tri Handoko** Chairman of The National Research and Innovation Agency
10.19 - 10.24	**Speech from Bapak Nadiem Anwar Makarim, B.A., M.B.A** Minister of Education, Culture, Research and Technology of Republic Indonesia
10.25 - 10.30	**Speech by Mr. Mitsuo Ohya** The Executive Vice President of Toray Industries, Inc., Japan
10.31 - 10.36	**Report by Mr. Herwindo Haribowo, Ph. D,** Chairman of Selection Committee on Science Education
10.37 - 10.42	**Report by Prof. Dr. Ir. Dedi Fardiaz, M. Sc,** Chairman of Selection Committee on Science and Technology
10.43 - 10.58	**Presentation Awards and Research Grants** • Science Education Award • Science and Technology Award • Science and Technology Research Grant
10.59 - 11.09	Presentation Science & Technology Award's recipient **Prof. Dr. Anto Sulaksono (University of Indonesia)** Title: Neutron stars, the Most Compact Horizonless Objects in the Universe
11.10 - 11.15	Take a picture with all the winners, the grant recipients, VIP guests, ITSF Board of Directors, and Selection Committees
	Luncheon

MESSAGE FROM Dr. 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. I am very pleased that all of us are being able to attend this event. Your presence indicates our commitment and enthusiasm for the advancement of science, technology and innovation in Indonesia.

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. Now, ITSF has inherited strong endorsement from Indonesia's Government through National Research and Innovation Agency (BRIN).

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.

So far, ITSF has been awarding 247 Science Education Awards to science educators in the fields of biology, physics and chemistry; Science and Technology Award to 26 researchers across the fields; and providing research grants to 536 researchers. In 2022, ITSF has awarded 10 Science Education Awards, 1 Science and Technology Award and disbursed 18 grants for the Science and Technology Research Grant. My highest appreciation also goes to the Selection Committees for their hard work and dedication for the success of this program. Congratulations to awardees.

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, Culture, Research and Technology of Indonesia, and the Honorable Chairman of National Research and Innovation Agency of Indonesia, and also to His Excellency the Ambassador of Japan to the Republic of Indonesia.

Thank You,

Dr. L.T. Handoko

MESSAGE FROM MR. MITSUO OHYA
EXECUTIVE VICE PRESIDENT OF TORAY INDUSTRIES, INC., JAPAN

On behalf of Toray Industries, Inc., Japan, I am pleased to extend my warmest wishes and greetings to you all here today on the 29th Presentation Ceremony of the Indonesia Toray Science Foundation (ITSF).

Firstly, I congratulate all the ITSF recipients who deservedly will be receiving their awards and grants today. Next, I wish to express my utmost appreciation to The Honorable Mr. Nadiem Anwar Makarim, B.A., M.B.A, Minister of Education, Culture, Research, Technology and Higher Education, Your Excellency Mr. Kenji Kanasugi, the Ambassador of Japan to the Republic of Indonesia, for taking time off from your busy schedules to grace this Award Ceremony.

Toray Group, founded in 1926, is an integrated chemical industry group developing its business in 29 countries and regions worldwide based on the corporate philosophy, "Contributing to society through the creation of new value with innovative ideas, technologies and products". In running its overseas business, our basic policy is to "contribute to industrial promotion, export expansion and improvement of technological level of the country from a long-term perspective".

To promote basic scientific research and education, guided by this corporate philosophy, Toray established the Toray Science Foundation of Japan in 1960. 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 each country through its business activities.

Over the years, the ITSF has given awards and grants in the accumulated total amount of more than 23 billion Rupiah to 809 researchers and scientists for their outstanding achievements related to technology and science education, and for their contributions in natural science and basic research.

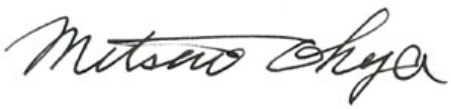
ITSF could not have carried out its activities successfully for 29 continuous years without the strong teamwork and earnest participation of everyone involved. Our sincere appreciation to ITSF Chairman, Dr. LT. Handoko for his able leadership, the hardworking Board and Committee members, secretariat staff and all other individuals and institutions who had rendered their invaluable assistance in one way or another to the ITSF.

Once again, I would like to convey my good wishes and warmest congratulations to all the respective awards and research grants recipients. I hope that the well-deserved reward and recognition will motivate you towards accomplishing higher levels of success, while helping the Republic of Indonesia to cultivate the next generation of scientists. Please do continue with your excellent efforts year ahead.

In concluding, I also express my sincere gratitude to the Minister of Education, Culture, Research Technology and Higher Education and the Ambassador of Japan to the Republic of Indonesia for participating in today's Ceremony.

Finally yet importantly, I wish everyone all the best in your future endeavors.

Thank you very much. **"Terima Kasih".**



Mitsuo Ohya

REPORT FROM THE SCIENCE EDUCATION AWARD 2022

For the year of 2022, the Science Education Award (SEA) proposals (nominees) received through online media were 100 proposals. The number of applicants has significantly increased about 38.9% compared to the previous year, partly because of the promotion of the SEA program through the annual Youth Science Camp Program on July 15, 2022 in Nusa Tenggara Barat, organized by the National Research and Innovation Agency (BRIN). The ratio of applicants from Java and outside Java is 52 : 48, and the ratio of applicants from senior high schools (SMA), junior high schools (SMP) and vocational schools (SMK) is 61 : 26 : 12. The criteria used for selecting the awardees this year were on the innovation, the originality, the simplicity, the reproducibility, and the use of local materials or local context.

On October 11, 2022, the Selection Committee had conducted online meetings and decided to invite 15 nominees to be interviewed. The online interviews for the 15 nominees were held on November 25 and 26, 2022. Based on the interview results, the Selection Committee has decided to propose 10 nominees to be awarded and has been approved by the Board of Directors meeting on December 7th, 2022. The recipients of the ITSF Science Education Award for the year 2022 are, in alphabetical order:

1. **Dewi Nurfita,** a physics teacher from SMA Pribadi Depok, West Java, who teaches the concept of temperature by developing physics short films.
2. **I Wayan Januariawan,** a chemistry teacher from SMA Negeri 1 Bangli, Bali, who developed kits for galvanic cell and electrolysis experiments based on local wisdom and green chemistry.
3. **Indra Budiansah,** a physics teacher from SMA Darul Hikam Bandung, West Java, who developed a simple electric motor to teach the relation between the number of windings and the angular speed of electric motor.
4. **Megasari,** a chemistry teacher from SMA Negeri 5, Bengkulu, who developed a method using board games with toy cars made from waste materials to teach electron configurations.
5. **Mulyono,** a physics teacher from SMP IT PAPB Semarang, Central Java, who developed an air-driven car to teach the Newton's Laws of motion.
6. **Nabila Aurelia Awalin,** a biology teacher from SMP Pondok Pesantren Tahfidz Al-Qur'an Ahmad Dahlan, Ponorogo, East Java, who developed a simple microscope from waste material for experiments in biology.

7. **Nafidh Anwar,** a physics teacher from SMA Tunas Bangsa, Bintan, Riau Islands, who developed a geometrical optic simulator from strings and bamboo.
8. **Rissa Anggraini Agustina,** a biology teacher from SMA Pahoa Tangerang, Banten, who uses gymnastic movements to teach human musculoskeletal system.
9. **Sri Supatmi,** chemistry teacher from SMA Santo Yakobus Jakarta, who developed a set of playing cards and board to teach periodical table.
10. **Suparman,** a biology teacher from SMA Negeri 11 Pangkep, South Sulawesi, who developed a set of teaching aids made from simple materials to teach Mendel's law of segregation.

We congratulate to the awardees with the hope that you all continue to innovate and encourage your colleague teachers to innovate their science teaching.

Thank you.

Jakarta, March 2023

Science Education Award Selection Committee:
- **Herwindo Haribowo, Ph.D.**
- **Prof. Dr. Eng. Agus Haryono**
- **Paulus Cahyono Tjiang, Ph.D.**

REPORT FROM THE ITSF SELECTION COMMITTEE 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 29th Science and Technology Award (STA) and the 29th Science and Technology Research Grant (STRG). As we realized Covid-19 pandemic has given us a valuable experience on how STRG proposals and STA nomination documents should be submitted and processed on-line by the ITSF secretariat. This year we did the same process including the ITSF Science and Technology Seminar held on-line on March 1, 2023

Science and Technology Award

The Selection Committee received 25 nominations for Science and Technology Award program from 17 universities, and 8 research institutes this year. After having reviewed all nomination documents, in particular on specific selection criteria aspects which include among others number and quality of paper published in scientific journal, the quality of scientific journal for publication, and scientific breakthrough claimed by the nominees, the Selection Committee selected and invited three candidates for face-to-face interview assessment.

After carefully evaluating the portfolios of the three candidates and interviewing them, the Selection Committee found that Prof. Anto Sulaksono from University of Indonesia was the candidate who fulfilled the ITSF criteria for the STA Winner. We noted that since his return to Indonesia after his doctoral study in 2002, he had initiated his career path as an independent researcher focusing on studying compact objects such as neutron stars from the perspective of nuclear physics and general relativity. With the knowledge and experience from his doctoral study in finite nuclear structures, he developed the Relativistic Mean Field model with a new set of parameters to investigate the core-crust transition density of neutron stars. As his approach was the first to be implemented in studying neutron stars, and the resulting publications in highly reputable journals have obtained a good number of citations, his pioneering work deserves to be considered a breakthrough. Therefore, the Selection Committee decided to select Prof. Sulaksono as the STA winner.

Science and Technology Research Grant

As many as 289 research proposals were received nationwide for Science and Technology Research Grant. ITSF received 134 proposals from universities and 155 proposals from research institutes. ITSF will provide the total grant of Rp. 704,973,600.- to 18 research proposals this year, as indicated in the following Table.

Table. List of Science and Technology Research Grant Recipients

No	NAME	UNIVERSITY/RESERACH INSTITUTE	GRANT APPROVED (IDR)
1	**Bernadeta Ayu Widyaningrum, M. Si.**	National Research and Innovation Agency (BRIN)	39,719,000
2	**Morgan Ohiwal, S.P., M. Si.**	Universitas Muhammadiyah Maluku	39,800,000
3	**Paula Mariana Kustiawan, Ph.D.**	Universitas Muhammadiyah Kalimantan Timur	39,783,000
4	**Isa Nuryana, M. Biotech**	National Research and Innovation Agency (BRIN)	35,900,000
5	**Dr. rer. nat. apt. Ni Putu Ariantari, S.Farm., M.Farm.**	Udayana University	39,870,000
6	**Dr. Julio**	National Research and Innovation Agency (BRIN)	38,000,000
7	**Ario Betha Juanssilfero, Dr. Eng., M. Sc.**	National Research and Innovation Agency (BRIN)	39,951,000
8	**Dr. Husain, S. Si., M. Si.**	Universitas Negeri Makassar	40,000,000
9	**Ekavianty Prajatelistia, S.T. ,M.S. Eng.,Ph. D.**	Institut Teknologi Bandung	40,000,000
10	**Dr. Adam Badra Cahaya**	Universitas Indonesia	38,000,000
11	**Dr. Eng. Sari Dewi Kurniasih Indrawan**	Institut Teknologi Bandung	39,691,400
12	**Aisyah Hadi Ramadani, S. Si., M. Sc.**	Universitas Muhammadiyah Lamongan	37,000,000
13	**Dr. Murni Handayani, S. Si, M. Sc.**	National Research and Innovation Agency (BRIN)	40,000,000
14	**Dr. Fajar Sofyantoro**	Universitas Gadjah Mada	35,800,000
15	**Mokhamad Nur Cahyadi, S.T., M. Sc., Ph. D.**	Institut Teknologi Sepuluh Nopember	40,000,000
16	**Ariyanti Suhita Dewi, Ph. D.**	National Research and Innovation Agency (BRIN)	40,404,000
17	**Fina Amreta Laksmi, M. Sc, Ph. D.**	National Research and Innovation Agency (BRIN)	40,950,000
18	**Anggia Prasetyoputri, M. Sc, Ph. D.**	National Research and Innovation Agency (BRIN)	40,105,200
TOTAL			**704,973,600**

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. We would like to encourage those who are not fortunate this time to continuously write and submit a better research proposal to ITSF next year.

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 March 1, 2023. As many as 18 recepients of the Science and Technology Research Grant year 2022 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, the Seminar participants had opportunity to listen to Prof. Sulaksono, as the STA Winner sharing his experience in studying neuron stars. 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 2022 and thank you very much for your kind attention.

Jakarta, March 6, 2023
On behalf the Selection Committee,

Prof. Dr. Ir. Dedi Fardiaz, M. Sc (Chairman)
Dr. M. Aziz Majidi (Member)
Dr. Ernawati Arifin Giri Rachman (Member)

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE EDUCATION AWARD'S RECIPIENTS
29th PROGRAM - 2022

NO	NAME	TITLE	AMOUNT
1	**Dewi Nurfita, S. Pd.** SMA Pribadi Depok, West Java Physics	An Innovation in Physics Lessons by Implementing the 21st Century Skills Through Physics Short Films with the Theme of Temperature	25.000.000
2	**I Wayan Januariawan,S. Pd.,M. Si.** SMAN 1 Bangli, Bali Chemistry	KITALIS: Innovation of Integrated Instrument Components (KIT) Voltaic Cells and Electrolysis Based on Local Genius and Green Chemistry	25.000.000
3	**Indra Budiansah, S. Pd, M. Si** SMA Darul Hikam Bandung West Java Physics	A Simple Electric Motor Experiment to Analyze the Effect of the Number of Turns on the Angular Speed of the Electric Motor	25.000.000
4	**Megasari, S. Pd, M. Pd** SMAN 5 Kota Bengkulu, Bengkulu Chemistry	"Electron Ojek" Learning Media	25.000.000
5	**Mulyono, S.Si** SMP IT PAPB Semarang, Central Java Physics	"Integration of Mobil Udara and Telang Flower Extract (Mobil Udara Mod) As an Innovative Teaching Tool for Science Learning"	25.000.000
6	**Nabila Aurelia Awalin, S. Pd** SMP Pondok Pesantren Tahfidz Al-Qur'an Ahmad Dahlan Ponorogo, East Java Biology	Portable Frog Microscope	25.000.000
7	**Nafidh Anwar, S. Pd** SMA Tunas Bangsa Bintan, Kepulauan Riau Physics	MORSA (Media Optik Rancangan Bersama_Co-design Optical Media) to Determine the Location of Shadow of Object on Refraction and Reflection Phenomena	25.000.000
8	**Rissa Anggraini Agustina, M. Pd.** SMA Pahoa Tangerang Banten Biology	SEGA (Senam Gerak Antagonis) : Freedom to Learn Human Movement System	25.000.000
9	**Sri Supatmi, S.Si, M. Pd** SMA Santo Yakobus DKI Jakarta Chemistry	Application of "OK KETUK" Learning Media with Games to Improve Students's Understanding of the Periodic System of Elements	25.000.000
10	**Suparman, S. Pd., M. Pd.** SMAN 11 Pangkep South Sulawesi Biology	Kopi Gen (Kotak Pintar Genetika or Genetic Smart Box) as a Strong Ammunition of Computational Thinking in Understanding Genetic Topic	25.000.000
TOTAL			**250.000.000**

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE AND TECHNOLOGY AWARD'S RECIPIENT
29th PROGRAM - 2022

NO	NAME	TITLE	AMOUNT
1	**Prof. Dr. Anto Sulaksono** University of Indonesia	Neutron stars, the Most Compact Horizonless Objects in the Universe	100.000.000

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE AND TECHNOLOGY RESEARCH GRANT'S RECIPIENTS
29th PROGRAM - 2022

NO	NAME	RESEARCH TITLE	AMOUNT	FUNDED BY
1	**Bernadeta Ayu Widyaningrum, M. Si.** National Research and Innovation Agency (BRIN)	3D Macroscopic Carbon Fibril Aerogel Enlace Magnetic with Antimicrobial Response for Oil/ Water Separation	39.719.000	ITSF
2	**Morgan Ohiwal, S.P., M. Si.** Universitas Muhammadiyah Maluku	Biofertilizer Formulation from Potential Phosphate Solubilizing-Bacteria and Nitroogen-Fixing Bacteria Isolated from the Rhizosphere Area of Linggua Tree (Petrocarpus Indicus Wild.) as Synthetic Fertilizer Analogue with Sageru as Carrier Material	39.800.000	ITSF
3	**Paula Mariana Kustiawan, Ph.D.** Universitas Muhammadiyah Kalimantan Timur	Nanostructured Lipid Carrier-Propolis as a New Candidate Transdermal Delivery For Human Breast Cancer Treatment: In Vitro And In Silico Evaluation	39.783.000	ITSF
4	**Isa Nuryana, M. Biotech** National Research and Innovation Agency (BRIN)	Development of Novel Trehalose Synthase and Its Potential for Bioconversion of Trehalose: A Natural Moisturizer for Skin Protection	35.900.000	ITSF
5	**Dr. rer. nat. apt. Ni Putu Ariantari, S.Farm., M.Farm.** Udayana University	Antimicrobial Metabolites from Mangrove-derived Endophytic Fungus, Cladosporium sp. (SA-L2-1), and Chemical Diversity Enhancement through OSMAC Study	39.870.000	ITSF
6	**Dr. Julio** National Research and Innovation Agency (BRIN)	Probing the Zee Model of Neutrino Mass via Decay of Heavy Resonance in e-muon Final States	38.000.000	ITSF
7	**Dr. Eng. Ario Betha Juanssilfero** National Research and Innovation Agency (BRIN)	Lactones Production from Non-hydroxylated Fatty Acids as the Valuable Bioflavor and Fragrance Through Engineering β-oxidation Pathway of Oleaginous Yeast	39.951.000	ITSF
8	**Dr. Husain, S. Si., M. Si.** Universitas Negeri Makassar	The Structural, Magnetic, dan Electromagnetic Wave Absorption of Fe3O4NPs/rGO from Natural Resources: a New Potential Candidate for Electromagnetic Absorption Materials.	40.000.000	ITSF

9	**Ekavianty Prajatelistia, S.T., M.S. Eng., Ph. D.** Institut Teknologi Bandung	The Dominant Role of Sodium Alginate as a Binder on Aqueous Zinc Ion Battery with ZnMn2O4 Cathode	40.000.000	ITSF
10	**Dr. Adam Badra Cahaya** Universitas Indonesia	Modeling of Electrical Control of Exchange Bias for Efficient Magnetic Recording	38.000.000	ITSF
11	**Dr. Eng. Sari Dewi Kurniasih Indrawan** Institut Teknologi Bandung	Purification and Characterization of Multimeric Bann-RBD Fusion Protein as A COVID-19 Vaccine Candidate	39.691.400	ITSF
12	**Aisyah Hadi Ramadani, S. Si., M. Sc.** Universitas Muhammadiyah Lamongan	Microbiome analysis in Fruit Garbage Enzyme (Ecoenzyme) Using Next-Generation Sequencing (NGS) to Optimize The Enzyme Role as Biocatalyst for Remediation of Crude-Oil Contaminant in Water	37.000.000	ITSF
13	**Murni Handayani, S. Si, M. Sc.** National Research and Innovation Agency (BRIN)	Development Graphene Quantum Dots (GQDs) derived from corncob biomass waste for electrochemical sensor for determination of painkiller drug 'acetaminophen" in pharmaceutical waste	40.000.000	ITSF
14	**Dr. Fajar Sofyantoro** Universitas Gadjah Mada	Expression of SIR2, GPX1, and GLR1 Genes in Saccharomyces cerevisiae upon Treatment with Anti-Aging Compounds from Pacar Cina (Aglaia odorata) and Beluntas (Pluchea indica) Leaves	35.800.000	ITSF
15	**Mokhamad Nur Cahyadi, Ph. D.** Institut Teknologi Sepuluh Nopember	Analysis of Preseismic and Coseismic Ionospheric Disturbances in the Maumere Earthquake on December 14, 2021 and the Alaska Earthquake on July 29, 2021 with the 3D Tomographic Method as a Tsunami Early Warning System (TEWS)	40.000.000	ITSF
16	**Ariyanti Suhita Dewi, Ph. D.** National Research and Innovation Agency (BRIN)	Metabolite Profiling and Action Mechanisms of Triterpene Glycosides from Holothuria scabra as Antiinflammatory Agents in Lipopolysaccharide-Stimulated RAW 264.7 Macrophages	40.404.000	Toray Science Foundation Japan
17	**Fina Amreta Laksmi, M. Sc., Ph. D.** National Research and Innovation Agency (BRIN)	Enhancing The Enzyme Property Of D-Allulose 3-Epimerase Through Rational Design For Bioconversion of A Non-Caloric Sweetener D-Allulose	40.950.000	Toray Science Foundation Japan
18	**Anggia Prasetyoputri, M. Sc., Ph. D.** National Research and Innovation Agency (BRIN)	Using Ribosome Engineering to Optimize the Production of Antibacterial Metabolites from Indonesian Marine Streptomyces	40.105.200	Toray Science Foundation Japan
TOTAL			**705.475.300**	

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

An Innovation in Physics Lessons by Implementing the 21st Century Skills Through Physics Short Films with the Theme of Temperature

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

Name	: **DEWI NURFITA, S. Pd.**
Sex	: Female
Place/Date of Birth	: Klaten, 15 January 1991
School	: SMA Pribadi Depok
School Address	: Jl. Margonda Raya No. 229, Kemiri Muka, Beji Depok, Jawa Barat 16424
Phone/Fax Number	: (021) 777-5620 Fax No: -
Email Address	: info@pribadidepok.sch.id

3. **Proposal Summary** :

In this digital era, students cannot be separated from social media. They are enthusiastic to become content creators. Therefore, students must have 21st century skills to face the challenges in the future. The innovation in physics lessons that implements 21st century skills and combined with student interest will be an excellent solution in learning physics. Thus, the innovation in physics lessons by implementing 21st century skills through physics short films with the theme of temperature need to be applied.

All stages in the application of this learning innovation can train the students to implement 21st century skills such as critical thinking, communication, collaboration, and creativity. The students are able to make films with storylines that contain physics concepts. They find out about daily activities related to one of the physics concepts which is temperature. In addition to training the students to implement 21st century skills, this learning innovation can also encourage the students to become content creators with positive and useful content.

In the filmmaking, the students learn not only about physics, but also Indonesian, English, and ICT. The equipment used in filmmaking are items that are commonly used in everyday life. Filming is done easily, cheaply and simply.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

KITALIS: Innovation of Integrated Instrument Components (KIT) Voltaic Cells and Electrolysis Based on Local Genius and Green Chemistry

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

Name	: **I WAYAN JANUARIAWAN, S.Pd., M.Si.**
Sex	: Male
Place/Date of Birth	: Tanggahan Peken, 17 January 1993
School	: SMA Negeri 1 Bangli
School Address	: Jl. Brigjen Ngurah Rai No.36, Kawan, Kec. Bangli, Kabupaten Bangli, Bali
Phone/Fax Number	: (0366) 91025 No. Fax: -
Email Address	: add.janu@gmail.com

3. **Proposal Summary** :

Kitalis is an Integrated Instrument Component (KIT) innovation to support practical activities in chemistry learning, especially the voltaic cell and electrolysis sub-materials. The development of Kitalis as a supporting medium for Chemistry learning practicum is carried out by taking into account the principles that integrate the green chemistry approach, local genius and environmentally friendly practicum.

The objectives of Kitalis include: 1) facilitating electrochemical practicum activities, especially on voltaic cells and electrolysis; 2) developing a practical kit for voltaic cells and electrolysis with a green chemistry approach, local wisdom and environmental insight; 3) develop students' critical, creative and analytical thinking skills in solving problems through a scientific approach in practical activities; and 4) applying chemistry learning in accordance with its essence, namely chemistry as a product, process and attitude.

Kitalis is designed with several considerations, namely: (1) safety, (2) ease of use and maintenance, (3) economic value, (4) accuracy in measurement. The existence of Kitalis is expected to overcome problems related to the limitations of practical facilities and infrastructure in the laboratory and problems related to equipment and practicum materials that are not environmentally friendly.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

A Simple Electric Motor Experiment to Analyze the Effect of the Number of Turns on the Angular Speed of the Electric Motor

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

Name	: **INDRA BUDIANSAH, S.Pd., M.Si.**
Sex	: Male
Place/Date of Birth	: Lebak, October 1st 1993
School	: SMA Darul Hikam
School Address	: Jl. Supratman No. 88, Cihaur Geulis, Kec. Cibeunying Kaler, Kota Bandung, Jawa Barat 40114
Phone/Fax Number	: (022) 2532571 No. Fax: -
Email Address	: indra.budiansah@gmail.com

3. **Proposal Summary** :

On a simple electric motor, the torque is proportional to electric current (i), magnetic field (B), cross-sectional area (A), and the number of turns (N). Based on those variables, students claim that the more coil turns, the faster it rotates. This assumption is not wrong because we assume that other variables are always constant in value.

As a teacher, it is necessary to provide learning experiences to confirm students' concepts. This simple electric motor experiment innovation is suitable for this purpose. Students can design their coil turn to investigate the effect of it on coil angular speed. The experiments show that the coil with relatively many turns (10 turns) had a low rotational speed and did not rotate for some students. These experimental results are in contrast to the students' hypothesis. To solve the gap, the teacher guides students to connect their analysis with the concept of electric resistance, electric current and the inertia moment of the coil.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

"Electron Ojek" Learning Media

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

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3. **Proposal Summary** :

The learning media of "Electron Ojek" is used in chemistry learning for subshell electron Configuration material and Quantum Number. This lesson topic is so abstract that most students have difficulties in constructing their understanding. The teacher also finds difficulties in helping them comprehend this lesson topic. In my opinion, a certain model which covers all rules in per subshell configuration is urgently needed in order that the students can easily comprehend it. Therefore, this "Electron Ojek" learning media can be applied.

This media is created by using easily accessed materials in our daily life. "Electron Ojek" consists of a toy car made of plastic bottle of mineral drink, the track of Aufbau principle is created on a cartoon paper. The electron is created like an arrow from 'kertas kambing.'

The use of "Electron Ojek" learning media in learning process can aids the students in constructing their better comprehension about the subshell electron configuration and quantum numbers lesson topic. It also helps teachers in explaining the materials, makes the learning more enjoyable. The students become more active and responsive in the class. It also encourages them to care more about the environment by making use of the waste mineral water bottles.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Integration of Mobil Udara and Telang Flower Extract (Mobil Udara Mod) As an Innovative Teaching Tool for Science Learning

1. **Subject** : Science (Physics)
2. **Receiver**

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3. **Proposal Summary** :

Mobil Udara Mod is a modification/development of Mobil Udara 003 with an oil drop model with Telang flower extract which can be used as an innovative teaching aid in science learning. In its implementation, this teaching aid can be used for 2 practicum modules, namely in class 7 Motion material and Newton's Laws and Forces material in class 8 which can also replace the practicum model with oil droplets and the existing ticker timer. The advantages of this tool are that it is cheap and easy to re-duplicate, and the children in the group make their own Mobil Udara media so as to stimulate Independence, Creativity and Mutual Cooperation in children. In addition to this graphic calculation model, the calculation of the formula with various variables obtained from the practicum they do, the child will be more critical of several factors that affect the motion of this Mobil Udara Mod, so that in addition to the value of the Pancasila Student Profile 4C in 21st Century learning, it will also be achieved. Telang flower extract as a substitute for oil, apart from being easy to obtain (many available in school yards) will also trigger in the next lesson about natural indicators of Acids, Bases and Salts. This work has also won 1st place in the 2015 Ministry of Education and Culture LKG, 2nd place in the 2015 UNNES LIMPRANAS, the 2017 ISF Bronze Medal, and 1st place in Linkar Astra's Great Teacher 2022.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Portable Frog Microscope

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

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3. **Proposal Summary** :

A microscope is a science practicum tool that can be used to observe very small objects (microscopic objects), be used to observe objects that are difficult to directly see or observe by the eye. The microscope is a very important science practicum tool.

Tafidhz Al-Qur'an Ahmad Dahlan Junior High School School is a new school. Tafidz Al-Qur'an Junior High School Ahmad Dahlan has usufficient practicum equipments, does not have a microscope. So, to overcome the limitations of the tool for practicum, I made a tool on science practicum by making a Portable Frog Miscropcope. I made a Portable Frog Microscope from local materials, easy to obtain materials, abundant materials,cheap materials.

How to use the Portable Frog Microscope is very easy. Portable Frog Microscope is very clear to see microscopic objects. Portable Frog Microscope to see the leaf structure of radish color the results are very clear. Portable Frog Microscope is very helpful for students in investigating microscopic objects. Students are very happy when doing practicum using a portable frog microscope. The enthusiasm and curiosity of students increased after doing practicum using the Portable Frog Microscope.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

MORSA (Media Optik Rancangan Bersama_Co-design Optical Media) to determine the location of shadow of object on refraction and reflection phenomena

1. **Subject** : Physic
2. **Receiver**

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3. **Proposal Summary** :

This innovation of learning media has purpose to make easier for student to understand how to determine the location of shadow on refraction and reflection phenomena on optical instrument (lens or mirror). The main point on this learning media is we build a media that we can touch and well operated, which is has origin abstract concept in determine the location of shadow using sketch drawing of it.

This innovation of learning media consists of two parts, fixed part and unfixed part. Fixed part has two sticks, horizontal and vertical stick. Horizontal stick has some holes on it, so we can place the object run into refraction and reflection. On the other hand, other holes have function to be focal point. The second part is vertical stick that can be function as optical instrument, however, it can be more effective if we use wire instead of stick, so we can arrange the shape based on the curve of optical instrument.
Unfixed part consists of three wires that can be function as three special lights on refraction and reflection phenomena, second component of unfixed part in the form of short stick which has function as the object in refraction or reflection phenomena.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

SEGA (*Senam Gerak Antagonis*): Freedom to Learn Human Movement System

1. Subject : Biology

2. Receiver

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3. Proposal Summary :

SEGA is an innovation in Biology learning, especially in human movement system material. SEGA here means a compilation of several movements as the result of antagonistic muscles' activities in human body. In this case, "Freedom to learn" refers to student's freedom to create and explain the antagonistic muscle mechanism and opportunity to collaborate in the group combining several movements to form a body exercise.

This exercise may increase student's motivation, creativity, and understanding of the types of antagonistic movements. It also gives students a 'learning through experience' moment in understanding the material. This innovation can be a solution to overcome boredom in learning Biology and limitation distance learning.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Application of "OK KETUK" Learning Media with Games to Improve Students's Understanding of the Periodic System of Elements

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

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3. **Proposal Summary** :

This research aims to improve students' understanding on the material periodic table of elements through the application of OK KETUK learning media with games. OK KETUK is a learning media for the periodic table of elements that combines element cards and the periodic table. This media is played by shuffling cards, determining the electron configuration, period and group of elements on the front of the card and doing problems on the back of the card and placing the element cards on the periodic table.

The research method used is a quasi-experimental design with one group pre-test post-test design. The research subjects were students of class X IPA2 SMA Santo Yakobus Jakarta academic year 2018/2019 with a total of 24 students. The instruments used in this study consisted of observation sheets, pre-test and post-test also student interviews.

The results showed that OK KETUK learning media could improve students' understanding of the material on the periodic table of elements. The average score increased from 64.79 with 37.50% learning completeness to 83.44 with 91.67% learning completeness at the passing grade 70.00. The application of OK KETUK makes students more active, trains cooperation, makes learning situations fun, fosters student motivation and improves learning outcomes.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Kopi Gen (Kotak Pintar Genetika or Genetic Smart Box) As a Strong Ammunition of Computational Thinking in Understanding Genetic Topic.

1. Subject : Biology

2. Receiver

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3. Proposal Summary :

Genetic topic in Biology is considered difficult to understand by students, one of the reasons is that genetics is considered as biological mathematics and is not taught with fun media. As a result, there are obstacles in learning, regarding the inheritance pattern of Mendel's Law crosses, resulting in low student learning outcomes.

The smart solution to overcome the problem is to make simple media innovations to overcome learning loss and help students overcome difficulties in learning genetics. This media is called "KOPI GEN" (Genetic Smart Box). It has two stages, manufacturing stage by making box patterns and genetic button gamete symbol and Implementation stage, namely the orientation, application, and evaluation stage, with computational thinking principles using aspects of decomposition, algorithm, abstraction and pattern recognition of abstract biological topic into meaningful and contextual learning. Therefore, learning situations created is more interesting and competitive, making it easier for students to understand concepts and improve learning outcomes. Finally, it affects level of concepts understanding and students learning outcomes. It also inspires numeracy literacy character-based learning so that students can understand the pattern of gametes and crosses of Mendel's Law according to the concept of independence learning and the Profiles of Pancasila Student.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

1. Title : Neutron stars, the most compact horizonless objects in the universe

2. Receiver

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3. Ringkasan Usulan :

Neutron stars (NSs), the most compact horizonless objects in the universe, are a perfect laboratory to study nuclear matter at extremely high densities and the signature of gravity modification beyond the standard of Einstein's general relativity. There is tremendous progress related to NS properties observations through the realization of new facilities such as the LIGO-Virgo gravitation wave facility, new simultaneously mass and radius pulsars measurements from NICER collaboration, and new multi-messenger hierarchical inference scheme analysis. However, uncertainty degeneracy between the matter of NS and the proper gravity in NS still exists. Here, we report four points of our contributions to pin down these twofold uncertainty degeneracies. We proposed a new RMF parameter set compatible with finite nuclei and nuclear matter experimental data, as well as a reasonable high-density region extrapolation for NS applications. We calculated the core-crust transition density of NS using the RPA method. We found that the "Hyperon Puzzle" issue in NSs can be solved by introducing anisotropic pressure or modifying the gravity sector and the compact object with mass=2.6Msun observed in the GW190814 event is not likely an NS. We checked the latter using anisotropic pressure modification and Eddington-inspired Born Infeld gravity theory.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

3D Macroscopic Carbon Fibril Aerogel Enlace Magnetic with Antimicrobial Response for Oil/ Water Separation

1. Research Team Leader

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2. Research Field	: Material adsorbent, sensor, chemistry
3. Number of Researcher(s)	: 2 (two)
4. Research Location	: iLab, CSC, Jl Raya Bogor No. KM 46, Cibinong, Kab. Bogor, Jawa Barat
5. Time Allocation	: 1 year
6. Research Grant	: Rp. 39,719,000
7. Summary of Research Proposal	:

Environmental and ecological problems from crude oil, oil spill from petroleum products and toxic organic solvents is become serious problem and urgently to solve. Absorption is one of the efficient, low cost, easy recovery treatment, and environmentally friendly. To develop ideal absorbent material, they should have high absorption capacity, selectivity, reusability, and environmentally friendly. Herein, we will explore the composite 3D carbon fibril aerogel with enlace magnetic and antimicrobial response via eco-friendly method. 3D macroscopic carbon fibril aerogel enlace magnetic with antimicrobial response can be easily attracted by a magnetic force and energy-saving method to collect oils from polluted areas. The simple and effective approach in two-step: freeze-drying and carbonization. To fabricate the aerogel, the suspension of cellulose nanofibril composite with ferric chloride solution and AgNWs is put in freeze-dryer and converted into 3D carbon aerogels via carbonization.

The properties of magnetic and antimicrobial will be evaluated, and it is expected that it is naturally hydrophobic, selective, and reusable for oil/water separation. The combination of low-cost biomass as raw materials, green preparation process, low density, excellent hydrophobicity, and antimicrobial activity will be great potential candidate absorber, which suitable for industrial oil-polluted water treatments and oil spill cleanup.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Biofertilizer Formulation from Potential Phosphate-Solubilizing Bacteria and Nitrogen-Fixing Bacteria Isolated from the Rhizozfer Area of Linggua Tree (*Petrocarpus Indicus* Wild.) As Synthetic Fertilizer Analogue With Sageru As Carrier Material

1. Research Team Leader

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2. Research Field	:	Soil Biotechnology
3. Number of Researcher(s)	:	3
4. Research Location	:	Ambon
5. Time Allocation	:	9 Months
6. Research Grant	:	Rp. 39.800.000
7. Summary of Research Proposal	:	

Phosphate and nitrogen are essential nutrients needed by plants in the process of photosynthesis and root development. The availability of phosphate in the soil is usually only about 0.01% of the total P in the soil. This is because most of the P is bound by the colloidal surface of the soil so it is not available to plants. On the other hand, Nitrogen makes up about 80% of gases in the atmosphere, but is not directly accessible to plants, so this results in high doses of fertilizer applied in fertilization. In addition, synthetic fertilizers will also cause health hazards and endanger sustainable agriculture. In order to suppress the excessive use of synthetic fertilizers, another alternative is needed, namely the use of biological fertilizers consisting of P-Solubilizing bacteria and N-fixing bacteria. The two bacteria will be isolated from rhizosphere area of Linggua tree using Pikovskaya and Nitrogen Free Mannitol (NFM) media. The research stages include: soil sampling using purpossive random sampling, isolation and screening of bacteria, hypersensitivity test of bacteria, formulation of biofertilizer using *Sageru* as a carrier material, and application of biofertilizer to Linggua seedlings. This fertilizer is expected to be commercialized and used by farmers, especially in Maluku.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Nanostructured Lipid Carrier-Propolis as A New Candidate Transdermal Delivery for Human Breast Cancer Treatment: In Vitro and in Silico Evaluation

1. Research Team Leader

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2. Research Field	: Health
3. Number of Researcher(s)	: 6 person
4. Research Location	: Universitas Muhammadiyah Kalimantan Timur and Nano Center Indonesia
5. Time Allocation	: 1 year
6. Research Grant	: Rp. 39,783,000
7. Summary of Research Proposal	:

This research aims to create the first NLC-propolis for breast cancer treatment by combining nanotechnology and lipid-based drug carrier with propolis as an active agent for transdermal application. The anticancer effect of NLC-propolis can be optimized in low doses, with high penetration, drug loading capacity, stability, and homogeneity. First, we synthesize NLC-propolis using our method described in Patent ID P0020225467. The particle size distribution, zeta potential, and morphology of NLC-propolis were then examined using a particle size analyzer, a zeta sizer, and a TEM, respectively. The best NLC-propolis with low-size particles, high stability, and homogeneity is subjected to additional testing to determine total bioactive content (polyphenol and flavonoid) and antioxidant capacity. Further testing will be performed in vitro using the MTT assay MCF-7 cell line and ex vivo penetration analysis using the Franz diffusion method. Throughout the LC-MS/MS QTOF investigation, all propolis compounds are identified. These compounds are then simulated to human breast cancer protein targets by in silico method using molecular docking and molecular dynamics. In the binding site of protein targets, anticancer propolis compounds will have the lowest binding affinity and the highest stability. Therefore, anticancer compounds in NLC-propolis can be identified.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Development of Novel Trehalose Synthase and Its Potential for Bioconversion of Trehalose: A Natural Moisturizer for Skin Protection

1. Research Team Leader

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2. Research Field	:	Microbial biotechnology
3. Number of Researcher(s)	:	3
4. Research Location	:	Genomics Laboratory BRIN, Bogor
5. Time Allocation	:	12 months (March 2023-Feb 2024)
6. Research Grant	:	Rp. 35,900,000
7. Summary of Research Proposal	:	

The novel gene encoding trehalose synthase has been first isolated from *Arthrobacter psychrolactophilus.* Trehalose synthase (TreS) is an enzyme that plays an important role in one-step trehalose production using maltose as a starting material. Since maltose is considered to be an affordable and abundant substrate in Indonesia, producing trehalose through the enzymatic process using TreS is industrially appealing due to its simplicity and cost-efficiency. Trehalose is a non-reducing disaccharide, associated with the survival of extremophile organisms because it acts as a cell protectant and moisturizer to prevent cell damage. Therefore, it has potential applications for skincare products. Besides, it was granted Generally Recognized As Safe (GRAS) status by the US FDA in 2000. This study aims to obtain a new TreS enzyme with properties preferable for industrial applications, such as high- and thermo-stability. The TreS gene isolated from a potential strain is constructed into the expression vector and then it is cloned and expressed in Escherichia coli system. Recombinant enzyme purification is performed using affinity chromatography. Finally, the purified enzyme is characterized by its biochemical properties. We hope this study will provide fruitful insights in regard to the development of prospective enzymes for rare sugar production in Indonesia.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Antimicrobial Metabolites from Mangrove-derived Endophytic Fungus, Cladosporium sp. (SA-L2-1), and Chemical Diversity Enhancement Through OSMAC Study

1. Research Team Leader

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2. Research Field	:	Pharmaceutical Biology
3. Number of Researcher(s)	:	2 People
4. Research Location	:	Bali, Indonesia
5. Time Allocation	:	12 Months
6. Research Grant	:	Rp. 39,870,000
7. Summary of Research Proposal	:	

In a recent study, we isolated several endophytic fungi from mangrove, Sonneratia alba, and one of these strains has been identified as Cladosporium sp. (SA-L2-1) based on its morphological characteristic. This fungal endophyte was found capable of producing antimicrobial metabolites against *Staphylococcus aureus* and *Staphylococcus epidermidis* in our bioassay screening. Thus, the objective of the proposed research is to isolate and characterize molecular structures of antimicrobial secondary metabolites from Cladosporium sp. Moreover, this study aims at optimization of production of antimicrobial metabolites from mangrove-derived endophytic fungus, Cladosporium sp., through the application of OSMAC approach.

The research will be conducted in several steps, including molecular identification and fermentation of fungal strain on rice media to get the crude extract. The resulting extract will be subjected to liquid-liquid partition, followed by chromatographic separation to obtain active metabolites. Each separation step will be monitored through TLC and HPLC analysis, as well as guided by antimicrobial assay against S. aureus and S. epidermidis. The chemical structure of isolated metabolites will be established through extensive NMR and MS analysis. Moreover, OSMAC strategy by addition of salts into rice media will be applied to uncover hidden chemical diversity or enhance the production of bioactive molecules.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Probing the Zee Model of Neutrino Mass via Decay of Heavy Resonance in e-μ Final States

1. Research Team Leader

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2. Research Field	:	Elementary Particle Physics
3. Number of Researcher(s)	:	2 (two)
4. Research Location	:	Serpong and Bandung
5. Time Allocation	:	12 months
6. Research Grant	:	Rp 38,000,000
7. Summary of Research Proposal	:	

The objective of the research is to find a model of neutrino mass that can be directly tested either at colliders or by future low-energy experiments. We choose the Zee mode since this model is very rich phenomenologically. We are particularly concerned about channel $H \to e^{\pm}\mu^{\pm}$ because it has a great potential to constrain the model parameter space; its strength is determined through neutrino oscillation data, and at the same time, subject to $\mu \to e+\gamma$ constraint.

Usually, one expects that constraint from such muon decay is always stronger than that of collider search. However, in this research, we want to show that the collider could give stronger constraints with enough data. We base our conjecture on the fact that the future MEG experiment would be only able to probe the $\mu \to e+\gamma$ at the sensitivity 6×10^{-14}, which is one order of magnitude smaller than the current bound, while the next generation LHC (or high-luminosity LHC/HL-LHC) could have an accumulation of data at 4000 fb^{-1}, with a center of mass energy 14 TeV. If it is the case, it can be a guide for experimenters to look at this channel more seriously.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Lactones Production from Non-hydroxylated Fatty Acids as the Valuable Bioflavor and Fragrance Through Engineering β-oxidation Pathway of Oleaginous Yeast

1. Research Team Leader

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2. Research Field	: Bioprocess/Applied Biotechnology
3. Number of Researcher(s)	: 3
4. Research Location	: Research Center for Applied Microbiology
5. Time Allocation	: 11 months
6. Research Grant	: Rp. 39,951,000
7. Summary of Research Proposal	:

Lactones are internally formed cyclic esters of five (γ)- or six (δ)-hydroxy acids which are in combination with their corresponding alcohols. It has an incredibly strong smell and a creamy taste with a concentration of <5 parts per million (ppm). Due to the low abundance (ppm levels) of lactones in natural sources, extraction of natural lactones is not economically feasible. Microbial hosts capable of lactone biosynthesis from fatty acids, sugars or glycerol, would enable a cheaper and more sustainable lactone production. However, generally lactone production using microbes are perform in a two-step processes which resulting in extra capital and running costs. We propose a method for single-step lactone production from non-hydroxylated fatty acid using oleaginous yeast. The oleaginous yeast will be engineered in which used by beta(β)-oxidation to hydroxylate fatty acids and to shorten-chain preferentially 12 or 10 carbons. The engineered strains are expetected to increase production yields of γ-Dodecalactone and δ-Decalactone, respectively at higher levels than the wild strain, thereby paving the way for higher lactone production by fermenting available agroresidues as substrate.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

The Structural, Magnetic, dan Electromagnetic Wave Absorption of Fe_3O_4NPs/rGO from Natural Resources: a New Potential Candidate for Electromagnetic Absorption Materials.

1. Research Team Leader

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2. Research Field	: Radar Absortion and Magnetic Materials
3. Number of Researcher(s)	: 2 (two)
4. Research Location	**:** Universitas Negeri Makassar
5. Time Allocation	: Januari 2023-Desember 2023
6. Research Grant	: Rp. 40,000,000
7. Summary of Research Proposal	:

The development of devices that work in the Giga Hertz (GHz) frequency range, has resulted in increased emission of electromagnetic waves that can interfere with the operation of electronic warfare and also the health of living beings. Fe_3O_4NPs and rGO are magnetic and dielectric materials, respectively, so they have the ability to attenuate electromagnetic waves which is consisting of magnetic and electric fields. In this project, Fe_3O_4NPs/rGO composites will be synthesized from natural materials. The study of crystal structure, microstructure, and electronic and local structure will provide an explanation of magnetic properties and their applications as electromagnetic wave absorbers. In the present research, the synthesis and study of Fe_3O_4NPs/rGO will use the natural resources of Indonesia (iron sand and coconut charcoal). A comprehensive study to obtain data on local structures, electronic structures, and crystal structures, and micro-nano structure will be carried out using several advanced characterization techniques, i.e. XRF, FTIR, XRD, XAS, and TEM. Moreover, magnetic properties and absorption of electromagnetic waves will be carried out using VSM and VNA, to determine their absorption characteristics, as a new potential candidate for electromagnetic wave absorbing materials.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

The Dominant Role of Sodium Alginate Binder for Aqueous Zn-Ion Batteries with α-MnO2 Nanorod Cathode

1. Research Team Leader

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2. Research Field	: Batteries Technology
3. Number of Researcher(s)	: 3
4. Research Location	: Insititut Teknologi Bandung, Bandung (40132), and Chonnam National University, Gwangju, South Korea (61186)
5. Time Allocation	: 6 months
6. Research Grant	: Rp. 40.000.000
7. Summary of Research Proposal	:

In 2050 the Indonesian government and all other countries are targeting "Net Zero Emissions" to reduce the amount of carbon that can harm the earth, so this research was carried out using Aqueous Zinc-Ion Batteries (AZIB) type batteries which have environmentally friendly values, low-cost fabrication, and long-term development. To stabilize and maximize the role of AZIB batteries, an α-MnO2 type cathode is needed. The α-MnO2 cathode has extraordinary electrochemical properties that can stabilize AZIB. In addition to the part of the cathode, the binder is also required to realize the long-term increase in the electrochemical capabilities of cells. A binder of Sodium Alginate (SA) was used, which can improve battery performance in several studies. So, to reduce battery fabrication costs and maximize Indonesia's seas' natural wealth, SA is one of the right choices for environmentally friendly binders. This study aims to analyze and compare the results of SA with commercial PVDF binders with characterization tests (XRD, SEM-EDX, and TEM-EDX) and battery performance tests (Galvanostatic Charge/Discharge, CV, EIS, and C-rate).

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Modeling of Electrical Control of Exchange Bias for Efficient Magnetic Recording

1. Research Team Leader

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2. Research Field	: Condensed Matter Physics
3. Number of Researcher(s)	: 2
4. Research Location	: Universitas Indonesia
5. Time Allocation	: 1 year
6. Research Grant	: Rp. 36,000,000
7. Summary of Research Proposal	:

The basic circuit of magnetic memory includes two ferromagnetic layers. The "0" and "1" of digital data is defined by the relative direction between the ferromagnetic layers. Discovery of giant magnetoresistance in 1988 has increased the data reading speed of the magnetic memory. On the other hand, the data writing speed of magnetic memory is ongoing research. The data writing efficiency rely on manipulating one ferromagnetic layer while fixing the other. By attaching an antiferromagnet into the ferromagnetic layer, an exchange bias can be induced and the ferromagnetic layer become fixed to a certain direction. The basic circuit magnetic memory that includes exchange bias is a magnetic heterostructure that consists of four layers: antiferromagnet-ferromagnet-spacer-ferromagnet.

This research theoretically investigates the role of spacer in the exchange bias. When there is symmetry breaking at the system, there is a spin-orbit interaction at the spacer that can induce additional exchange bias. We aim to show that the spin-orbit interaction induces a magnetoelectric effect at the spacer. The magnetoelectric effect is useful for determining the mechanism of electric field manipulation of the exchange bias. Since manipulation of electric field require less energy than magnetic field, our result can lead to a more efficient magnetic memory.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Purification and Characterization of Multimeric Bann-RBD Fusion Protein as A COVID-19 Vaccine Candidate

1. Research Team Leader

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2. Research Field	: Biochemistry
3. Number of Researcher(s)	: 2
4. Research Location	: Jalan Ganesha No. 10 Bandung
5. Time Allocation	: 1 September 2022 - 31 Desember 2023
6. Research Grant	: : Rp. 39.691.400
7. Summary of Research Proposal	:

Various vaccine platforms have been developed worldwide in an effort to deal with COVID-19 pandemic that caused by the transmission of SARS-CoV-2 virus. One of the subunit proteins that has been used is the receptor binding domain (RBD) protein of the SARS-CoV-2. RBD can stimulate the immune system to produce neutralizing antibodies that can inhibit the interaction of the virus with ACE2. Several studies have shown that dimeric, trimeric, and multimeric RBDs produce higher neutralizing antibodies than monomeric RBD. The aim of this proposal is to purify and characterize the multimeric RBD, consist of RBD with β-annulus (Bann) from tomato bushy stunt virus (TBSV) and conduct biochemistry and immunology characterization.

Bann-RBD fusion protein will be produced in *Hansenula polymorpha* that can secrete high level of protein and has a post-translational modification system. This research starting with structural modeling of Bann-RBD design, the construction of the Bann-RBD gene in the expression vector of *H. polymorpha*, continued with the expression, purification, and characterization of Bann-RBD protein. Multimeric Bann-RBD is expected to have proper folding, recognized by RBD antibody, and can interact with ACE2. The multimeric protein system developed in this study is expected to be used on subunit protein-based vaccine platform

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Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Microbiome analysis in Fruit Garbage Enzyme (Ecoenzyme) Using Next-Generation Sequencing (NGS) to Optimize the Enzyme Role as Biocatalyst for Remediation of Crude-Oil Contaminant in Water

1. Research Team Leader

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2. Research Field : Environment
3. Number of Researcher(s) : 4
4. Research Location : Univ. Muhammadiyah Lamongan
5. Time Allocation : 8 months
6. Research Grant : Rp. 37.000.000
7. Summary of Research Proposal :

In this research work, we investigate the ecosystem of microorganisms including bacteria genus and fungi genus that exist in fruit garbage enzyme through microbiome approach. We also measure the enzyme content and activity of ecoenzyme from crude oil remediation process. To optimize the enzyme role in remediation we analyze the correlation of microorganism diversity and enzymatic product. The research will be started by taking fruit garbage enzyme samples made from pineapple peel fermented with molasses and water for 3 months. The enzyme will analyze using qualitative approaches to determine lipase, protease, laccase, oxygenase, hydroxylase, and dioxygenase presence in ecoenzyme. Extraction and amplification of DNA with NucleoSpin® Tissue kit (Macherey-Nagel, Duren, Germany) to isolate DNA in samples. Bacterial and fungi 16S rRNA sequences were detected using primers then PCR amplification and nested PCR were performed. Sequence results of more than 200 bp were analyzed by 80% similarity threshold as an operational taxonomic unit. OTU will be analyzed by Kruskall-Wallis and the Shannon-Wiener diversity index calculated. The abundance of bacterial and fungal genera obtained will be tested by pearson's test to the enzyme activity.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Development Graphene Quantum Dots (GQDs) derived from corncob biomass waste for electrochemical sensor for determination of painkiller drug 'acetaminophen" in pharmaceutical waste

1. Research Team Leader

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2. Research Field	:	Nanomaterials, Functional materials
3. Number of Researcher(s)	:	1
4. Research Location	:	: BRIN, Tangerang Selatan, Banten
5. Time Allocation	:	1 years
6. Research Grant	:	Rp. 40.000.000
7. Summary of Research Proposal	:	

Currently, drugs in household and hospital wastewater are associated with increased production and consumption of over-the-counter medicines such as acetaminophen as painkillers. The presence of these compounds is a danger to aquatic species and humans. The potential application for detecting pharmaceutical waste, such as acetaminophen in wastewater, will be very beneficial to monitor wastewater and pharmaceutical waste problems that are hazardous to health and the environment.

Our research on the Graphene Quantum Dots aims to convert waste that has so far been underutilized to produce a significant added value into advanced functional materials to reduce wastewater and pharmaceutical waste problems that are hazardous to health and the environment. To achieve the research objectives, our main stages of the research consist of 3 parts: synthesis of GQDs, characterization of GQDs, and sample preparation and testing of sensor performance electrochemically.

Synthesis of GQD follows the hydrothermal method of corncob waste after the grinding process and removing dirt particles. The GQDs obtained will then be characterized by UV-Vis, XRD, SEM, EDX, TEM, Raman spectrophotometer and BET. Evaluation of GQD for the pharmaceutical sample is planned to be tested using several methods, such as cyclic voltammetry, amperometry, differential pulsed voltammetry, and electrochemical impedance spectroscopy.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Expression of SIR2, GPX1, and GLR1 Genes in *Saccharomyces cerevisiae* upon Treatment with Anti-Aging Compounds from Pacar Cina (*Aglaia odorata*) and Beluntas (*Pluchea indica*) Leaves

1. Research Team Leader

Name	: **DR. FAJAR SOFYANTORO**
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2. Research Field	: Molecular biology
3. Number of Researcher(s)	: 2
4. Research Location	: Universitas Gadjah Mada
5. Time Allocation	: 12 months (February 2022 – February 2023)
6. Research Grant	: Rp. 35,800,000
7. Summary of Research Proposal	:

Aging is characterized by a decline in bodily functions. In recent years, a global trend in choosing animal-free cosmetics provides opportunity for the development of alternative model organisms. One of the promising strategies is to use the budding yeast *Saccharomyces cerevisiae* as model organism in anti-aging research. S. cerevisiae has become a potent tool for chemical and genetic screening in anti-aging research due to its quick workflow, experimental amenability, and accessibility to genetic mutant libraries. Several important genes involved in the cellular aging process are SIR2, GPX1, and GLR1, which are conserved in yeast and humans. These genes act as regulators of aging-related metabolisms. The extract of Pacar Cina (*Aglaia odorata*) and Beluntas (*Pluchea indica*) leaves are reported to have a significant antioxidant property. Therefore, the purpose of this study is to determine the molecular mechanisms on how the anti-aging compounds from Pacar Cina and Beluntas affect the expression level of SIR2, GPX1, and GLR1 genes. The research method includes anti-aging test, lifespan assay, and SIR2/GPX1/GLR1 genes expression test. Our hypothesis is that Pacar Cina dan Beluntas extract are capable of up regulating the SIR2, GPX1, and GLR1 genes expression and suppressing the aging process in budding yeast *S. cerevisiae*.

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Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Analysis of Preseismic and Coseismic Ionospheric Disturbances in the Maumere Earthquake on December 14, 2021 and the Alaska Earthquake on July 29, 2021 with the 3D Tomographic Method as a Tsunami Early Warning System (TEWS)

1. Research Team Leader

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2. Research Field	:	GNSS
3. Number of Researcher(s)	:	3
4. Research Location	:	Dept. of Geomatics Engineering, ITS Surabaya
5. Time Allocation	:	September 2022-September 2023
6. Research Grant	:	Rp. 40,000,000
7. Summary of Research Proposal	:	

The Global Navigation Satellite System (GNSS) can be used to observe the atmosphere layer. Ionospheric disturbances due to earthquakes were studied from Total Electron Content (TEC) values obtained from wave data that were delayed as they passed through the ionosphere. Acoustic waves from the vertical deformation of the earthquake travel perpendicular from the earth's crust towards the ionosphere and disrupt the electron density known as Coseismic Ionospheric Disturbance (CID). CID's fluctuation can be used as an early warning system before the tsunami arrives. GNSS was used to obtain information on ionospheric disturbances following the December 14, 2021, Maumere earthquake (7.3 SR) and then compared with the July 29 Alaska earthquake (8.2 SR) from both preseismic and CID. The distribution of ionospheric anomalies was analyzed using the 3D Tomography method. The study results are used to analyze the TEC on the TEH (Tsunamigenic Ionospheric Hole) to estimate the initial height of the tsunami, including building an early warning system using GNSS. This research is expected to be a reference for mitigating the EWS earthquake and tsunami.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Metabolite Profiling and Action Mechanisms of Triterpene Glycosides from Holothuria scabra as Antiinflammatory Agents on Lipopolysaccharide-Stimulated RAW 264.7 Macrophages

1. Research Team Leader

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2. Research Field	:	Marine Natural Products
3. Number of Researcher(s)	:	2 (two)
4. Research Location	:	Jakarta
5. Time Allocation	:	January-December 2023
6. Research Grant	:	Rp. 40.404.000
7. Summary of Research Proposal	:	

The aim of this project is to investigate the metabolite profile and to evaluate the mechanisms of actions of triterpene glycosides from *Holothuria scabra* as anti-inflammatory agents. This project is a continuation from our previous work, in which we have successfully established the bioactivities of rich-triterpene glycoside extract of *H. scabra* (HSTG) *in vitro*. The addition of the extract was found to effectively reduce the lipopolysaccharide-induced NO production in RAW 264.7 cells with an ED50 of 25.1 µg/mL. In this study, the metabolite profiling HSTG will be conducted using LC-MS. The anti-inflammatory effects of HSTG will be determined using ELISAs for prostaglandin E2 (PGE2) and tumor necrosis factor-α (TNF-α). The anti-inflammatory action mechanisms of HSTG will be evaluated using RT-PCR for activation of nuclear transcription factor kappa B (NF-κB) and mitogen-activated protein kinases (MAPKs). We hypothesize that HSTG in RAW 264.7 macrophages are associated with inhibition of the release of inflammatory mediators and cytokines through the suppression of MAPK and NF-κB activation.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Enhancing The Enzyme Property Of D-Allulose 3-Epimerase Through Rational Design For Bioconversion of A Non-Caloric Sweetener D-Allulose

1. Research Team Leader

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2. Research Field	:	Applied Biotechnology
3. Number of Researcher(s)	:	3 persons
4. Research Location	:	Genomic building-BRIN, CSC Soekarno, Cibinong, Bogor, West Java
5. Time Allocation	:	10 months
6. Research Grant	:	Rp. 40,950,000
7. Summary of Research Proposal	:	

In recent years, with the increasing public health awareness, low-calorie rare sugar, D-allulose, has received more attention on a global scale. D-allulose has many advantages for human health in addition to being a non-caloric sweetener including antioxidant effects, strong anti- hyperlipidemic and anti-hyperglycemic, improving insulin resistance, anti-obesity, and anti- hypertension. The US FDA has confirmed the safety of D-allulose as generally regarded as safe (GRAS) food and is permitted to be served as food ingredients and dietary supplements. For production of D-allulose, an enzyme called D-allulose 3-epimerase (DAEase) is utilized by using D-fructose as substrate, which is cheap and widely available in Indonesia. Previously, we successfully obtained D-allulose 3-epimerase from *Arthrobacter psychrolactophilus* (ApDAEase) and overexpressed in Escherichia coli system. Although ApDAEase showed excellent thermostability, higher catalytic activity is desirable for further use in food industrial. Hence, we intend to enhance the catalytic activity of ApDAEase via rational design. Saturation mutagenesis at the residues responsible for the interaction between the ApDAEase and the O-3, -4, -5, and -6 atoms of D-fructose was performed to increase the catalytic activity. Promising mutant variants with improved catalytic activity are screened and selected. The purified mutant variants will be used for the investigation on their activites.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Using Ribosome Engineering to Optimize the Production of Antibacterial Metabolites from Indonesian Marine Streptomyces

1. Research Team Leader

Name	: **DR. ANGGIA PRASETYOPUTRI**
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2. Research Field	: Microbiology
3. Number of Researcher(s)	: 6 (six) people
4. Research Location	: Cibinong
5. Time Allocation	: 12 months
6. Research Grant	: Rp. 40,105,200
7. Summary of Research Proposal	:

The problem of antimicrobial resistance has prompted multiple approaches to discover and develop new antibiotics, including from natural sources. However, improved methodologies and approaches are needed to ensure that novel compounds are discovered and not merely rediscovering of known compounds. The ribosome engineering approach has also been shown to be a viable method to activate the silent BGCs and optimize the production of antibacterial compounds. This research aims to apply the ribosome engineering method to improve the production of secondary metabolites with antibacterial activity from Indonesian marine *Streptomyces*.

Selection of rifampicin-resistant mutants will be performed by screening for growth in rifampicin-supplemented agar medium, following which the mutations in the *rpoB* gene will be characterised via sequencing. Extracts from liquid fermentation will be assessed for their antibacterial activity and characterised using chromatography analysis such as HPLC and LCMS.

It is hypothesized that isolates carrying certain mutations in rpoB gene will have improved antibacterial activity compared to the wild type strain. This study is expected to result in one or more *Streptomyces* isolates with good yield of antibacterial metabolites and add evidence of the feasibility of the ribosome engineering method to optimize production of secondary metabolite production with biological activity of interest.

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. Kazuhiko Shiomura**
Director	:	**Prof. Dr. Dali Santun Naga**
		Prof. Dr. Ir. Bambang Soehendro, M. Sc
		Prof. Dr. Satryo Soemantri Brodjonegoro
		Mr. Hironobu Sudo, PT. TIN

SELECTION COMMITTEE

1. The Examination Selection Committee for Science Education Award:
   - **Herwindo Haribowo, Ph. D** (chairman)
   - **Paulus Cahyono Tjiang, Ph. D** (member)
   - **Prof. 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)
   - **Dr. Ernawati Arifin Giri Rachman** (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 ¥ 2,228.5 billion in March 2022 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) TORAY Innovation by Chemistry	Jakarta	Manufacturer of polyester staple fiber, nylon, polyester filament yarn & resin
2	**PT Indonesia Synthetics Textile Mills** (PT ISTEM) ISTEM	Jakarta	Spinning, weaving, dyeing of polyester based textiles
3	**PT Acryl Textile Mills** (PT ACTEM) ACTEM	Jakarta	Spinning and dyeing of acrylic fibers
4	**PT Century Textile Industries, Tbk** (PT CENTEX) CENTEX PT. CENTURY TEXTILE INDUSTRY Tbk	Jakarta	Spinning, weaving, dyeing of industry blended dyeing of blended polyester & cotton textiles
5	**PT Easterntex** (PT ETX) PT EASTERNTEX	Pandaan, Jawa Timur	Spinning, weaving of blended polyester & cotton textiles
6	**PT Toray Polytech Jakarta** (PT TPJ) TORAY TORAY POLYTECH JAKARTA	Jakarta	Nonwoven polypropilene
7	**PT TAK Textile Indonesia** (PT TATI) TORAY PT TAK Textiles Indonesia	Jakarta	Spinning, weaving, dyeing of polyester based textiles
8	**PT Toray International Indonesia** (PT TIIN) TORAY Innovation by Chemistry	Jakarta	Trading company
9	**PT TI Matsuoka Winner Industry** (PT TIMW) TIMW	Semarang	Garment