ITSF INDONESIA TORAY SCIENCE FOUNDATION

31st PRESENTATION CEREMONY

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

JAKARTA

THURSDAY, JANUARY 30TH, 2025

THE 30th PRESENTATION CEREMONY

HOTEL MULIA SENAYAN JAKARTA, 20 FEBRUARY 2024

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

Good morning.

It is a great pleasure for me as the Chairman of the Indonesia Toray Science Foundation to welcome you all in this great occasion. Please allow me, on behalf of the Board of Directors of the Indonesia Toray Science Foundation, to convey our appreciation for your presence today. Your presence is very encouraging for us and showing you commitment to support science in general and, in particular, scientific communities in Indonesia.

ITSF, since its establishment on December 1993 by Toray Indonesia with full supports from the Ministry of Education and Culture and the Indonesian Institute of Sciences (LIPI) that time, has been aiming to contributing on the development of education and scientific research in Indonesia. Currently, Indonesia government continues supporting ITSF through the National Research and Innovation Agency (BRIN).

ITSF has established several programs to support science educators and researchers in Indonesia, in the form of research grants and scientific awards. Applications are open to all Indonesian people and are carried out transparently and competitively by independent committees consisting of leading scientists in the respected fields. This grant is intended to motivate and support researchers and educators from all over Indonesia to improve their capabilities through high quality research activities.

Please allow me to summarize the ITSF's programs this year:
1. Science Education Award for 10 educators in the fields of biology, physics and chemistry.
2. Science and Technology Award for 1 researcher.
3. Research grants for 18 researchers.

As a comparison, in 2023, ITSF has awarded 9 Science Education Awards, 1 Science and Technology Award and distributed 18 Science and Technology Research Grants.

Taking this opportunity, on behalf of ITSF, I would like to congratulate all the awardees. Secondly, I would also like to express my personal appreciation to all members of Selection Committees for your hard work and dedication, and also your precious time to make those programs success.

Concluding my welcoming remark, I would like to thank the Governments of the Republic of Indonesia and Japan for their sincere support since the inception of ITSF program. I would especially like to express my deep gratitude to the Excellency Ambassador of Japan to the Republic of Indonesia.

Sincerely

Dr. L.T. Handoko

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

On behalf of Toray Industries, Inc., Japan, I am delighted to extend my warmest wishes and greetings to you all here today at the 31st Presentation Ceremony of the Indonesia Toray Science Foundation (ITSF).

Firstly, I congratulate all the ITSF recipients who will deservedly be receiving their awards and grants today. Next, I wish to express my utmost appreciation to the Honorable Prof. Dr. Satryo Soemantri Brodjonegoro, Minister of Higher Education, Science and Technology, the Honorable Minister of Primary and Secondary Education, Prof. Dr. Abdul Mu'ti, and His Excellency Mr. Yasushi Masaki, the Ambassador of Japan to the Republic of Indonesia, for taking time out of your busy schedules to grace this Award Ceremony.

Toray Group, founded in 1926, is an integrated chemical industry group developing its business in Japan and overseas based on the corporate philosophy, **"Contributing to society through the creation of new value with innovative ideas, technologies and products"**. In our overseas operations, the 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 25 billion Rupiah to 884 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 31 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 have rendered their invaluable assistance 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 continue with your excellent efforts in the year ahead.

In concluding, I also express my sincere gratitude to the Minister of Higher Education, Science and Technology, Minister of Primary and Secondary 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".**

Akihiro Nikkaku

REPORT FROM THE SELECTION COMMITTEE FOR SCIENCE EDUCATION AWARD

For the year of 2024, the Science Education Award (SEA) proposals received through online media were 112. The composition number of applicants from Java and outside Java were 73:39, and the number of applicants from Junior High Schools (SMP), Senior High Schools (SMA) and Vocational Schools (SMK) were 19:83:10. The composition of Subjects were Biology:Chemistry:Physic: Integrated Science (SMP) = 31 : 32 : 41 : 8. These compositions showed us that the participation of science teachers for SEA were varied represents most of geographical areas, level ang type of educations, and three science subjects awarded.

The criteria for selecting the awardees were on the bases: the correctness of the contents, the innovation, the originality, the simplicity, the reproducibility, and the use of local materials or local context.

On October 21st, 2024, the Selection Committee conducted evaluation meeting and decided to invite 15 nominees to be interviewed. The online interviews for the 15 nominees were held on November 1st and 2nd, 2024. Based on the interview results, the Selection Committee has decided to propose 10 Awardees and have been approved by The ITSF Board of Directors in a BOD meeting conducted on December 16th, 2024. The Science Education Awardees year 2024 are (in alphabetical order):

1. **Ardyansyah Ibraham, S. Pd., M. Si.**
   SMA Swasta Kristen Immanuel, West Kalimantan
2. **Ayuk Ratna Puspaningsih, S. Pd., M. Pd.**
   SMA Negeri Bali Mandara, Bali
3. **Dewi Suryana. S. Pd.**
   SMA Avicenna Cinere, Depok, West Java
4. **Haryanti S. Si., M. Pd.**
   SMA Negeri 6 Palopo, South Sulawesi
5. **Herlina Tumiur Ritonga, S. Pd.**
   SMP Negeri 1 Sidikalang, North Sumatera
6. **Maisaroh, S. Pd.**
   MTs Darul Fikri, Ponorogo, East Java
7. **Nurlela Ramadani Marpaung, S. Pd, M. Pd.**
   SMA Negeri 2 Bandar, North Sumatera
8. **Rachma Indah Kurnia, M. Pd.**
   SMP Negeri 2 Kedungadem, East Java
9. **Risat Kasiang, S. Pd.**
   SMA Negeri 6 Halmahera Utara, North Maluku
10. **Tsaniyah Nur Kholilah, S. Pd., M. Si.**
    MAN 2 Kota Malang, East Java

In summary, the composition of Science Education Awardees were: Inside Java: Outside Java 4:6; Biology: 4Chemistry: 3 Physics: 3; SMP, SMA: 2:8.

The SEA Selection Committees congratulate to all Awardees with the hope that all Awardees continues and deseminate their science teaching innovation to ease the understanding for the students.

Thank you very much.

Jakarta, 30 January 2025

Science Education Award Selection Committee:

- **Herwindo Haribowo, Ph.D. (Chairman)**
- **Paulus Cahyono Tjiang, Ph.D. (Member)**
- **Prof. Is Fatimah (Member)**

REPORT FROM THE ITSF SELECTION COMMITTE FOR SCIENCE AND TECHNOLOGY

As the ITSF Selection Committee for Science and Technology, we—Dr. Muhammad Aziz Majidi, Prof. Dr. Suryadi Ismadji, and myself—are pleased to present this report on two key ITSF programs: the 31st Science and Technology Award (STA) and the 31st Science and Technology Research Grant (STRG). This report also includes an overview of the ITSF Science and Technology Seminar, which was held online on January 11, 2025.

Science and Technology Award

This year, the ITSF Selection Committee received 22 nominations for the Science and Technology Award program, representing 14 universities and 8 research institutes (BRIN). Following a rigorous review and quantitative assessment of proposals based on criteria such as track record, networking, significant breakthroughs, independence, consistency, pioneering work, and recognition, three outstanding candidates were selected for final interviews.

After a thorough review of the three candidates' achievements, commitment, and portfolios, the Selection Committee determined that Prof. Ocky Karna Radjasa, Ph.D., from BRIN, presented the most comprehensive and impactful research and best fulfilled the ITSF criteria for the STA Winner.

Prof. Radjasa's pioneering work in deep-sea exploration, employing cutting-edge technology to address critical challenges, represents a significant contribution to both Indonesian science and global knowledge. His research methodologies, unique materials, and innovative approaches are particularly relevant to Indonesia's needs, effectively bridging global scientific challenges with local applications. This demonstrates not only groundbreaking research but also remarkable perseverance and innovation. The Selection Committee congratulates Prof. Ocky Karna Radjasa, Ph.D., on this well-deserved recognition. The Committee encourages more nominations for the STA program next year.

Science and Technology Research Grant

This year, the Science and Technology Research Grant program received 319 research proposals from across the country, with 215 originating from universities and 104 from research institutes. After careful consideration, ITSF has selected 18 promising research proposals to receive grants totaling Rp 704,946,000, as shown in the following table.

The ITSF Selection Committee extends its congratulations to the grant recipients and expresses its hope that these grants will provide valuable support for the completion of their high-quality research. To those who were not selected this year, we encourage continued pursuit of research and submission of refined proposals to ITSF next year.

List of Science and Technology Research Grant Recipients

No	NAME	UNIVERSITY/RESERACH INSTITUTE	GRANT APPROVED (IDR)
1	**Melati Septiyanti, M.T.**	National Research and Innovation Agency of Indonesia (BRIN	39,150,000
2	**Dr. Sc. Bangun Satrio Nugroho, M.Sc.**	National Research and Innovation Agency of Indonesia (BRIN)	39,000,000
3	**Ir. Jindrayani Nyoo Putro, S.T., Ph.D., IPM.**	Universitas Katolik Widya Mandala Surabaya	39,150,000
4	**Syahril Siregar, S.Si., M.Sc., Ph.D.**	Universitas Indonesia	39,000,000
5	**Dr. Husain, S.Si., M.Si.**	Universitas Negeri Makassar	39,000,000
6	**Dr. Aqwin Polosoro, S.Si., M.Sc.**	National Research and Innovation Agency of Indonesia (BRIN)	39,072,000
7	**Adhi Dwi Hatmanto, S.Si., M.Sc., Ph.D.**	Universitas Gadjah Mada	39,150,000
8	**apt. Candra Dwipayana Hamdin, S.Farm., M.Sc., Ph.D.**	Universitas Mataram	39,400,000
9	**Dr.Eng. Ir. Yorina Sarah Franscoise Lantang, S.T., M.Eng.**	Institut Teknologi Bandung	39,000,000
10	**Dr. Eng. Dani Permana, S.Si., M.Si.**	National Research and Innovation Agency of Indonesia (BRIN)	39,050,000
11	**Dr. Lia Aprilia**	National Research and Innovation Agency of Indonesia (BRIN)	39,150,000
12	**Ir. Erni Dwi Puji Setyowati, S.T.P., M.Sc**	Universitas Palangka Raya	39,150,000
13	**Dr. Windri Handayani**	Universitas Indonesia	39,150,000
14	**Dr. apt. Hegar Pramastya**	Institut Teknologi Bandung	39,000,000
15	**Ika Dewi Wijayanti, S.T., M.Sc., Ph.D.**	Institut Teknologi Sepuluh Nopember (ITS)	39,500,000
16	**Ganies Riza Aristya, S.Si., M.Sc., Ph.D.**	Universitas Gadjah Mada	39,266,000
17	**Dr. Ima Mulyama Zainuddin**	National Research and Innovation Agency of Indonesia (BRIN)	39,258,000
18	**Iwan Darmadi, Ph.D**	National Research and Innovation Agency of Indonesia (BRIN)	39,500,000
TOTAL			**704,946,000**

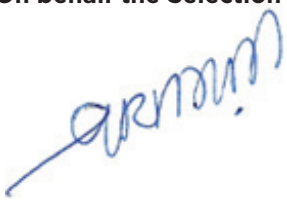
Science and Technology Seminar

The ITSF Selection Committee is pleased to report the successful online execution of the ITSF Science and Technology Seminar on January 11, 2025. This seminar, a key forum for information exchange among scientists and featured presentations from 18 grant recipients from 2023. Invited experts provided valuable review and feedback on the presented research. This event offers a vital platform for these young scientists to showcase their work, share findings, and gain constructive insights. It also serves as a valuable learning opportunity for all participants, typically from universities and research institutes. This year, participants benefited from a special presentation by Prof. Radjasa, the STA Winner, who shared her expertise in deep-sea exploration. As a token of appreciation, the reviewers selected three best presenters, one from each presentation group, to receive prizes.

I would like to take this opportunity to express my gratitude to all members of the ITSF Selection Committee for their solid cooperation throughout the selection process. We also express our sincere gratitude to ITSF Toray Industries, Inc., Japan, and the Toray Group Indonesia for their continued annual support of ITSF activities. We also thank the ITSF Seminar organizing committee and the ITSF Executive Board of Directors for entrusting us with this important and challenging assignment.

Finally we conclude the report of the ITSF Selection Committee for Science and Technology Year 2024 and thank you very much for your kind attention.

Jakarta, January 30, 2025
On behalf the Selection Committee,



Dr. Ernawati Arifin Giri-Rachman **(Chairman)**
Dr. M. Aziz Majidi **(Member)**
Prof. Dr. Suryadi Ismadji **(Member)**

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE EDUCATION AWARD'S RECIPIENTS
31st PROGRAM - 2024

NO	NAME	TITLE	AMOUNT
1	**Ardyansyah Ibraham, S.Pd., M.Si.** SMA Swasta Kristen Immanuel West Kalimantan Chemistry	The Utilization of Arduino Uno with Hydrogen Gas Sensor in Measuring Hydrogen Gas Concentration for Reaction Rate, Reaction Stoichiometry, Voltaic Cell and Electrolysis Cell Experiments in the Laboratory	Rp25,000,000
2	**Ayuk Ratna Puspaningsih, S.Pd., M.Pd.** SMA Negeri Bali Mandara Bali Biology	Innovative Experiment Model on Topic Enzymes using Papaya Leaves Extract	Rp25,000,000
3	**Dewi Suryana. S.Pd.** SMA Avicenna Cinere Depok West Java Chemistry	"Creative Redox: Fun Learning Chemistry with 21st Century Skills" (Resolution of Chemistry Learning with a Combination of Leader in Me, Chemoedutainment, AI and Gallery Walk to Improve Understanding of Redox Concepts through Fun Practicum)	Rp25,000,000
4	**Haryanti S.Si., M.Pd.** SMA Negeri 6 Palopo South Sulawesi Biology	The Effectiveness of using the Lipasawe Genetics Media in Enhancing the Understanding of Inheritance Concepts in Humans for 12th Grade Biology Students at SMAN 6 Palopo	Rp25,000,000
5	**Herlina Tumiur Ritonga, S.Pd.** SMP Negeri 1 Sidikalang North Sumatra Physics	Increasing the Outcomes of Learning Waves and Sound using an Experimental Tooled Wheel for Class VIII Students of SMP Negeri 1 Sidikalang Academic Year 2023/2024	Rp25,000,000
6	**Maisaroh, S.Pd.** MTs Darul Fikri Ponorogo East Java Physics	OOB (Otok-otok Boat) as a Contextual and Intregrated Learning Media for Motion and Speed Material in Class VII MTs Darul Fikri	Rp25,000,000
7	**Nurlela Ramadani Marpaung, S.Pd, M.Pd.** SMA Negeri 2 Bandar North Sumatra Chemistry	Determination of Acetic Acid Concentration in Packaged Vinegar using Small Scale Chemistry Principles	Rp25,000,000
8	**Rachma Indah Kurnia, M.Pd.** SMP Negeri 2 Kedungadem East Java Biology	Organ System Game	Rp25,000,000
9	**Risat Kasiang, S.Pd.** SMA Negeri 6 Halmahera Utara North Maluku Physics	Modification of the Traditional Dodorobe Game to Improve Class XI Students Understanding of Physics on Business Material	Rp25,000,000
10	**Tsaniyah Nur Kholilah, S.Pd., M.Si.** MAN 2 Kota Malang East Java Biology	2D Plantae Action Figure Learning Media Combined with AI Image Generator	Rp25,000,000
TOTAL			**225.000.000**

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE AND TECHNOLOGY AWARD'S RECIPIENT
31st PROGRAM - 2024

NO	NAME	TITLE	AMOUNT
1	**Prof. Ocky Karna Radjasa, Ph.D.** National Research and Innovation Agency of Indonesia (BRIN)	Bioprospecting of Indonesia's Marine Treasures: from Shallow Coral Reefs to Deep-sea	Rp100,000,000

INDONESIA TORAY SCIENCE FOUNDATION
SCIENCE AND TECHNOLOGY RESEARCH GRANT'S RECIPIENTS
31st PROGRAM - 2024

NO	NAME	RESEARCH TITLE	AMOUNT	FUNDED BY
1	**Melati Septiyanti, M.T.** National Research and Innovation Agency of Indonesia (BRIN)	Enhanced Antioidant Activity of Sungkai Leaves Extract Using Natural Deep Eutectic Solvents For Anti-aging Treatment	Rp39,150,000	Toray Science Foundation Japan
2	**Dr. Sc. Bangun Satrio Nugroho, M.Sc.** National Research and Innovation Agency of Indonesia (BRIN)	"All-graphene Iron-air Battery: Reversible Rusting for the Next Rechargeable Battery Generation"	Rp39,000,000	Toray Science Foundation Japan
3	**Ir. Jindrayani Nyoo Putro, S.T., Ph.D., IPM.** Universitas Katolik Widya Mandala Surabaya	The Application of Durian Seed and Chitosan as Polyelectrolyte Complex for Bioimaging	Rp39,150,000	Toray Science Foundation Japan
4	**Syahril Siregar, S.Si., M.Sc., Ph.D.** Universitas Indonesia	Deep Learning-Based Segmentation of Breast Cancer Lesions in Ultrasound Imaging Using U-Net	Rp39,000,000	Toray Science Foundation Japan
5	**Dr. Husain, S.Si., M.Si.** Universitas Negeri Makassar	Advanced Protective Coatings: Fe_3O_4NPs/rGO-Infused Paint for Submarine Hulls with Radar Absorption Capabilities	Rp39,000,000	Toray Science Foundation Japan
6	**Dr. Aqwin Polosoro, S.Si., M.Sc.** National Research and Innovation Agency of Indonesia (BRIN)	Development a Novel Genome Editing Plasmid for SrFT Gene Knockout to Optimize Steviol Production in Stevia Rebaudiana	Rp39,072,000	Toray Science Foundation Japan
7	**Adhi Dwi Hatmanto, S.Si., M.Sc., Ph.D.** Universitas Gadjah Mada	Enhancing the Performance of Chitosan/ Polyaniline-based Quasi Solid Electrolyte with Morphology-dependent TiO2 Nanofillers for Dye-sensitized Solar Cells	Rp39,150,000	Toray Science Foundation Japan
8	**apt. Candra Dwipayana Hamdin, S.Farm., M.Sc., Ph.D.** Universitas Mataram	Evaluation of Brucea Javanica L. Merr Extract Effectivity on Vascular Stenosis Development Post-Endothelial Denudation in Mice	Rp39,400,000	Toray Science Foundation Japan

9	**Dr.Eng. Ir. Yorina Sarah Franscoise Lantang, S.T., M.Eng.** Institut Teknologi Bandung	Effect of Thermal Aging and Solution Annealing on Sigma Phase Formation and Corrosion Resistance in Super Duplex Stainless Steel UNS S32760	Rp39,000,000	Toray Science Foundation Japan
10	**Dr. Eng. Dani Permana, S.Si., M.Si.** National Research and Innovation Agency of Indonesia (BRIN)	Post-translational Modifications of Staphylokinases from Indonesian Strains of Staphylococcus Aureus to Improve their Activity and Affinity Against Plasminogen	Rp39,050,000	Toray Science Foundation Japan
11	**Dr. Lia Aprilia** National Research and Innovation Agency of Indonesia (BRIN)"	Non-Invasive Glucose Detection using Polydopamine-Functionalized Dynamic Microcantilevers	Rp39,150,000	Toray Science Foundation Japan
12	**Ir. Erni Dwi Puji Setyowati, S.T.P., M.Sc.** Universitas Palangka Raya	Formulation of an Ointment Based on Red Palm Oil and Channa Striata Fish Oil Extract as a Wound Healing Treatment	Rp39,150,000	Toray Science Foundation Japan
13	**Dr. Windri Handayani** Universitas Indonesia	Toxicological Assessment of Biogenic Ag Nanoparticles: Phytotoxicity on Oryza Sativa L. (Rice) and Zea mays L. (Corn) and Cytotoxicity on Macrophage Cells	Rp39,150,000	Toray Science Foundation Japan
14	**Dr. apt. Hegar Pramastya** Institut Teknologi Bandung	Genome Wide Effect of Heterologous Expression of Mevalonate Pathway in Bacillus Subtilis	Rp39,000,000	Toray Science Foundation Japan
15	**Ika Dewi Wijayanti, S.T., M.Sc., Ph.D.** Institut Teknologi Sepuluh November (ITS)	Development of Electro-Spun Nanofiber-based Polyaniline-linseed Oil Self-Healing Coating for Anti-corrosion Applications	Rp39,500,000	ITSF
16	**Ganies Riza Aristya, S.Si., M.Sc., Ph.D.** Universitas Gadjah Mada	Yeast Bioengineering for Sustainable Lipid-Based Energy Production from Rhodotorula Glutinis	Rp39,266,000	ITSF
17	**Dr. Ima Mulyama Zainuddin** National Research and Innovation Agency of Indonesia (BRIN)	Purification and Characterization of Lectin Proteins from Chitosan-coated Banana Musa Acuminata and Plantain M. Balbisiana as Agglutinin Molecule Candidates to Detect Cancer Biomarkers	Rp39,258,000	ITSF
18	**Iwan Darmadi, Ph.D.** National Research and Innovation Agency of Indonesia (BRIN)	Fabrication of Nanoplasmonics-Fiber Optics Sensor: Enabling Ultrasensitive Operando Sensing of Rechargeable Battery Cell	Rp39,500,000	ITSF
TOTAL			**Rp704,946,000**	

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

The Utilization of Arduino Uno with Hydrogen Gas Sensor in Measuring Hydrogen Gas Concentration for Reaction Rate, Reaction Stoichiometry, Voltaic Cell and Electrolysis Cell Experiments in the Laboratory

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

Name	: **ARDYANSYAH IBRAHAM, S.Pd., M.Si.**
Sex	: Male
Place/Date of Birth	: Pontianak, 21 April 1989
School	: Immanuel Christian High School
School Address	: Jl. Letjen Sutoyo No. 1 Pontianak, West Kalimantan 78121
Phone/Fax Number	: (0561) 732594 Fax No: (0561) 737045
Email Address	: ardyansyah.ibraham@ski.sch.id

3. **Proposal Summary** :

Chemistry lessons in high school direct students to think critically in performing chemical calculations so that the results can be compared with the results of measurements in the laboratory. The commonly studied chemical reactions are those that produce hydrogen, which are studied in reaction rate, stoichiometry, Volta cells and electrolysis cells lessons. Thus far, hydrogen gas measurements have been made with simple equipment with inaccurate results. Arduino Uno device with hydrogen gas sensor can be an innovation to measure hydrogen gas concentration. The application of this innovation in the classroom aims to make chemical concepts directly applicable on a laboratory scale. The learning was conducted in two meetings. The first meeting focused on explaining the concepts, while the second meeting focused on students measuring hydrogen gas in the laboratory with the Arduino Uno device. The result obtained was an increase in student learning outcomes by 80.95% and the questionnaire results showed 88.88% of students stated that the application of Arduino Uno could add experience and increase interest in learning chemistry. The advantage of this innovation is that hydrogen gas measurement can be done easily, equipped with a stopwatch to measure time and obtain accurate real time data with ppm units.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Innovative Experiment Model on Topic Enzymes using Papaya Leaves Extract

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

Name	: **AYUK RATNA PUSPANINGSIH, S.Pd., M.Pd.**
Sex	: Female
Place/Date of Birth	: Denpasar, 13 March 1987
School	: SMA Negeri Bali Mandara
School Address	: Air Sanih Street, Kubutambahan Buleleng, Bali 81172
Phone/Fax Number	: (+62)81238211702 Fax No: -
Email Address	: bi.jegeg@gmail.com

3. **Proposal Summary** :

As prerequisite material in teaching metabolism, enzymes are studied through a catalase-enzyme experiment using the animal's liver. This experimental activity has several weaknesses, namely (1) only obtaining qualitative data, (2) not all the inquiry skills are cultivated, (3) not promoting differentiated learning, (4) less interesting for students and (5) enzymes come from the liver which is smelly, difficult to break down and sticky. These weaknesses can be overcome by conducting the enzyme experiment using papaya leaves.

The innovations in this experiment model are enzyme material derived from papaya leaves and procedures. The procedures are (1) making papaya leaf extract, (2) inserting circular filter paper into the extract, (3) inserting H2O2 into the extract, and (4) calculating the time required for the paper to rise to the surface with a stopwatch. The steps can be modified by adjusting independent variables such as temperature, pH, enzyme concentration and substrate concentration.

Learning using this experiment model can cultivate all inquiry skills, promote students' learning engagement, promote better understanding to the topic and foster an open, honest and responsible attitude. This experiment is easy to replicate, and the materials are easy to obtain so it can be adopted by any Biology teachers.

ITSF

Indonesia Toray Science Foundation

"AWARDING PROPOSAL"

Creative Redox: Fun Learning Chemistry with 21st Century Skills (Resolution of Chemistry Learning with a Combination of Leader in Me, Chemoedutainment, AI and Gallery Walk to Improve Understanding of Redox Concepts Through Fun Practicum)

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

Name	: **DEWI SURYANA, S.Pd.**
Sex	: Female
Place/Date of Birth	: Jakarta, 12 October 1970
School	: SMA Avicenna Cinere, Depok
School Address	: Jl. H. Rosyid No.21, Cinere, District. Cinere, Depok City, West Java 16514
Phone/Fax Number	: 085282379421
Email Address	: nidomdewi123@gmail.com

3. **Proposal Summary** :

Creative Redox, Fun Learning Chemistry with 21st Century Skills is a cooperative Chemistry Learning Resolution that is centered on students in exploring their potential for independent learning with a combination of Leader in Me (habits), Chemoedutainment assisted by AI and Gallery Walk in Simple Redox Reaction practicum. Students reflect on the feelings given in redox subjects with problem- solving ideas that are creative, innovative, and relevant to the students. The research was conducted on class 12 students at Avicenna Cinere High School for the 2024-2025 academic year with 2 cycles, namely Practicum-Project- Presentation, 4 teams were given different practicums, each team was given tools and materials, and flip chart paper, then wrote the report results with creativity, followed by making digital comics and then presenting with a gallery walk. Students understand the material better with simple practical materials that are easily found in everyday life, comics and galleries. By being united, helping each other, being responsible, and being able to form a leader in the work team so that the results obtained are in accordance with the desired an in mind, the practicum resolution becomes fun and meaningful, the presence of digital comics from each team makes the work differentiated.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

The Effectiveness of Using the Lipasawe Genetics Media in Enhancing the Understanding of Inheritance Concepts in Humans for 12th Grade Biology Students at SMAN 6 Palopo

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

Name	: **HARYANTI, S.SI., M.Pd.**
Sex	: Female
Place/Date of Birth	: Palopo, 14 September 1980
School	: SMA Negeri 6 Palopo
School Address	: Jl. Patang II, Palopo South Sulawesi 91923
Phone/Fax Number	: - Fax No: -
Email Address	: haryantirasyid88@gmail.com

3. **Proposal Summary** :

Inheritance of Traits is a crucial part of the secondary education curriculum. This concept is often considered difficult by students because it is abstract and involves a deep understanding of biological processes that are not visible to the naked eye. However, many teachers only use lectures to explain this material.

To address this issue, the author has developed a simple teaching aid that reflects the local wisdom of Palopo city, called LIPASAWE. LIPASAWE depicts the movement of a sarong opening and closing, resembling the motion of the tool to discover the combination of X and Y chromosomes in determining human gender. This tool uses easily accessible recycled materials like plywood, bolts, and LED lights.

The impact of using this innovative tool is that learning becomes more active, collaborative, and enjoyable, creating an engaging learning atmosphere. Students can create mind maps to organize the information they learn in the form of their own projects based on their talents and interests. By using the LIPASAWE genetics teaching aid, students can understand abstract concepts in a concrete way, resulting in improved learning outcomes.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Increasing the Outcomes of Learning Waves and Sound using an Experimental Tooled Wheel for Class VIII Students of SMP Negeri 1 Sidikalang Academic Year 2023/2024

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

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3. **Proposal Summary** :

Learning about waves and sound should be done through practice. The limited laboratory equipment and computer facilities at SMP Negeri 1 Sidikalang are obstacles. The solution is to make a cogwheel as a simple experimental tool.

The cogwheel experimental tool is made of used boards shaped like a wheel with a cogwheel side with a different number of teeth 1, 2, 3 and 4. This tool is equipped with a crank to rotate. When the wheel rotates, the aluminum box is directed to the side of the wheel which produces a different jolt/sound according to the number of teeth. In practice, all wheels rotate at the same time, 1 second. Students attach paper tape to the outside of the cogwheel to obtain a picture of the wavelength produced according to the number of teeth. For one tooth, one hill and one straight line are formed, and so on. The formation of the tape is analyzed by students to find the wavelength, frequency, and difference in sound height due to differences in frequency. The more cogwheel experiment tool (rotated by a dynamo) produces a sound close to the notes do, re, mi fa sol, la, ti.

The advantages of this experiment" ool, students can describe the wavelength, frequency, frequency and sound relationships. Students are directly involved in learning and think critically. The tool is easy to make.

Pretest students 59, after using this tool, the posttest score of students became 87 (KKM 75), the passing rate 95%. Through the questionnaire distributed 100% of students agreed to use the cogwheel experiment tool Send feedback

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

OOB (Otok-otok Boat) as a Contextual and Integrated Learning Media for Motion and Speed Material in Class VII MTs Darul Fikri

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

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3. **Proposal Summary** :

Otok-Otok Boat (OOB) is a type of traditional game, which is unique and antique. The superior value of the Otok-Otok Boat (OOB) include: 1). The price is very cheap. 2). One set of Otok-Otok Boat (OOB) cost IDR 11,250. 3). It's very easy to make. 4). Easy to obtain, Otok-Otok Boat (OOB) can be purchased at children's toy stores.

The Otok-Otok Boat (OOB) is very suitable as a learning media for motion and speed material. Use of the Otok-Otok Boat (OOB) as a learning media for motion and speed material, lots of positive values, among other: 1). Very easy to use to attract students' attention. 2). Can increase students' enthusiasm for learning. 3). It really helps make it easier for students to learn motion and speed material. 4). Very helpful for teachers in meeting the demands of the Merdeka Curriculum.

The result of the motion and speed learning process using the Otok-Otok Boat (OOB) learning media, as follows: 1). Main material (motion and speed). From all classes and all student totaling 70 students. Student who gets: (i) 5 students (7.14%) scored 100, (ii). 10 students (14.29%) scored 95, (iii). 15 students (21.42%) scored 90, (iv). 30 students (42.86%) scored 85, (v). 10 students (14.29%) scored 80, (vi). Meanwhile there are no students who scored less than or below 80(0.00%). 2). Integration material, student who get: (i). 3 students (4.29%) scored 100, (ii). 10 students (14.29%) scored 95, (iii). 15 students (21.43%) scored 90, (iv). 25 students (35.71%) scored 85, (v). 13 students (18.57%) scored 80, (vi). 5 students (7.14%) scored less than or below 80.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Determination of Acetic Acid Concentration in Packaged Vinegar using Small Scale Chemistry Principles

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

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3. **Proposal Summary** :

The determination of Acetic Acid (CH3COOH) concentration in packaged vinegar using the principles of Small-Scale Chemistry is an innovative approach in chemistry. This method addresses the challenges posed by limited availability of laboratory equipment and chemicals, while also optimizing the use of chemicals in school laboratory experiments.

In general, determining the concentration of Acetic Acid in packaged vinegar is based on the principle of Acid – Base Titration using a burette and other large glassware. In experiments utilizing Small Scale Chemistry principles the glassware used in the titration process is modified with small-scale plastic equipment from Small Scale Chemistry, such as a 96-well plate, microtubes, Lab–Top No. 5, and other small plastic tools. Additionally, the use of phenolphthalein (PP) as an indicator in titration is modified by using natural indicators that are easy to find in daily life, such as turmeric extract, pandan leaf extract, and butterfly pea flower extract.

The experiment was conducted in Class XI Science 1. Each group took turns performing the experiment and the experimental results were recorded through calculations based on the provided worksheet and then presented. Student's understanding of chemistry improved, and they became more motivated in learning Acid – Base Titration.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Organ System Game

1. **Subject** : Biology
2. **Receiver**
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3. **Proposal Summary** :

An *Organ System Game* was developed to address the lack of appropriate learning media for the chapter on the Structure and Function of Living Organisms. This chapter covers four essential subsystems: circulatory, respiratory, digestive, and excretory. The game presents organ system concepts in a concise, integrated, meaningful, and engaging manner. Moreover, it actively involves students in the learning process.

The implementation of this innovative organ system game resulted in a significant improvement in student learning outcomes (N-Gain). Specifically, 19 out of 30 students (63%) showed a high increase in their scores, while 11 out of 30 students (37%) demonstrated a moderate increase. The average score after the intervention was 82.3. Furthermore, a learning motivation questionnaire revealed that 83% of students found the game easy to play, enjoyable, and motivating, which enhanced their interest in the Structure and Function of Living Organisms chapter.

ITSF
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"AWARDING PROPOSAL"

Modification of the Traditional Dodorobe Game to Improve Class XI Students' Understanding of Physics on Business Material

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

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3. **Proposal Summary** :

The results of my observations as a physics teacher, the use of handphone has a very negative effect on students. Students are more focused on playing games, not paying attention to their friends in class. For this reason, one of the learning methods that I apply in physics lessons is to modify the Dodorobe game. The Dodorobe game is a traditional game used to play war by children in North Maluku and Dodorobe are made from bamboo. How to play it is easy, played by 2 groups. The size of the bamboo used is around 30 cm with one push rod whose size is adjusted. The bullets used are wet paper, coconut flesh, water guava that has not yet bloomed. This game can be modified for physics learning to improve students' understanding of projectile motion, force, pressure, speed and work.

In the implementation of physics learning through modified Dodorobe games at SMAN 6 North Halmahera, there is an increase in students' understanding of business material, increasing students' learning motivation, which is characterized by students' enthusiasm during learning, encouraging curiosity, and increasing students' critical thinking abilities. Apart from that, through this game, students will not be burdened with studying physics, which is known to be difficult, because it can be done while playing, in fact this game is a form of preserving culture and local wisdom values which are starting to be eroded by online games.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

2D Plantae Action Figure Learning Media Combined with AI Image Generator

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

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3. **Proposal Summary** :

Scientific and digital literacy can be fostered through innovative learning approaches. The innovation of the 2D Action Figure Plantae learning media, combined with AI technology, aimed to enhance student's participation, cognitive skills, scientific processes, and creativity of computational thinking. This learning media featured personalized images of Gymnospermae plants, designed using the ibis Paint application, which were printed and mounted on acrylic. Each design was equipped with a barcode that linked to detailed information. Students were encouraged to use AI image generators to create 2D visualizations of other plant families. Plantae observations were adapted to the local context by using examples of plants from the area surrounding the school to create a dichotomous key classification. This integration not only enriched the learning experience but also fostered a sense of appreciation and care for the environment, instilling a conservation mindset in students.

The implementation of these learning innovations showed a significant increase in student participation and learning outcomes. This innovative approach was proven to enhance student's creativity and digital skills, making learning more interactive, engaging, and relevant to the technological demands of the 21st century. Additionally, this media can be easily replicated by other educators using readily available materials. The experience serves as an inspiration for students to become accustomed to using AI technology as a problem-solving tool. They can apply their experience with AI image generation in various real-life contexts, such as when serving as committee members, planners, designers, or entrepreneurs.

ITSF
Indonesia Toray Science Foundation
"AWARDING PROPOSAL"

Transforming Bioprospecting of Indonesia's Marine Treasures: from Shallow Coral Reefs to Deep-Sea Through Genome Mining and Synthetic Biology

2. Receiver

Name	: **Prof. OCKY KARNA RADJASA, Ph.D.**
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3. Proposal Summary :

Marine invertebrates are sources of a variety of bioactive metabolites with potential for development as new drugs and industrial applications. Traditional harvesting of these marine organisms has been considered unsustainable and harmful to marine ecosystems. Much evidence has emerged that many natural products from marine invertebrates are in fact the products of microbial symbionts. Less than 1% of marine microbial diversity is known today, offering a huge potential of new structures and bioactivities to be exploited in a sustainable manner. As one of the megadiversity countries, Indonesia offers a rich source of marine microorganisms that produce valuable secondary metabolites.

Sixty-eight percent of Indonesian waters are deeper than 200 m and are the habitat of microorganisms adapted to extreme environments, known as extremophiles. Thus, the importance of studying the ability of these extremophiles to produce secondary metabolites is very prospective. A combination of genome mining and synthetic biology is being carried out, resulting in unlocking the potential of marine resources and making significant contributions to various industries. This integration offers a transformative approach to the development of marine natural products in a more efficient, precise and sustainable for discovering novel and valuable compounds without harming precious marine resources.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Enhanced Antioxidant Activity of Sungkai Leaves Extract using Natural Deep Eutectic Solvents for Anti-Aging Treatment

1. Research Team Leader

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2. Research Field	:	Chemical processing and Natural Product Chemistry
3. Number of Researcher(s)	:	3 persons
4. Research Location	:	Chemistry Characterization Laboratory KST BJ Habibie, Gd.452, Tangerang Selatan, Banten
5. Time Allocation	:	10 months
6. Research Grant	:	Rp. 39,150,000
7. Summary of Research Proposal	:	

Sungkai leaves (*Peronema canescens Jack.*) is Indonesian origin plant which has antioxidant and anti-tyrosinase activity that can overcome the sign of aging such as wrinkle and black spot. The extraction is done using environmental friendly solvent to substitute conventional organic solvent, namely Natural Deep Eutectic Solvent (NADES). NADES plays role as extraction solvent and also enhance the antioxidant activity because of its nature properties and selectivity.

The extract from NADES can be directly formulated into nanoemulsion formulation where the smaller size enable closer contact with stratum corneum thus increase the efficacy and penetration to the targeted site. Sungkai leaves is extracted using ultrasonication assisted extraction method (UAE-NADES). NADES is made by the combination of Hydrogen Bond Aceptor (HBA) choline chloride and betaine and Hydrogen Bond Donor (HBD) lactic acid, levulinic acid and propylene glycol with HBA:HBD mol ratio (1:6). Further, the extract is formulated into nanoemulsion using high speed homogenizer with surfactant concentration variation.
The Sungkai NADES extract is analyzed with parameter total phenolic compound, total flavonoid compound, antioxidant and anti-tyrosinase. The nanoemulsion formulation stability is conducted using accelerated stability test method and analyzed for the parameters separation percentage, droplet size, zeta potential, FTIR, physical appearance, pH and viscosity.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

All-Graphene Iron-Air Battery: Reversible Rusting for the Next Battery Generatio

1. Research Team Leader

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2. Research Field	:	Nanomaterial, Electrochemistry
3. Number of Researcher(s)	:	6
4. Research Location	:	Research Center for Chemistry, BRIN
5. Time Allocation	:	1 year
6. Research Grant	:	Rp. 39,000,000
7. Summary of Research Proposal	:	

Two types of graphene oxide (GO) will be synthesized using different methods: Brodies' method yields a uniform structure with fewer oxygen functional groups, mainly epoxy groups, while Hummer's method results in a complex structure with various oxygen functional groups and low uniformity. These GO materials will serve as a platform (co-catalyst) for maghemite (γ-Fe_2O_3). The tunable crystallinity and oxygen-containing functional group compositions of GOs and maghemite are expected to synergistically boost the long-term cycling stability of rechargeable all-graphene iron-air battery via reversible rusting mechanism. The performance of iron oxide (maghemite (γ-Fe_2O_3)), will further substantiate new catalytic electrode material with specific properties such as surface reduction and oxidation that is originated from redox reaction related with the maghemite structure. To advance this research, a novel method for maghemite production will be developed, involving GO—$FeCl_2$ as precursor materials in a one-pot synthesis route, with stirring at room temperature for a day under mild conditions. These materials are expected to achieve high stability of the air-cathode material for rechargeable all-graphene iron-air battery. Additionally, molecular dynamic simulations will verify experimental results and aid in understanding the mechanism of maghemite formation (the inclusion of Fe^{2+} in the GO lattice) in the HGO and BGO samples.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

The Application of Durian Seed and Chitosan as Polyelectrolyte Complex for Bioimaging

1. Research Team Leader

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2. Research Field	:	Chemical engineering
3. Number of Researcher(s)	:	2
4. Research Location	:	Universitas Katolik Widya Mandala, Surabaya
5. Time Allocation	:	March 2025 – March 2026
6. Research Grant	:	Rp. 39,150,000
7. Summary of Research Proposal	:	

Heteropolysaccharide has gained interests due to its abundance, biodegradability, non-toxic, and easy modification of material. This material has been studied for drug delivery, food industry, and pharmaceutical. In this study, the exploration of durian seed as agricultural waste for the synthesis of polyelectrolyte complex with chitosan is investigated. Many natural compounds have an active compound that able to develop fluorescence properties under UV radiation. Durian seed as natural compound is processed to obtain the durian seed gum which is combined with chitosan for the complex coacervate in the bioimaging. Polyelectrolyte complex is widely used for the preparation of active compound/drug encapsulation. This technique involves the dissolution of anion and cation materials in a solution, and create spontaneous complex coacervate, which is a green method that require no hazardous chemical than other method such as radical polymerization. This complex has fluorescence properties that show blue light emission after UV radiation, which was useful in the optical imaging. This material has the potential to be fluorescent probe for cell imaging with its biocompatibility and biodegradability. Furthermore, its property as anticancer agent is investigated to better understand the possibility of this material for photodynamic therapy.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Deep Learning-Based Segmentation of Breast Cancer Lesions in Ultrasound Imaging using U-Net

1. Research Team Leader

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2. Research Field : Medical Physics and Biophysics
3. Number of Researcher(s) : 2
4. Research Location : Depok, Jawa Barat
5. Time Allocation : 1 year
6. Research Grant : Rp 39,000,000.-
7. Summary of Research Proposal :

Breast cancer is the most common cancer in women and a major cause of cancer-related deaths. Early detection is essential for better outcomes. X-ray imaging methods, such as mammography, are widely used because they show clear differences between normal and cancerous tissues. However, mammography has limitations, especially for women with dense breast tissue, such as those under 50 years old, where it may miss abnormalities. It also exposes patients to radiation, even at low doses. Ultrasound imaging is a safer option since it does not use radiation, making it suitable for frequent monitoring. However, its images are less clear compared to X-ray imaging.

This research focuses on improving ultrasound imaging by using a U-Net deep learning algorithm to segment breast cancer lesions. Early results show that this method enhances the visibility of lesions, making it easier to identify cancer. The algorithm will be trained using the BrEaST dataset and tested with images from Dharmais National Cancer Hospital in Indonesia. The goal is to improve accuracy, help doctors diagnose breast cancer earlier, and encourage more use of ultrasound in Indonesia.

This work offers a safer, reliable alternative to X-ray imaging, especially for women with dense breasts or in low-resource settings, improving breast cancer care globally.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Advanced Protective Coatings: Fe_3O_4NPs/rGO-Infused Paint for Submarine Hulls with Radar Absorption Capabilities

1. Research Team Leader

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2. Research Field : Advanced Protective Coatings for Radar Absorber materials

3. Number of Researcher(s) : 2 (two)

4. Research Location : Universitas Negeri Makassar

5. Time Allocation : Januari 2025-Desember 2025

6. Research Grant : Rp 39,000,000.-

7. Summary of Research Proposal :

This research focuses on developing a multifunctional, eco-friendly paint incorporating Fe_3O_4NPs/rGO synthesized from natural resources. The proposed paint is tailored for application on aluminum plates used in submarine hulls, aiming to enhance durability, corrosion resistance, and radar wave absorption capabilities.

Building on previous success in synthesizing Fe_3O_4NPs/rGO from natural sources, the study will optimize these nanomaterials for integration into an epoxy-based paint matrix. The research involves synthesis, formulation, application, and comprehensive testing of the paint to assess its performance under harsh marine environments. Durability tests, corrosion resistance analysis, and radar absorption evaluations will validate its suitability for defense applications.
The proposed paint addresses the dual challenges of protecting submarine hulls from environmental degradation while enhancing stealth properties through radar absorption. Additionally, the use of natural materials aligns with sustainability goals, reducing environmental impact and production costs.

This project contributes to the advancement of materials science and marine defense technology, offering an innovative solution for improving the lifespan and operational efficiency of submarines. The results are expected to have a significant impact on national and international marine and defense industries.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Development a Novel Genome Editing Plasmid for *SrFT* Gene Knockout to Optimize Steviol Production in *Stevia Rebaudiana*

1. Research Team Leader

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2. Research Field	:	Biotechnology
3. Number of Researcher(s)	:	2
4. Research Location	:	Cibinong, West Java
5. Time Allocation	:	January 1st – December 31st, 2025
6. Research Grant	:	Rp 39,072,000.-
7. Summary of Research Proposal	:	

Flowering is essential for plant reproduction, genetic diversity, and crop improvement, making its molecular regulation critical for ecological adaptation and agricultural productivity. *Stevia rebaudiana*, valued for its non-caloric sweeteners derived from steviol glycosides (SG), demonstrates peak glycoside accumulation before flowering. This study integrates Fastrack breeding technology with genome editing to develop a novel plasmid aimed at inhibiting flowering in Stevia. The approach targets *Flowering Locus T* (FT) gene knockout to extend the vegetative phase, enhancing biomass and SG production. The plasmid construction involves amplifying the *EgHd3a* gene overexpression cassette and integrating it into the pHEE401E plasmid using Gibson Assembly, which ensures precise DNA fragment joining. The plasmid will be tested in Arabidopsis thaliana using Agrobacterium-mediated floral dip transformation. Plants with functional EgHd3a expression are expected to flower early, aiding in mutant selection, while AtFT knockout mutants will exhibit delayed flowering, prolonging vegetative growth. Testing in Arabidopsis, a model species with a well-characterized genome and short life cycle, will validate the plasmid before application to Stevia. This dual-purpose strategy increases SG yield while expediting breeding processes by efficiently distinguishing transgene-free mutants. If successful, this innovative approach could significantly boost Stevia productivity and serve as a model for broader crop improvement applications.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Enhancing the Performance of Chitosan/polyaniline-based Quasi Solid Electrolyte with Morphology-dependent TiO_2 Nanofillers for Dye-sensitized Solar Cells

1. Research Team Leader

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2. Research Field	: Inorganic Chemistry and Materials
3. Number of Researcher(s)	: 2
4. Research Location	: UGM, Yogyakarta
5. Time Allocation	: One year (12 months)
6. Research Grant	: Rp 39,150,000.-
7. Summary of Research Proposal	:

Dye-sensitized solar cells (DSSCs) are promising third-generation solar cell technology due to their easy fabrication, low cost, and relatively high efficiency. However, conventional DSSCs suffer from low stability due to crucial issues like evaporation and electrolyte leakage. The use of polymer electrolytes offers a promising solution. Chitosan, a biopolymer, can serve as an electrolyte matrix in DSSCs because its nitrogen and oxygen atoms interact with electrolyte ions. Despite, chitosan alone exhibits a relatively low performance. TiO2 nanofillers are known to enhance the electrochemical properties of polymer electrolytes, but the mechanism of this improvement remains unclear. This study examines the effects of anatase-dominant TiO_2 nanoparticles with different morphology (nanorod, nanosphere, and nanotube) as nanofillers in a chitosan matrix with I^-/I_3^- redox couple as quasi-solid electrolytes in DSSCs. The study investigates the impact of TiO_2 nanofillers morphology and particle size, as well as the ratio of nano-TiO_2 to chitosan/polyaniline matrix, on the electrolyte performance and DSSC efficiency. Characterization will be conducted using FTIR spectroscopy, XRD, SEM, TEM, cyclic voltammetry, and electrical I-V analysis. The incorporation of TiO2 nanoparticles is expected to improve the electrolyte conductivity and oxidation-reduction intensity, leading to high stability and efficiency of eco-friendly DSSCs.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Evaluation of Brucea javanica L. Merr Extract Effectivity on Vascular Stenosis Development Post-Endothelial Denudation in Mice

1. Research Team Leader

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2. Research Field	: Pharmacology
3. Number of Researcher(s)	: 4
4. Research Location	: University of Mataram, Indonesia
5. Time Allocation	: 11 Months
6. Research Grant	: Rp 39,400,000.-
7. Summary of Research Proposal	:

Cardiovascular diseases (CVDs), primarily driven by vessel stenosis including ischemia and atherosclerosis, remain the leading global cause of mortality. Therefore, this study investigates an alternative treatment strategy to mitigate CVDs by evaluating the effect of *Brucea javanica* L. Merr (BJ) extract on a stenotic model in mice.

A specific guide wire will be employed to remove the endothelial layer in mouse arteries, inducing medial vascular smooth muscle cell (VSMC) proliferation, which eventually leads to vessel stenosis. Given the critical role of VSMCs in the development of stenotic plaques, we preliminarily revealed that the treatment of BJ extract could reduce IL-1β-induced VSMC proliferation. Our further investigation indicated that BJ extract decreased the number of IL-1β-induced early endosomes. These findings suggest that BJ extract may impact endosome synthesis. Our pilot investigations showed N-cadherin co-localizes with endosomes, suggesting that N-cadherin degradation was influenced in VSMCs.

Collectively, our preliminary in vitro results indicate that BJ extract reduces VSMC proliferation through the N-cadherin-endosome axis pathway. Based on this finding, we hypothesize that BJ extract treatment may reduce injury-induced stenosis in mice. Thus, we propose evaluating the functional role and underlying molecular in vivo mechanism of BJ extract on stenotic model.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Effect of Thermal Aging and Solution Annealing on Sigma Phase Formation and Corrosion Resistance in Super Duplex Stainless Steel UNS S32760

1. Research Team Leader

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2. Research Field	:	Materials Science and Engineering
3. Number of Researcher(s)	:	3
4. Research Location	:	Bandung, West Java, Indonesia
5. Time Allocation	:	February 2025 – January 2026
6. Research Grant	:	Rp 39,000,000.-
7. Summary of Research Proposal	:	

This study examines the influence of thermal aging and solution annealing on the development of the sigma (σ) phase and its effect on the corrosion resistance of Super Duplex Stainless Steel (SDSS) UNS S32760. Its superior mechanical qualities and stress corrosion cracking resistance make SDSS popular in the oil and gas industry. However, high temperatures (600–1050 °C) can generate harmful secondary phases such the sigma phase, which depletes chromium and decreases corrosion resistance.

The study centers on two primary objectives. Initially, the sigma phase formation and microstructural alterations following thermal aging at temperatures of 700, 800, 900, and 1000 °C were analyzed. Second, to assess the efficacy of solution annealing at temperatures of 1100, 1200, and 1300 °C in reducing the impact of the sigma phase and enhancing corrosion resistance. The methodology encompasses thermal treatment, microstructural characterization using OM, SEM, EDS, XRD, hardness testing, and corrosion resistance testing (electrochemical impedance spectroscopy, Tafel polarization, and immersion test). This work seeks to determine ideal heat treatment parameters to decrease sigma phase development and maintain SDSS corrosion resistance, improving reliability and performance in severe conditions, particularly in the oil and gas industry.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Post-translational Modifications of Staphylokinases from Indonesian Strains of *Staphylococcus Aureus* to Improve their Activity and Affinity Against Plasminogen

1. Research Team Leader

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2. Research Field	:	Biotechnology
3. Number of Researcher(s)	:	three
4. Research Location	:	Bandung and Cibinong
5. Time Allocation	:	A year
6. Research Grant	:	Rp 39,050,000.-
7. Summary of Research Proposal	:	

According to the published reports and papers, the study and application of SAK which identified and isolated from the Indonesia strain of *S. aureus* have not been conducted, reported, or published yet. SAK from different *S. aureus* strains may have different expression levels than reported SAKs.

Different strains of *S. aureus* may share some similarities with specific genes, making it possible to compare the characteristics of the proteins to screen the best one. However, most of the reported amino acid sequences of SAK were canonical. However, some SAK-like molecules harbour unusual sequences and structural elements. Some possess cysteine-rich C-terminal extensions of unknown function, challenging recombinant expression in *E. coli.* Thus, the optimization of expression and purification strategies are required to successfully express these newly identified SAKs.

The sequence of most SAKs is similar for the first 100 amino acid residues. However, the differences in length and other amino acid residues may provide different SAK functional and structural characteristics. Therefore, this study will contribute to a deep understanding of the functional and structural characteristics of SAK from Indonesian strains of *S. aureus* which will open up the future advanced study of SAK and its clinical application as a thrombolytic agent in the future.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Non-Invasive Glucose Detection using Polydopamine-Functionalized Dynamic Microcantilevers

1. Research Team Leader

Name	:	**Dr. LIA APRILIA**
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2. Research Field	:	MEMS Sensor and Biosensor
3. Number of Researcher(s)	:	3 (include principal researcher)
4. Research Location	:	BRIN KST BJ Habibie, Setu, Tangerang Selatan, Banten, Indonesia 15314
5. Time Allocation	:	10 months
6. Research Grant	:	Rp 39,150,000.-
7. Summary of Research Proposal	:	

Microcantilevers have been widely studied for sensor and biosensor applications due to their high sensitivity and rapid response. This study aims to develop a non-invasive glucose detection system using dynamic microcantilevers functionalized with polydopamine (PDA). The specific objective is to utilize PDA to enhance enzyme immobilization, overcoming the limitations of traditional methods, such as using complex binders (e.g., EDC-NHS, glutaraldehyde) that can affect the sensor performance. We hypothesize that PDA will provide a more stable and effective platform for enzyme attachment, enhancing the sensitivity and selectivity of the microcantilever sensor for glucose detection.

The methodology involves functionalizing of the microcantilever surface with polydopamine and immobilizing glucose oxidase to enable selective glucose detection. Sensor response is observed by measuring the resonance frequency shift of microcantilever when glucose interacts with the enzyme. The sensor's performance will be assessed through sensitivity and selectivity. Other sugar molecules are also tested to ensure sensor selectivity. In addition to investigating the capabilities of microcantilever sensors for glucose biosensors, this approach can advance non-invasive glucose monitoring by simplifying enzyme immobilization and improving sensor reliability.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Formulation of an Ointment Based on Red Palm Oil and Channa Striata Fish Oil Extract as a Wound Healing Treatment

1. Research Team Leader

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2. Research Field	: Agroindustrial Technology
3. Number of Researcher(s)	: 4
4. Research Location	: Palangka Raya City (University of Palangka Raya)
5. Time Allocation	: 8 – 10 months
6. Research Grant	: Rp 39,150,000.-
7. Summary of Research Proposal	:

The research aims to formulate and optimize a synergistic ointment that leverages the combined effects of RPO and Channa striata oil. The study will determine the optimal oil ratio, assess the ointment's physicochemical properties, and evaluate its wound healing efficacy compared to individual components and standard treatments.

The combination of Red Palm Oil and Channa striata fish oil extract in an ointment formulation will enhance the wound healing process more effectively than using either oil alone, due to the synergistic effects of their bioactive compounds. In this study, an ointment formulation combining red palm oil and snakehead fish oil will be made. The formulation will vary the concentrations of red palm oil and snakehead fish oil as follows: 5%+5% (I), 5%+10% (II), 5%+15% (III), 10%+5% (IV), 10%+10% (V), and 10%+15% (VI). Based on the above ointment standards, a 20 g ointment formulation will be made with six concentration variations

Preliminary findings suggest that this natural formulation could offer an effective and accessible wound care solution, particularly in regions where these resources are abundant. Further research and clinical trials are necessary to validate its efficacy and optimize its use for various wounds.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Toxicological Assessment of Biogenic Ag Nanoparticles: Phytotoxicity on *Oryza sativa* L. (Rice) and *Zea mays* L. (Corn) and Cytotoxicity on Macrophage Cells

1. Research Team Leader

Name	:	**Dr. WINDRI HANDAYANI**
Sex	:	Female
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2. Research Field	:	Nanobiology
3. Number of Researcher(s)	:	2
4. Research Location	:	Departement of Biology, FMIPA UI
5. Time Allocation	:	10 months
6. Research Grant	:	Rp 39,150,000.-
7. Summary of Research Proposal	:	

The increasing application of nanoparticles in agriculture necessitates a thorough understanding of their potential toxicological impacts on both crops and human health. This study aims to evaluate the phytotoxicity of biogenic silver nanoparticles (AgNPs) on two major crops, *Oryza sativa* L. (rice) and *Zea mays* L. (corn), as well as their cytotoxicity on RAW 264.7 cell line macrophage. Biogenic AgNPs were synthesized using an eco-friendly method using Diospyros discolor leave extracts and characterized by spectrophotometer UV-Vis and Transmission electron to confirm their properties. Phytotoxicity was assessed by examining seed germination, root elongation, and growth parameters under varying concentrations of AgNPs. Physiological responses such as chlorophyll content and enzyme activities were measured, also AgNP accumulation in plant tissues was analyzed uaing ICP-MS. For cytotoxicity, macrophage cells were tested using the WST-1 assay to determine cell viability, TNF-α ELISA to measure inflammation, and NO production assay to evaluate macrophage activation. It is hypothesized that AgNPs will exhibit a dose-dependent phytotoxic effect, negatively impacting seed germination and plant growth at higher concentrations. Similarly, macrophage cell viability is expected to decrease, with increased inflammation and NO production observed at certain AgNP concentrations.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Genome Wide Effect of Heterologous Expression of the Mevalonate Pathway in *Bacillus subtilis*

1. Research Team Leader

Name	: **Dr. Apt. HEGAR PRAMASTYA**
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2. Research Field	: Pharmaceutical Biology
3. Number of Researcher(s)	: 3
4. Research Location	: School of Pharmacy, ITB
5. Time Allocation	: 12 months (1 year)
6. Research Grant	: Rp 39,000,000.-
7. Summary of Research Proposal	:

Recent progress in genetic engineering facilitates nonnative/ combinatorial/ heterologous production of terpenoids using microbes including *Bacillus subtilis*. We have already engineered B. subtilis to produce amorphadiene (a dedicated artemisinin precursor) via heterologous mevalonate pathway which produced up until 800 mg/L of amorphadiene. Nonetheless, the production still relied on mevalonate supplementation, suggesting the problem on the upper part of the pathway. The project aims to reveal the genome wide effect of upper part mevalonate pathway expression in *B. subtilis* which further can be a basis for rewiring and genome wide optimization to improve terpenoid production through heterologous mevalonate pathway. Total RNA would be isolated from two different strains of *B. subtilis*, *B. subtilis* 168 WT and B. subtilis MVA6 which possess an upper MVA pathway integrated into its genome. RNA-seq including differential gene expression (DGE) analysis would be employed to assess the affected gene expression. The result would then be validated with qPCR for most affected genes which has preponderance in regulating terpenes biosynthetic pathway and/or central carbon metabolism. We hypothesize that the upper mevalonate pathway expression changed dramatically gene expression especially related to central carbon metabolism enzyme and regulators with emphasized on downstream of glycolysis pathway.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Development of Electro-spun Nanofiber-based Polyaniline-linseed Oil Self-Healing Coating for Anti-corrosion Applications

1. Research Team Leader

Name	:	**IKA DEWI WIJAYANTI, S.T., M.Sc., Ph.D.**
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2. Research Field	:	electrospinning, EIS, rapid solidification, NiMH batteries, SOFC
3. Number of Researcher(s)	:	5 (including the principal investigator)
4. Research Location	:	Dept. Mech. Engineering ITS Surabaya
5. Time Allocation	:	12 months
6. Research Grant	:	Rp 39,500,000.-
7. Summary of Research Proposal	:	

Corrosion is an unavoidable issue with significant negative impacts, especially when occurring on electrical industrial equipment. These impacts include power outages, high repair costs, damage analysis expenses, and additional personnel costs. Preventive measures are essential to minimize these effects. A promising and cost-effective method for mitigating corrosion on engineering surfaces is using protective coatings.

We propose an innovative electro-spun nanofiber-based Polyaniline (PANI) coating, building on the success of our first home-funded electrospinning machine in 2021. Electrospinning produces nanofibers with a high surface area to volume ratio, enhancing the coating's protective properties. Polyaniline, known for its excellent conductivity and stability, serves as the primary matrix. We integrate self-healing by embedding microcapsules with linseed oil as healing agent within the PANI nanofibers. Upon damage, these microcapsules release the agents, restoring the coating's integrity.

This study will optimize electrospinning parameters, characterize structural and electrochemical properties, and evaluate self-healing efficiency and corrosion resistance through accelerated aging tests. The goal is to develop a robust, self-healing coating that extends the steel substrate's life, significantly reduces maintenance costs, and enhances economic and environmental sustainability. This research aims to provide a novel solution for reducing corrosion-related failures in steel structures.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Yeast Bioengineering for Sustainable Lipid-Based Energy Production from Rhodotorula Glutinis

1. Research Team Leader

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2. Research Field	: Genetics Engineering
3. Number of Researcher(s)	: 5
4. Research Location	: Yogyakarta
5. Time Allocation	: 10 months (February - November 2025)
6. Research Grant	: Rp 39,266,000.-
7. Summary of Research Proposal	:

Yeast bioengineering offers a promising strategy to approach sustainable lipid-based energy production. *Rhodotorula glutinis* as a chosen candidate is known as robust lipid accumulation capabilities. This research focuses on the genetic engineering of *R. glutinis* to optimize its lipid biosynthesis pathways, specifically targeting the DGA1 gene. The aim of this research is to increase the yield and efficiency of biofuel production by enhancing lipid accumulation in the recombinant yeast. The methods including in silico design, molecular cloning, transformation, and fermentation, are justified by their efficiency, and suitability for the project goals. The application of genetic engineering techniques by modifying the gene cassette and recombinant plasmid containing the target DGA1 gene is expected to enhance lipid expression. This research also utilizes glycerol as a carbon source for lipid synthesis. The engineered yeast strains are expected to exhibit significantly higher lipid content, facilitating more efficient conversion to biofuel. This bioengineering approach not only enhances the feasibility of yeast-based biofuels but also aligns with global efforts to develop renewable energy sources. The findings from this research could pave the way for scalable and economically viable biofuel production, contributing to a more sustainable energy future.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Purification and Characterization of Lectin Proteins from Chitosan-coated Banana *Musa Acuminata* and Plantain *M. balbisiana* as Agglutinin Molecule Candidates to Detect Cancer Biomarkers

1. Research Team Leader

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2. Research Field	:	Biotechnology
3. Number of Researcher(s)	:	3 (three)
4. Research Location	:	KST Soekarno BRIN, Cibinong and SITH ITB, Bandung
5. Time Allocation	:	8 (eight) months
6. Research Grant	:	Rp 39,258,000.-
7. Summary of Research Proposal	:	

The proposed research explores the potential of banana and plantain lectins (BanLec and PlanLec) extracted from chitosan-coated Musa acuminata and M. balbisiana respectively, as agglutinin molecule candidates to detect cancer biomarkers. Given the fact that cancer remains a leading cause of death globally, there is an urgent need for early detection and accurate diagnostic tools. Lectins, a group of carbohydrate-binding proteins, are promising candidates in cancer diagnostics due to their ability to specifically bind to glycoproteins and glycans, which are key cancer biomarkers. The objectives of this study are developing a robust protocol for the extraction and purification of BanLec and PlanLec from chitosan-coated bananas and plantains, characterizing these lectins in terms of molecular weight, carbohydrate-binding specificity, and stability under various conditions, and computationally simulating their binding affinity to known cancer biomarkers. Lectins will be extracted by using a combination of mechanical disruption, buffer extraction, and affinity chromatography. The characterization of the extracted BanLec and PlanLec will include a hemagglutination assay, SDS-PAGE, and stability tests. Additionally, computational modelling will be conducted to unlock the identification of novel lectin genes regulated in bananas and plantains to take roles in cancer diagnostics.

ITSF
Indonesia Toray Science Foundation
"RESEARCH PROPOSAL"

Fabrication of Nanoplasmonics-Fiber Optics Sensor: Enabling Ultrasensitive Operando Sensing of Rechargeable Battery Cell

1. Research Team Leader

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Sex	:	Male
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2. Research Field	:	Plasmonics sensor
3. Number of Researcher(s)	:	6 (including the team leader)
4. Research Location	:	KST B.J. Habibie Serpong
5. Time Allocation	:	1 year
6. Research Grant	:	Rp 39,500,000.-
7. Summary of Research Proposal	:	

Operando battery cell monitoring is important to study the microscopic mechanism that will enhance our understanding to improve efficiency and lifetime. This project aims at developing a nanoplasmonics-fiber optics hybrid sensor as a compact sensor enabling insertion in between the battery's active layer. Functionalization of nanoplasmonics will enhance the sensitivity of the sensor than that of bare fiber optics. To achieve this target, we outline three objectives. First, we begin by developing the sensor via self-assembly route, which eliminates the need of sophisticated facilities, to promote fabrication of low-cost sensor. Second, we establish a battery holder model that enables fiber optic feedthrough in transmission mode. Lastly, we investigate the electrical charge-discharge input and the real-time optical response readout. Within one year, we expect to develop a proof-of-concept of nanoplasmonics-fiber optic sensors for operando battery cell monitoring that will pave the way for the next development in the coming years.

OUTLINE OF
THE INDONESIA TORAY SCIENCE FOUNDATION

FOUNDATION HISTORY

The Indonesia Toray Science Foundation was established in 1993 through 3billion 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

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

BOARD OF DIRECTOR MEMBERS:

Chairman	:	**Dr. L. T. Handoko**
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		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. Is Fatimah** (member)

2. The Examination Selection Committee for Science and Technology Award and Science and Technology Research Grant:
   - **Dr. Ernawati Arifin Giri-Rachman** (chairman)
   - **Dr. M. Aziz Majidi** (member)
   - **Prof. Dr. Suryadi Ismadji** (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 ¥ 2,464.5 billion in March 2024. Toray leads the world in develop production of carbon fibers & other advanced composite materials. Building on its extraordinary technological strength, Toray is diversif 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	TORAY Innovation by Chemistry	**PT Indonesia Toray Synthetics** (PT ITS)	Jakarta	Manufacturer of polyester staple fiber, nylon, polyester filament yarn & resin
2	ISTEM	**PT Indonesia Synthetics Textile Mills** (PT ISTEM)	Jakarta	Spinning, weaving, dyeing of polyester based textiles
3	ACTEM	**PT Acryl Textile Mills** (PT ACTEM)	Jakarta	Spinning and dyeing of acrylic fibers
4	CENTEX PT. CENTURY TEXTILE INDUSTRY Tbk	**PT Century Textile Industries, Tbk** (PT CENTEX)	Jakarta	Spinning, weaving, dyeing of industry blended dyeing of blended polyester & cotton textiles
5	PT EASTERNTEX	**PT Easterntex** (PT ETX)	Pandaan, Jawa Timur	Spinning, weaving of blended polyester & cotton textiles
6	TORAY TORAY POLYTECH JAKARTA	**PT Toray Polytech Jakarta** (PT TPJ)	Jakarta	Nonwoven polypropilene
7	TORAY PT TAK Textiles Indonesia	**PT TAK Textile Indonesia** (PT TATI)	Jakarta	Spinning, weaving, dyeing of polyester based textiles
8	TORAY Innovation by Chemistry	**PT Toray International Indonesia** (PT TIIN)	Jakarta	Trading company
9	TIMW	**PT TI Matsuoka Winner Industry** (PT TIMW)	Semarang	Garment

ITSF INDONESIA TORAY SCIENCE FOUNDATION